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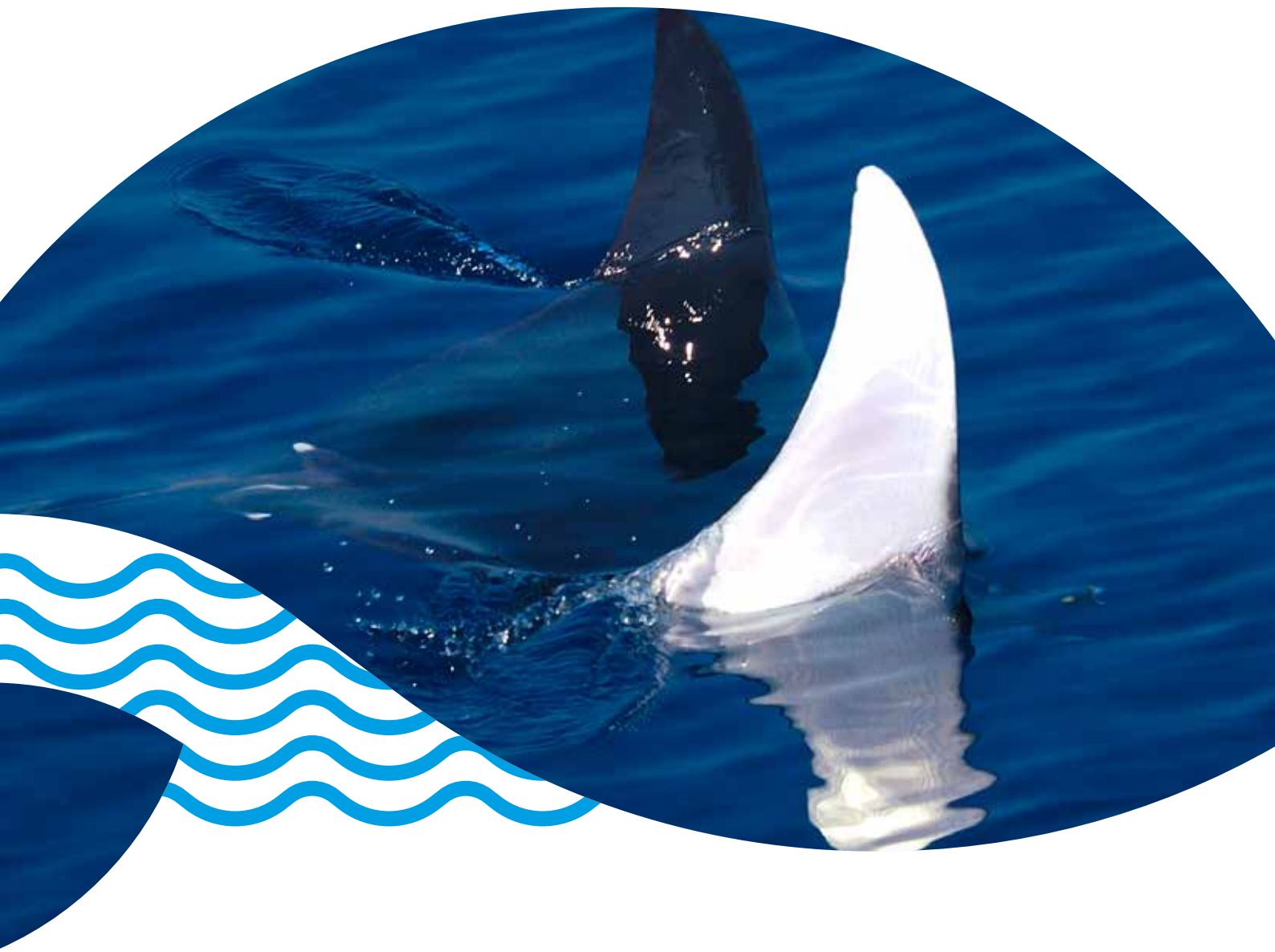
POST-2020
SAP BIO

CONSERVATION OF MARINE AND COASTAL BIODIVERSITY IN THE AEGEAN SEA AND LEVANTINE BASIN SUB-REGION BY 2030 AND BEYOND



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CONSERVATION OF MARINE AND COASTAL BIODIVERSITY IN THE AEGEAN SEA AND LEVANTINE BASIN SUB-REGION BY 2030 AND BEYOND

SUB-REGIONAL REPORT OF THE POST-2020 SAPBIO

POST-2020
SAP BIO

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

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List of Acronyms

ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea, the Mediterranean Sea and the contiguous Atlantic Area
ASI	ACCOBAMS Survey Initiative
Barcelona Convention	The Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean
CAMP	Coastal Area Management Programme
CBD	Convention on Biological Diversity
CC	Climate Change
CFP	Common Fisheries Policy
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EASIN	European Alien Species Information Network
EcAp	Ecosystem approach under Barcelona Convention
EIA	Environmental Impact Assessment
EMODnet	European Marine Observation and Data Network
EQS	Ecological Quality Status
EU	European Union
EUNIS	European Nature Information System
FAO	Food and Agriculture Organization of the United Nations
FRA	Fisheries Restricted Area
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
IAS	Invasive Alien Species
IBA	Important Birds Area
ICZM	Integrated Coastal Zone Management
IMAP	Integrated Mediterranean Monitoring and Assessment Programme
IMMAs	Important Marine Mammal Areas
IUCN	The International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated
MCPA	Marine and Coastal Protected Area
MCS	Monitoring, Control and Surveillance
MPA	Marine (and coastal) Protected Areas
MSFD	EU Marine Strategy Framework Directive
MSP	Maritime/Marine Spatial Planning
NAP	National Action Plan
NIS	Non-indigenous species
OECM	Other effective area-based conservation measure
Post-2020 SAPBIO	Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region
SAPBIO	Strategic Action Programme for the Conservation of Biodiversity Resources in the Mediterranean Region
SDG	Sustainable Development Goal

SPA/BD Protocol	Protocol concerning specially protected areas and biological diversity in the Mediterranean
SPA/RAC	Specially Protected Areas Regional Activity Centre
SPAMI	Specially Protected Areas of Mediterranean Importance
UNDP	United Nations Development Program
UNEP/MAP	Mediterranean Action Plan of the UN Programme for Environment
WFD	Water Framework Directive

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Introduction

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The Mediterranean Sea is considered as one of the least-productive seas of the world. The geophysical and arid climatic conditions make the Eastern Mediterranean the most oligotrophic part of the Basin (Azov, 1991). This low productivity is based on the prevailing low nutrient levels, impoverished phytoplankton populations and phosphorus deficiency (Azov, 1991; Ignatiades, 1998). In spite of that, this sea is a hot spot of the marine biodiversity.

The Aegean Sea and the Levantine Basin are one of the subareas of the Mediterranean Sea. It is important in terms of biodiversity because the Aegean Sea is connected to the Black Sea through the Turkish Straits System (TSS) while the Levantine Basin to the Red Sea through the Suez Canal since its opening in 1869.

Currently, the Levantine Basin is the main and fastest area of changing biota within the entire Mediterranean Sea due to Lessepsian migration. Besides, Levantine Basin is also undergoing an intense climate change. Moreover, the Aegean Sea and Levantine Basin have severe and increasing human pressures in recent decades. Sustainability and effective conservation of biodiversity is needed on a long term basis. Coherent and regional approaches are essential, for which it is important to think strategically and well in advance.

In December 2003, the Contracting Parties to the Barcelona Convention adopted the first comprehensive strategic plan to conserve biodiversity in the Mediterranean Region - SAP BIO. Since then, SAPBIO has played an important role both as a strategic framework for implementation of the SPA/BD Protocol at national and regional levels and in facilitating exchanges among departments within and among countries on common concerns in biodiversity conservation. Considering the changes occurred in relation to the status of Mediterranean biodiversity and the related policies, the Barcelona Convention COP 21 requested to prepare in 2020-2021 the Post-2020 SAPBIO. This strategic plan should be specifically tailored to address current and future regional and national challenges in the Mediterranean, and in doing so, to contribute to global processes, particularly the Global Sustainable Development Goals (SDGs) and CBD Post-2020 Global Biodiversity Framework.

The elaboration of the Post-2020 SAPBIO follows the bottom-up and participatory approach, starting with the development of national reports, which then represent bases for sub-regional level analyses and consultations for 4 sub-regions, including a subregion containing the Aegean Sea and Levantine Basin. The main objective of the sub-regional report is to promote complementarity and harmonisations of the priority actions identified at a national level, most notably for transboundary issues such as biological invasions, climate change, representativeness and connectivity of MPAs. This report will further indicate the objectives to achieve and priority actions at the Mediterranean level.

2. Methodology

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The sub-regional report for the Aegean Sea and Levantine Basin is prepared by a sub-regional expert selected by the SPA/RAC, under the coordination of SPA-RAC and in cooperation with different national and sub-regional stakeholders.

The preparation of the document is foremostly based on literature review, desk research, complemented with inputs from different stakeholders during the sub-regional workshop.

The most relevant documents used for the preparation of the sub-regional report are national reports prepared in 2020 under guidance of SPA/RAC by each country of the Aegean and Levantine Basin, namely Cyprus, Egypt, Greece, Israel, Lebanon, Turkey and Syria, as total 7 countries. The national reports contain, among all, analysis of current state, pressures, responses and identified needs and future priorities. These reports were prepared by appointed national experts and finalized after the national workshops with relevant stakeholders. Besides national reports, following main groups of documents were used:

- Additional scientific literature on different group of species in the Aegean and Levantine Basin
- Mediterranean level reports on environment and state of fisheries, prepared by UNEP/MAP Plan Bleu and the GFCM
- Strategic documents at the global, European and Mediterranean levels; Post-2020 global biodiversity framework under the CBD (in preparation process), EU Biodiversity Strategy for 2030, ACCOBAMS Strategy for 2014–2025. GFCM documents for Mediterranean and Black Sea fisheries and aquaculture.

The full list of all used documents is provided in the List of References.

The Draft Sub-regional Report for the Aegean Sea - Levantine Basin will be presented to different stakeholders during the sub-regional workshop organized on 16 March 2021.

3.

Key biodiversity values of the Aegean sea and levantine Subregion and their present status

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3.1. Main physical features of the Subregion

The Aegean Sea is connected with the Marmara and Black Seas through the Dardanelles Strait, with the Ionian Sea through the Kithira, Antikithira and Elafonisos Straits and with the Levantine through the Rhodes, Kassos and Karpathos Straits (Fig. 1). The North Aegean Sea has a complex topography characterized by numerous islands, and a combination of shallow and deep basins. Two major shelf areas (< 200m) occupy the west-southwest of the Dardanelles Strait (Limni Plateau) and to the north-northwest and along the Thracian coast (Semadirek Plateau). They are separated by a zonally oriented narrow trough deeper than 1000m (Limnos basin).

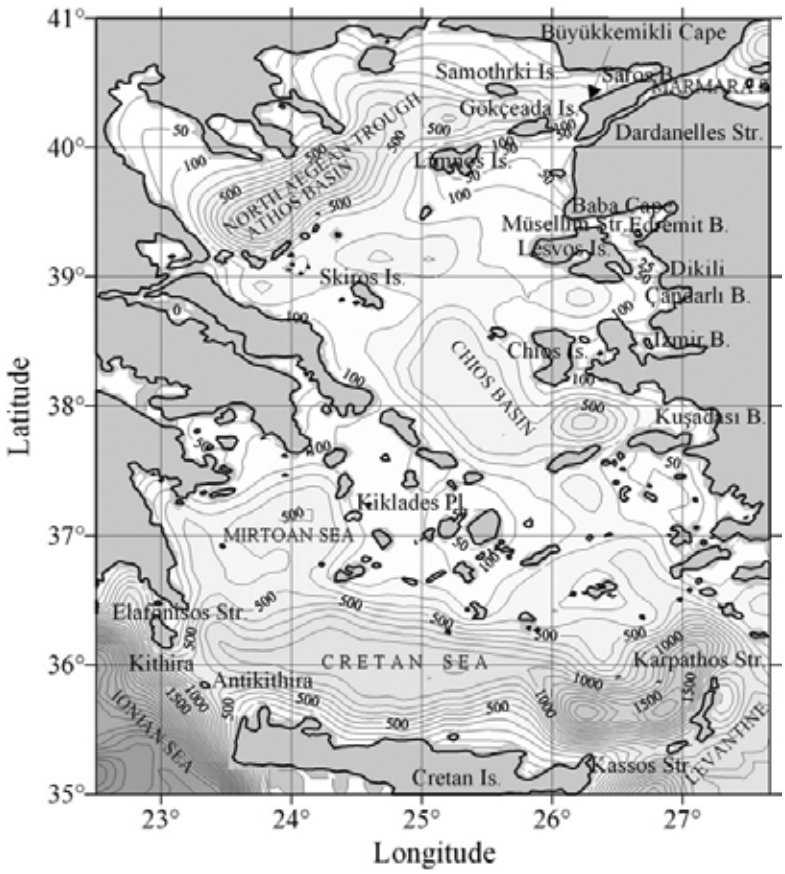

Fig. 1.
The Aegean Sea geography and bathymetry (Sayın *et al*., 2011)

The Black Sea water mass entering the Aegean Sea is traced by its cooler and fresher characteristics. It is separated from the warmer, more saline Aegean Sea surface waters by small scale temperature and salinity fronts around the exit section, Limni and Gökçeada Islands (Zodiatis, 1994), and on the larger sub-basin scale by a well-defined offshore salinity front.

The Levantine Basin covers the area extending to the sea between the Asia Minor and African coast. It is one of the three main deep basins of the Mediterranean Sea and exhibits particular geological structures such as depressions, cold seeps, shallow and deep sea marine canyons, seamounts and mud volcanoes (Öztürk *et al*., 2012). The eastern Mediterranean coastal zone contains very special geomorphological features due to coastal evolution and rock type

(Ardos, 1979). With a generally narrow continental shelf (except for the Gulf of İskenderun, Bay of Mersin and the Nile Fan), the Levantine Basin displays various bathymetric features including seamounts: Anaximander (1500m) and Eratosthenes Seamounts (1000m) and troughs: Rhodes (~4000m), Latakia (1000-1500m), Cilicia (1000m), Antalya (2000- 2500m), Hellenic Trench (3000-3500m) and Herodotus Abyssal Plain (3000m) (Fig. 2).

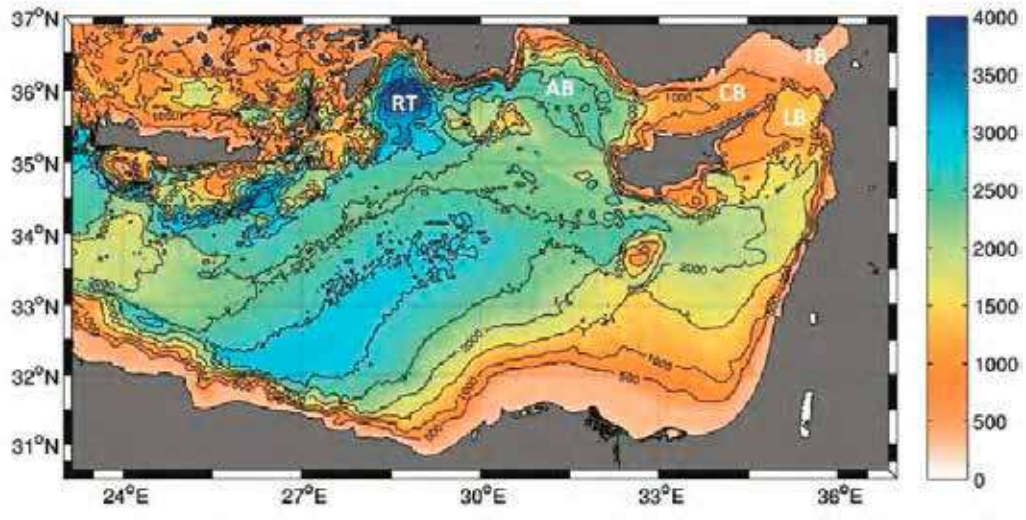

Fig. 2.
Bathymetry of the Levantine Basin. Data obtained from (http://www.gebco.net). RT-Rhodes Trough, AB-Antalya Basin, CB-Cilician Basin, LB- Latakia Basin, IB-Iskenderun Bay

It also presents a deeper part of the Mediterranean Sea. The Rhodes Basin is an upwelling area of the region and contains high species diversity. In addition, Cyclonic Rhodes Gyre (Fig. 3) causes nutrient enrichment, concentration of the larval food distribution and local retention of eggs and larvae (Agostini and Bakun, 2002). The central to southern Aegean Sea has very peculiar characteristics because of the oceanographic conditions that the Aegean Sea is influenced by the less saline surface water of the Black Sea which is rich in nutrients.

Contrarily, the Cyprus Basin is very oligotrophic and influenced by the biological invasion through the Suez Canal. In recent years, many alien species have been reported in the eastern Mediterranean Sea, including nomad jellyfish, poisonous fish such as puffer fish and lionfish, mollusc, crustacean, entering the area from the Indian Ocean. Another important features of the Cyprus Basin are Finike (Anaximander) and Eratosthenes Seamounts. Eratosthenes Seamount has been put under protection, in line with the resolution made by GFCM (General Fisheries Commission for the Mediterranean) on the protection of sensitive deep sea habitats. Fishing is one of the most important métiers in the riparian countries and often the people depend on it as their livelihood.

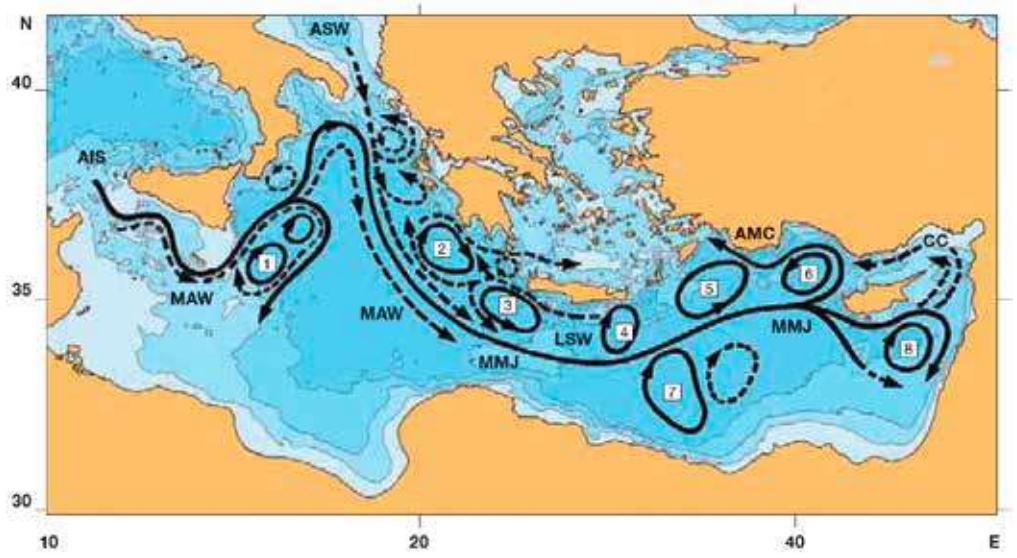

Fig. 3.

Rhodes Gyre and other key oceanographic structures in the east Mediterranean Sea: AIS, Atlantic-Ionian Stream; AMC, Asia Minor Current; ASW, Adriatic Surface Water; CC, Cyprus Current; LSW, Levantine Surface Water; MAW, Modified Atlantic Water; MMJ, Mid-Mediterranean Jet. 1) Ionian Anticyclones; 2) Pelops Anticyclone; 3) Cretan Cyclone; 4) Ierapetra eddy; 5) Rhodes gyre; 6) West Cyprus gyre; 7) Mersa Matruh gyre; 8) Shikmona gyre; Modified from Hogan and Saundry (2011).

3.2. Short description of geopolitical position of the subregion

The countries in the Aegean/Levantine Basin subregion are most diverse, heterogeneous in terms of culture, economic prosperity, religion, social life, and even different political blocks, i.e. European Union, Arab Union, NATO. Even some countries have been or still is in a war (e.g. Syria). Politically, some part of the coastal and marine area is a part of the EU (Greece and Cyprus), but non-EU candidates (Egypt, Israel, Lebanon, Syria) and a candidate country (Turkey) are also located in the Aegean and Levantine Basin. Unfortunately, there is little institutional infrastructure, harmony and effort for the cooperation on marine conservation nor marine biodiversity among those countries.

All these countries simply geographically exist in the eastern Mediterranean area and it is not easy to make sentences of all effort in one basket. Often political destabilisation, economic crisis or political tension are serious in the subregion. The countries in this subregion are also at different levels in terms of marine sciences and marine conservation. This heterogeneity is due to the difference in culture, political stability and economy, but mainly due to their internal systems or the mode of different administration of the countries. However, there are also several similarities because the Mediterranean Sea is an enclosed sea and negative impacts of the marine ecosystem are clearly and increasingly seen in recent years. Confident building measures is needed among countries to decrease political

tension and unifying the efforts for the protection of the marine and coastal biodiversity can be a new opportunity in the regional political agenda for the rapprochement or dispute settlement, and a new way of cooperation as the beginning of COP22 or other fora. Because The 22nd Meeting of the Contracting Parties to the Barcelona Convention and its Protocols is scheduled to take place in December 2021.

3.3. Biodiversity characteristics

The Aegean Sea and Levantine Basin contain rich, diverse and unique habitats. All countries have at least one of the main key habitats such as seamounts, underwater caves and canyons, aphotic hard beds in the Mediterranean Sea (dark habitats), marine vegetation (canopies, forests and sea grass meadows), coralligenous, Rhodolit/Maerl beds, vermitid terrace and other calcareous bio-concretions, Some singular habitats, such as hydrothermal vents and mud volcanoes, also exist in the waters off Cyprus, Egypt, Greece, and Israel. The Mediterranean's Levant Basin is a geologically active area, meaning that its unique geomorphologic phenomena that also constitute special habitats, such as underwater ridges, trenches, and canyons, deep sea plateaus, submarine landslides, hydrothermal vents and more (Assif *et al*., 2015).

The Black Sea water, rich in dissolved organic and inorganic carbon and nutrients, plays a key role for sustaining high biological productivity and dense fish stocks in the North Aegean Sea (Öztürk and Öztürk, 1996; Petiakis *et al*., 2014). A population of an iconic species of the Mediterranean, the Mediterranean monk seal, is found mainly along the coasts of Cyprus, Greece, and Turkey.

In this report, marine and coastal habitat types are classified under the Updated Classification of Benthic Marine Habitat Types for the Mediterranean Region (SPA/RAC–UN Environment/ MAP 2019).

3.3.1. Benthic habitats

In the entire Aegean Sea and partly in the Levantine Basin the most notable marine and coastal habitats are brown algal canopies of the genera *Cystoseira sensu lato* and *Sargassum* spp. on rocky substrata and *Posidonia oceanica* meadows in infralittoral sediments. Both these habitats are considered of high conservation importance, but despite their legal protection status through the Barcelona Convention and the EU Habitat Directive (92/43/ EC), they are known to decline across the Mediterranean (Telesca *et al*., 2015; Gubbay *et al*., 2016) European Red List of Habitats, Part 1 Marine habitats, European Commission.

Coralligenous assemblages, sea caves, coastal lagoons and marshes are prevailing. Seagrass meadows are considered as one of the most important habitats in the area in a biological, ecological and economic way. Endemic *Posidonia oceanica* is under protection

in all countries but there is no detailed habitat map for all the riparian countries, with only a few habitat maps exist covering national waters.

The knowledge on distribution, abundance and condition of other habitats is limited, particularly for coralligenous, rhodolith beds and dark habitats in this subregion. Other singular habitats, such biotic communities of seamounts, canyons, cold seeps, hydrothermal vents, caves, etc. are also poorly known (Sini *et al*., 2017).

3.3.2. Water column biological communities

The Levantine Basin is oligotrophic, which results in extremely low values of phytoplankton abundance. The paucity of nutrients in the Levantine photic zone causes Cyanobacteria and heterotrophic bacteria to dominate the surface assemblages, while Eukaryotic algae are sparse (Herut *et al*., 2017). The coastal waters fronting the Nile Delta are usually more fertile due to the eutrophication effect of the Nile water and land drainage. The density of phytoplankton in the offshore waters is low. In fact, marine environment can be described as oligotrophic and of low productivity, clear and transparent waters (Aktan, 2011; Lakkis, 2018).

A general characteristic of the phytoplankton population is the high species diversity and the comparatively low abundance of each species, which is a characteristic of oligotrophic environment. There are also several toxic phytoplankton species (Labib and Halim, 1995, Mikhail, 2003, Aktan and Keskin, 2017). Phytoplankton biomass and abundance in the coastal Aegean waters are characterized by high seasonal variability, revealing a clear annual cycle.

The Levantine Basin shows low concentrations of nutrients, thus extremely low values for phytoplankton-related variables, including chlorophyll a, primary production and cell abundance and the limited quantities of zooplankton as a result of the ultra-oligotrophic condition of the water (Hannides *et al*., 2015).

Zooplankton that graze on the scant phytoplankton in the oligotrophic Levant are typically as poor as the resource they rely on. Besides native zooplankton species, Lessepsian zooplankton species have also been reported from the Mediterranean Sea (Zakaria, 2016).

The brown macroalgae of the genus *Cystoseira* form an important habitat type - photophilic algal communities. Red algae *Lithophyllum* spp. play an important ecological role in forming of coralligenous assemblages and tratoirs particularly in the Levantine Basin.

The Aegan Sea and Levantine subregion has five species of angiosperms, namely *Posidonia oceanica*, *Cymodocea nodosa*, *Zostera marina*, *Zostera noltei* and non-indigenous *Halophila stipulaceae*. *Posidonia oceanica* shows the widest distribution and a greater biomass, forming extensive seagrass meadows from the entire Aegean Sea to Mersin on the Turkish coast. Distribution of *P.oceanica* is limited in the Levantine Basin and does not exist in the coast of Israel and Lebanon. Marine vegetation is among key marine habitats and the information on density, distribution and protection has vital importance for the Aegean and Levantine Basin.

3.3.3. Invertebrate bottom fauna

Benthic organisms can be assessed according to their distribution on hard substrata, classified as littoral rock (supra and midlittoral), infralittoral rock (upper, middle and lower horizons) and circalittoral rocky bottoms. The limits between these zones are not static or well defined as they are subject to tide patterns, wave action and overall water level and movement. There are different groups of marine invertebrates including Porifera, Cnidaria, Annelida, Arthropoda, Brachipoda, Bryozoa, Chaetognatha, Foraminefera, Nemertea, Phoronida, Mollusca, Echinodermata and Chordata. Total number of the species is not known precisely in the coastal states.

Benthic fauna and flora play important roles in bioturbation activity, mineralization of organic matter, and in marine food webs (Stratmann *et al.*, 2020). The Aegean Sea is richer in terms of marine bottom fauna and flora compared to the Levantine Basin due to higher primary production.The Aegean Sea and Levantine Basin are also a habitat for two vulnerable mollusc species with significant ecological role, namely *Pinna nobilis* and *Lithophaga litophaga*. Due to recent mass mortality, *P.nobilis* is listed as Critically Endangered in the IUCN Red List (Kersting *et al.*, 2019). The characteristic species of the vermetid platform, *Dendropoma anguliferum, Vermetus triquetrus,* and *Neogoniolithon brassica-florida* are also known to occur in the Levantine Basin. Corallium rubrum (red coral) is one of the iconic species and this species is under protection in some countries.

3.3.4. Vertebrates other than fish

Marine mammals

One pinniped species, twelve native cetacean species and two non-indigenous species are recorded in the Aegean Sea and Levantine Basin. The Mediterranean monk seal (*Monachus monachus*) is the only recorded pinniped species, which in the past was a regular inhabitant of the Aegean and Levantine waters (Karamanlidis *et al.*, 2016; Kurt and Gücü, 2021). This species is one of the rarest and most threatened species in the Mediterranean. The population size of the monk seal in Greece is currently estimated as ~300 individuals, representing 43% of its global population (Karamanlidis *et al.*, 2016). The second most important population inhabits on the Turkish coasts, part of which are shared with neighboring countries. In recent years, however, monk seals are observed in all countries in the Levantine Basin.

Two cetaceans are most common in the Levantine Basin, namely the bottlenose dolphin (*Tursiops truncatus*) and striped dolphin (*Stenella coeruleoalba*) (see Table 1). Fin whale (*Balaenoptera physalus*) is the only baleen whale species with regular sightings in the Levantine Sea. Strandings of Cuvier's beaked whale (*Ziphius cavirostris*) have been recorded but the sightings of live specimens are rare in the Aegean and Levantine Sea (Fig. 4). The Black Sea harbour porpoise (*Phocoena phocoena relicta*) is restricted to the northern Aegean Sea. The NIS humpback dolphin (*Sousa plumbea*) is a new comer to the area (Özbilgin *et al.*, 2018). Rough-toothed dolphin *Steno bredanensis* has been recorded especially in the

southeastern corner of the Levantine Basin (Kerem *et al*., 2016). Farrag *et al*. (2019) reported marine mammals species from Egypt.

Table 1.

Marine mammal species observed in the Aegean Sea and Levantine Basin

Common name	Scientific name	Aegean Sea	Levantine Basin
Mediterranean monk seal	*Monachus monachus*	Present	Present
Fin whale	*Balaenoptera physalus*	Present	Present
Sperm whale	*Physeter microcephalus*	Present	Present
Cuvier's beaked whale	*Ziphius cavirostris*	Present	Present
Common dolphin	*Delphinus delphis*	Present	Present
Common bottlenose dolphin	*Tursiops truncatus*	Common	Common
Striped dolphin	*Stenella coeruleoalba*	Common	Common
Risso's dolphin	*Grampus griseus*	Present	Present
Long-finned pilot whale	*Globicephala melas*	Rare	Rare
Rough-toothed dolphin	*Steno bredanensis*	Absent	Rare
Black Sea harbour Porpoise	*Phocoena phocoena relicta*	Rare	Absent
False killer whale	*Pseudorca crassidens*	Rare	Rare
Common minke whale	*Balaenoptera acutorostrata*	Rare	Rare
Indian Ocean humback dolphin	*Sousa plumbea*	Absent	Rare

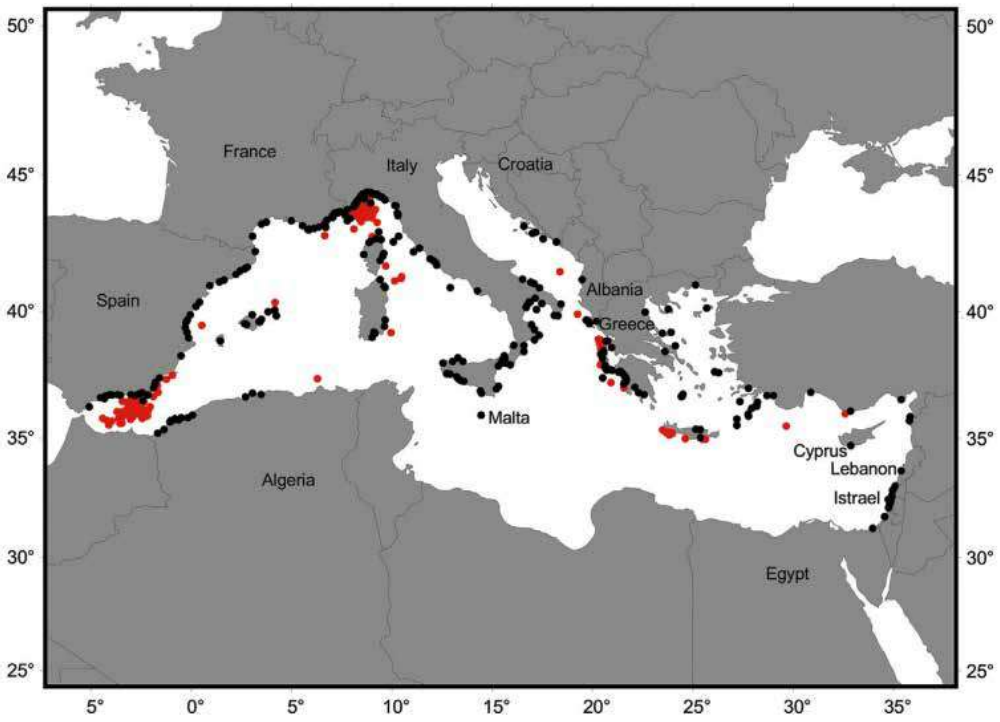

Fig. 4.

Distribution of sightings and stranded of Ziphius cavirostris in the entire Mediterranean Sea. Black dots indicate strandings and red dots indicate sightings at seas. Modified from Podestà *et al*. (2016).

The first basin-wide aerial survey along with boat surveys (in Egypt, Lebanon and Syria), were carried out in 2018-2019 in the scope of the ACCOBAMS Survey Initiative (ASI), but the data are still being processed. The preliminary data available online show the Aegean Sea and Levantine Basin show lower density of cetaceans than the rest of the Mediterranean Basin (Fig. 5).

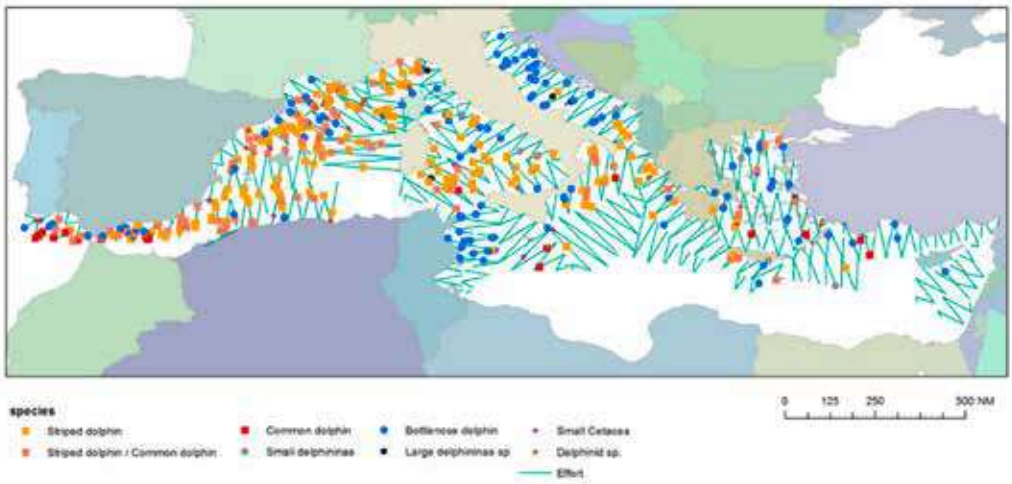

Fig. 5.

Sightings of small cetaceans by the aerial surveys carried out under the ACCPBAMS Survey Initiative (ASI) in summer 2018. Accessed at https://accobams.org/main-activites/accobams-survey-initiative-2/asi-preliminary-results/ (The result of ship surveys are not shown in this map.)

The Aegean and Levantine Basin also contain several critical habitats for cetaceans (CCHs) designated by ACCOBAMS (Fig. 6).

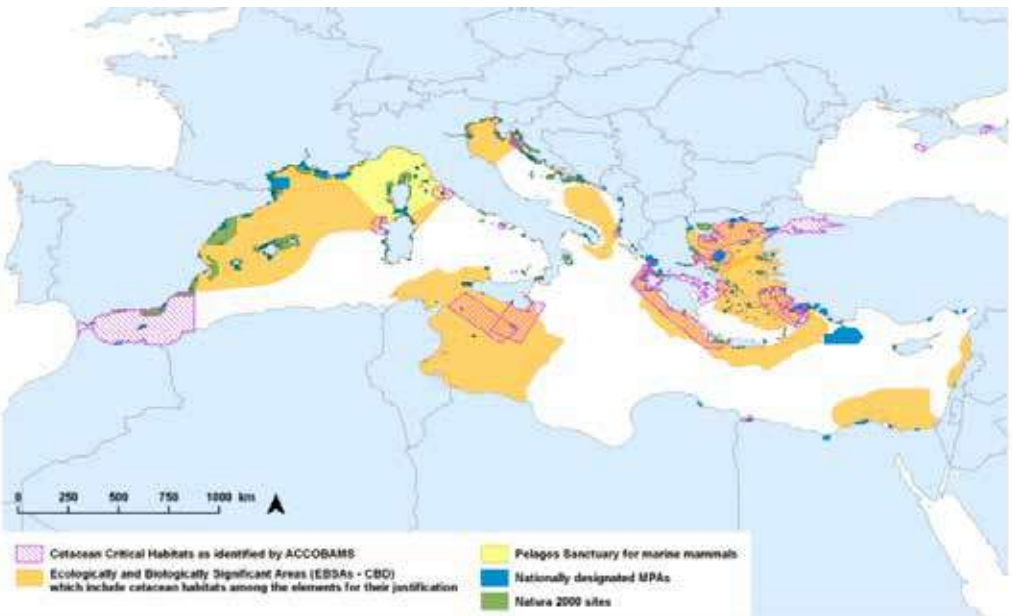

Fig. 6.

ACCOBAMS Cetacean Critical Habitats (CCHs) (ACCOBAMS 2019)

Marine reptiles

The loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*) are sea turtle species reported from the Aegean and Levantine Basin. The leatherback sea turtles do not nest in the Mediterranean and those individuals uncommonly encountered are suggested to be of Atlantic origin.

The most common are the loggerhead sea turtle and green sea turtle that regularly nest along some of the sandy beaches of the Levantin Basin (Fig. 7), but Greece has nesting sites for loggerhead sea turtles only (Casale *et al*., 2018; Caminas *et al*., 2020).

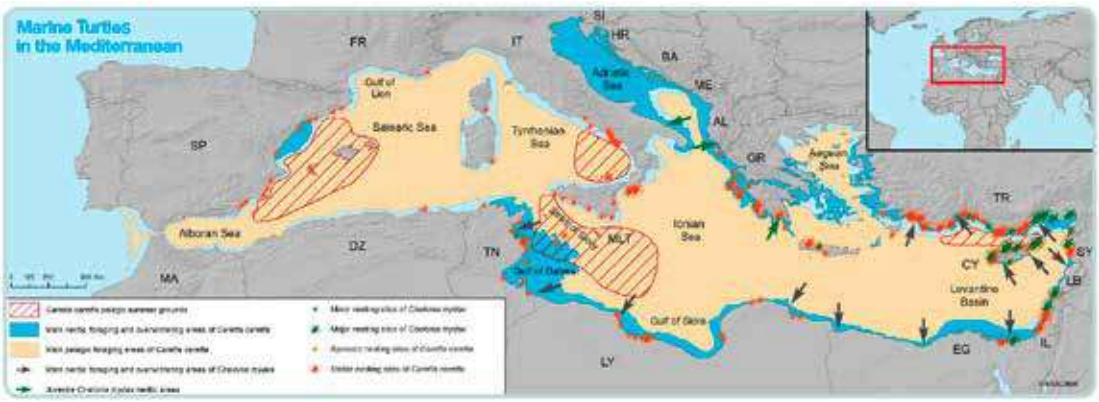

Fig. 7.
Marine turtles in the Mediterranean Sea (Caminas *et al*., 2020)

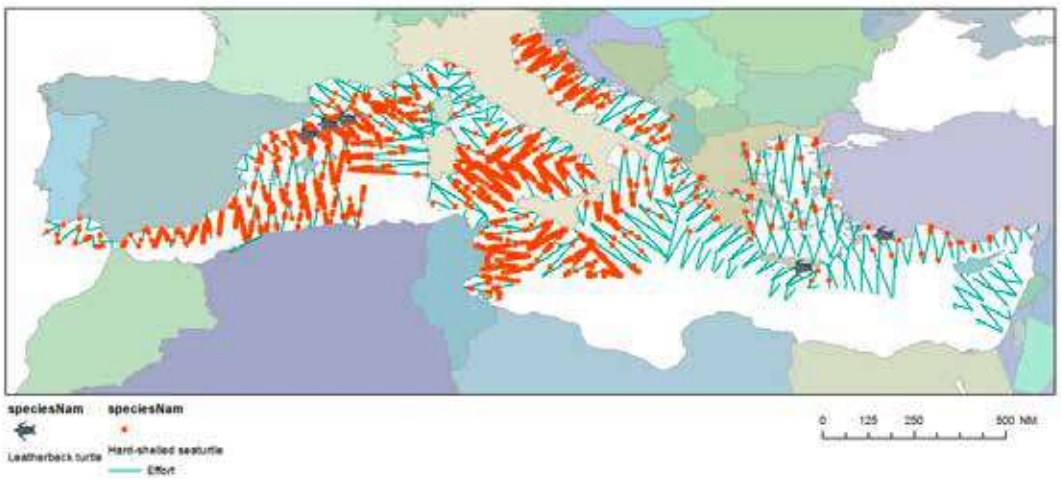

Fig. 8.
Sightings of the sea turtles by the aerial survey of ASI in 2018 summer. Accessed at https://accobams.org/main-activites/accobams-survey-initiative-2/asi-preliminary-results/ (The result of ship surveys are not shown in this map.)

In the Eastern Mediterranean Sea, including the Central Aegean/Cyprus Basin, sea turtles are heavily impacted from bycatch in fisheries (Godley *et al*., 2018), along with habitat loss

and other anthropogenic impacts such as the construction of tourist resorts and the use of bright lights on their nesting beaches at night (www.medasset.org) (Oruç, 2016).

During the ASI aerial survey carried out in 2018 summer, leatherback turtles were also spotted beside numerous sightings of loggerheads and green turtles (Fig. 8). Two leatherback turtles were observed in the Levantine Basin.

Birds

The seabird community in the Aegean Sea and Levantine Basin is at the top of the food chain and represents an important fraction of all the seabirds found in the Mediterranean Sea. Scopoli's shearwater (*Calonectris diomedea*), Yelkouan shearwater (*Puffinus yelkouan*), European shag (*Phalacrocorax aristotelis desmarestii*) and Audouin's gull (*Larus audouinii*). These species highly depend on good status of the marine environment, because they feed at sea. Important Bird and Biodiversity Areas (IBAs) have been identified in the Mediterranean Sea by Birdlife International (Fig. 9), where the sea birds nest and breed.

Besides, European storm petrel (*Hydrobates pelagicus*) and ferruginous duck (*Aythya nyroca*) are rare in the subregion. Coastal wetlands are important habitats for nesting and wintering of water birds in both the Aegean Sea and Levantine Basin.

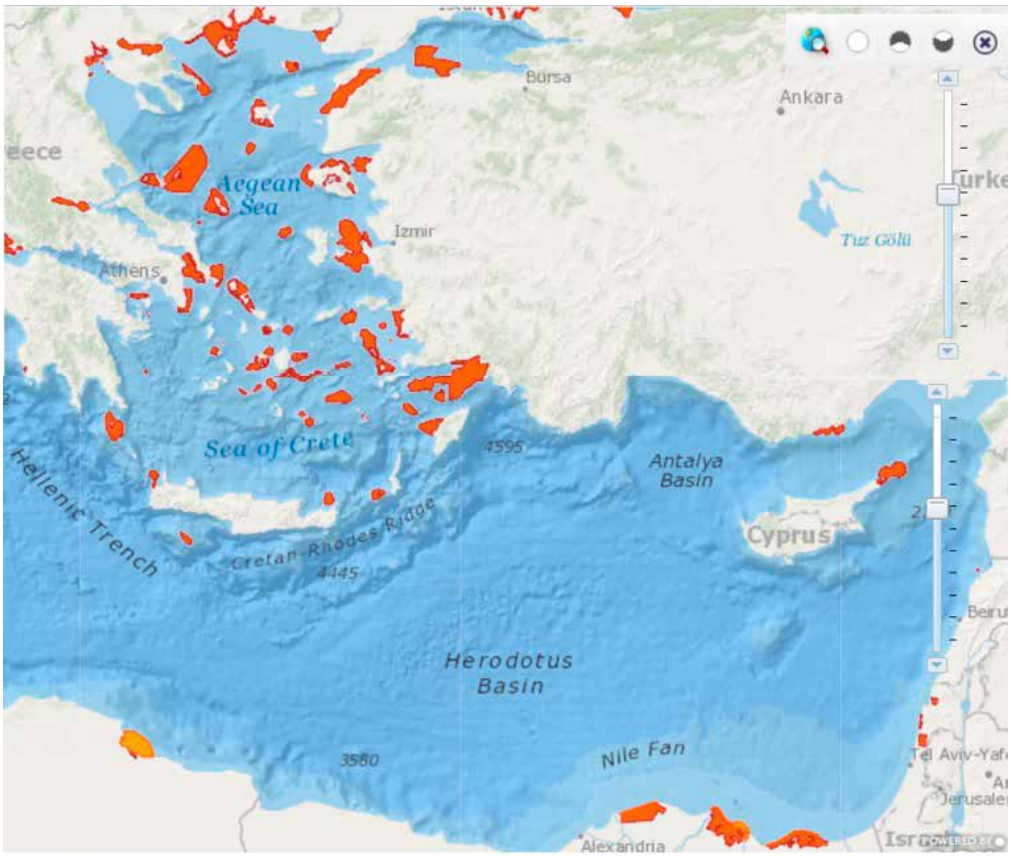

Fig. 9.
Important Bird and Biodiversity Areas (IBAs) identified in the Aegean Sea and Levantine Basin by Birdlife International (adapted from https://maps.birdlife.org/marineIBAs/default.html)

ACCOBAMS surveys (ASI), carried out in 2018, made an effort in sighting marine birds as well although the species identification was difficult. The sightings of marine birds were mostly along the coasts or islands. The majority of the islets in the Central Aegean Sea have been designated as Natura 2000 sites by Greece and some part are in Cyprus. These sites help protect marine birds in the area. Besides, Egypt, Israel, Lebanon, Syria and Turkey have important bird habitats in their Mediterranean coasts. Nevertheless, marine birds face threats, such as bycatch in fishing gears, decreased prey availability due to overfishing and marine pollution. Wind farms are also a potential threat for several bird species. Commercial coastal fisheries are widespread in the area, mainly small-scale demersal longlines and gillnets. Marine birds following fishing vessels are affected by accidental catch at varying rates in different locations, seasons and types of fishing gear. The importance of this threat is considered medium to locally high.

3.3.5. Singular Habitats to the subregion

Seamounts such as Eratosthenes Seamount, Finike Seamount (Anaximander), mud volcanoes, underwater canyons such as the Achiziv Canyon, underwater volcanoes, hydrothermal vents, cold methane seeps, vermetids platforms, mesophotic coral reefs, sponge and coral grounds in the bathyal zone, Maerls /Rhodolit beds are singular habitats in the subregion. In addition, shallow marine and anchialine caves, which are one the most distinctive features of the Greek rocky coasts, harbour several endemic, rare and protected taxa (Gerovasileiou *et al*., 2015).

3.3.6. Fish, molluscs and shellfish species of commercial interest

Numerous fish and invertebrate species are caught in the Aegean and Levantine Basin. Some of them are alien species which have replaced the native species. Fishing in the subregion is generally small-scale artisanal type.

About 60 marine fish and invertebrate species have commercial value in this subregion. The Aegean Sea is one of the largest areas of occurrence of demersal and small pelagic stocks in the Mediterranean, such as sardine (*Sardina pilchardus*), anchovy (*Engraulis encrasicolus*), horse mackerel (*Trachurus trachurus*) and mackerel (*Scomber scombrus*).

Trawlers target mainly shrimps (*Penaeus* spp., *Metapenaeus* spp., *Marsupenaeus* spp., *Parapenaeus* spp., *Melicertus hathor* and *Aristaeomorpha* spp.), blue crab (*Portunus pelagicus*) and common cuttlefish (*Sepia officinalis*), and some fish species, such as red mullet (*Mullus* spp.), European hake (*Merluccius merluccius*). Lizard fish (*Saurida undosquamis*) is one of the alien species and it is now a commercial species in the Levantine region (Mahmoud *et al*., 2014).

The continental shelf is also rich in invertebrate fauna, where some of the most abundant species are cuttlefish (*Sepia officinalis* and *S. elegans*), octopuses (*Eledone moschata, E. cirrhosa* and *Octopus vulgaris*), squids (*Loligo vulgaris* and *Alloteuthis media*), shrimps,

and Norway lobster (*Nephrops norvegicus*).The Levantine Basin is also one of the most important spawning ground in the Mediterranean population of the bluefin tuna (Karakulak *et al*., 2016) shown in Fig. 10.

Remarkably, Israel and Egypt are two countries in the Mediterranean today to ban the extraction of all cartilaginous fish species and they are all protected by law. *Carcharhinus plumbeus* and *C. obscurus* are the most prominent inshore species among them, as well as *Centrophorus granulosus* and *Mustelus mustelus* common in deeper strata.

The available data suggest that Aegean and Levantine Basin is also a nursery and spawning area for the sandbar shark (Başusta *et al*., 2021). Besides, the Aegean Sea is also important for another endangered species, the giant devil ray (*Mobula mobular*).

Four sponge species are commercially harvested by Greece in the Aegean Sea (Voultsiadou *et al*., 2011). Red coral, Corallum rubrum, is harvested in Greece mainly in the North Aegean Sea (Dounas *et al*., 2010). This species has been protected in Turkey (Çınar *et al*., 2018). Sponge beds and red coral habitats need to be monitored.

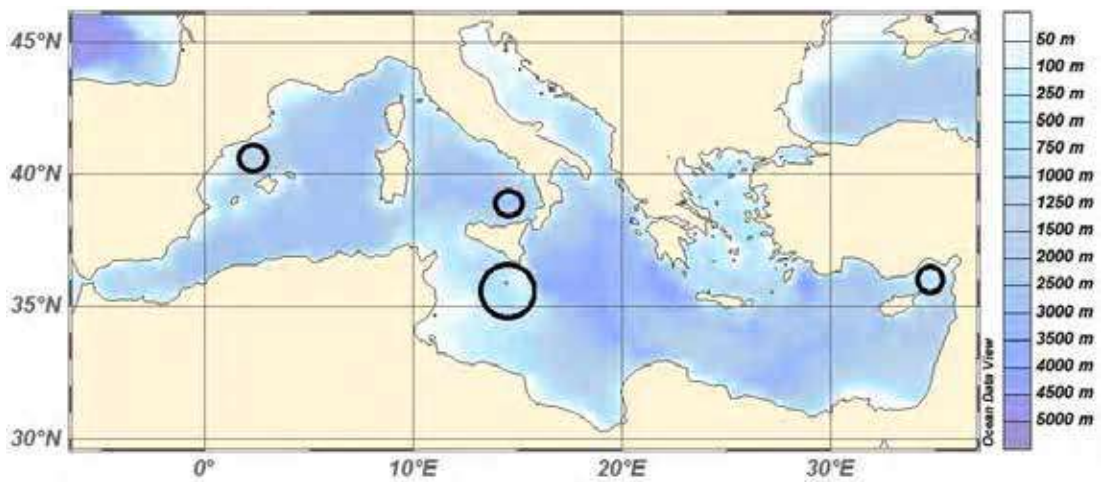

Fig. 10.
The spawning areas the bluefin tuna in the Mediterranean Sea (Karakulak *et al*., 2016).

4.

Main threats, pressures and impacts on biodiversity

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4.1. Economic drivers and pressures

The various anthropogenic economic activities in the Aegean Sea and Levantine Basin generate pressures on marine and coastal ecosystems; notably urbanization and industry, tourism, fishery and aquaculture, the energy sector and agriculture. All these activities generate overexploitation of marine resources and pollution. Besides, increasing maritime traffic has been observed in this subregion (See Fig. 11).

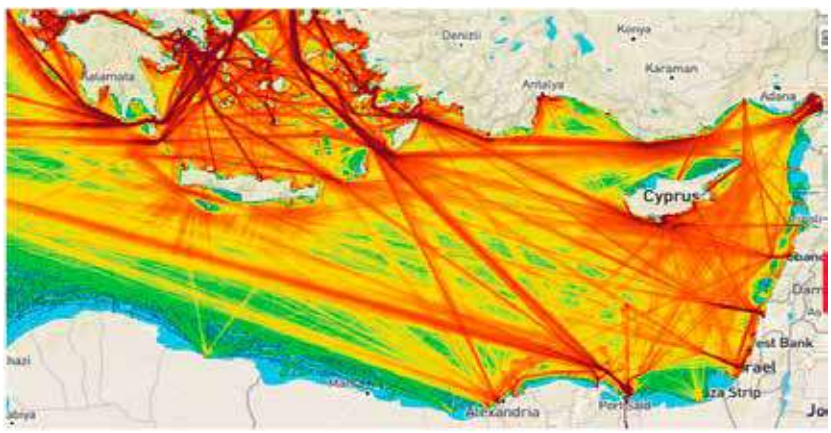

Fig. 11.
Marine traffic density in the Eastern Mediterranean Sea (Zodiatis *et al*., 2017)

The Levantine Basin is one of the busiest maritime hubs for petrol transportation from the east to the west of the Mediterranean. It is also expected that with increasing oil and gas exploration in the Levantine Basin, an increase of the traffic of tankers containing oil and gas and associated oil spills will be inevitable. In fact, Balcıoğlu *et al.* (2010) already reported that Cypriot, Lebanese, Syrian and Turkish parts of the Levantine Basin are contaminated by hydrocarbon pollution. Pollution hot spots and areas of environmental concern in the Mediterranean Sea are shown in Fig. 12, clearly indicating the concentration of hot spots and areas of concern in the Levantine Basin and Aegean Sea. Oil spill in early 2021 polluted the coasts of Israel and Lebanon severely.

Fig. 12.
Pollution hot spots and areas of environmental concern in the Mediterranean. (UNEP/MAP-Plan bleu, 2020)

Maritime traffic is a serious concern also as a vector for the introduction of non-indigenous alien species (NIS) as well in ships' ballast water, sediments and hauling.

Tourism is one of the main livelihoods of coastal people in the Aegean Sea and Levantine Basin, contributing significantly to some countries' national GDP, with the same applying to employment. However, untreated waste water related to coastal communities can cause local hypoxia as well as introducing pathogens. Marine litter, particularly plastics, is another threat to the basin as in all the world oceans (Galgani *et al*. 2021). Uncontrolled anchoring is also known to exert significant pressure in coastal ecosystems, particularly where seagrass beds or other sensitive ecosystems occur (Salamodi *et al*. 2020).

Fisheries have always had a socio-economic importance in the Levantine Basin. It is predicted that both fisheries and mariculture will have growing trends and contribute to national GDPs of the riparian states. Aquaculture is spreading throughout the entire Aegean Sea and Levantine Basin, with high concentration of aquaculture production in coastal areas. Economically significant production has been realized for several species, such as sea bass, sea bream, meagre and as well as fattening of bluefin tuna. Setting high environmental standards and sustainability is the key issue for the blue economy and growth in the subregion.

Fishing practices by trawling cause significant and frequently irreversible impact on protected marine habitats, such as *Posidonia* seagrass meadows, coralligenous and Rhodolith/Maërl beds, *Cystoseira/Sargassum* forests. Away from the trawl path, resuspended sediments can settle, smothering biota and algal/plant communities.

Anthropogenic activities are also drivers of marine litter (including microplastic and ghost-nets). Underwater noise pollution which affects cetaceans and other organisms that use sounds for their survival, has been a growing issues in the subregion. The Aegean Sea contains several hotspots of underwater noise (Fig. 13) and more monitoring studies are needed. Besides, offshore energy production and underwater cables shold be considered for their potential impacts. Main environmental problems are the risk associated with the installation of the cables and the possible impacts on benthic communities, and endangered species including marine turtles and marine mammals.

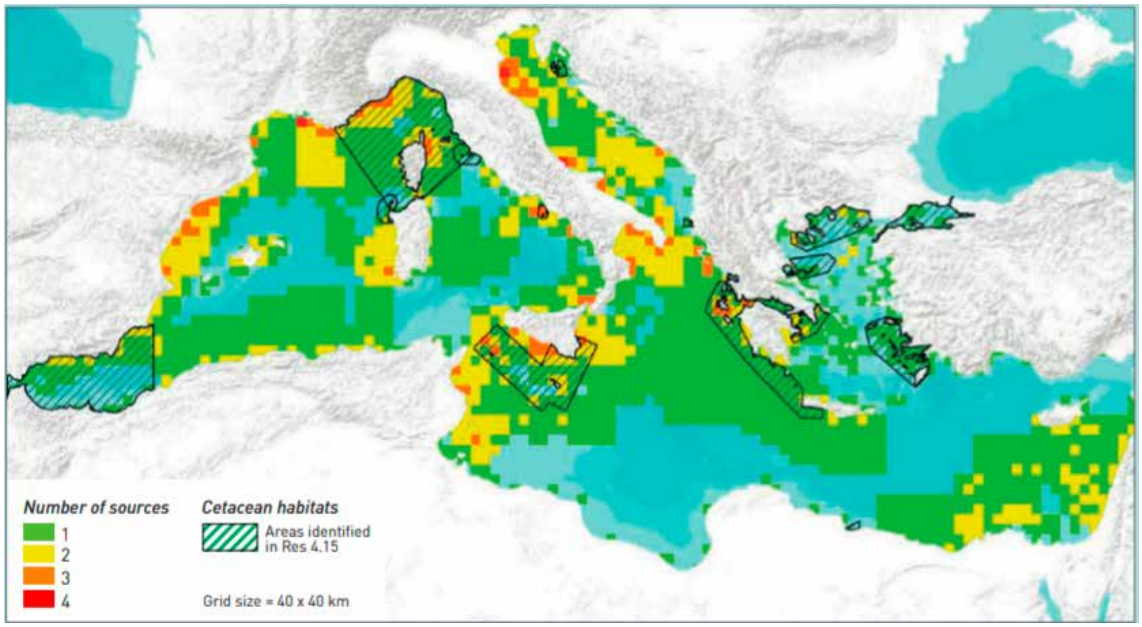

Fig. 13.
Overview of noise hotspots in the ACCOBAMS area, based on mapping of sources of pressure (Maglio *et al*., 2016)

4.2. Impacts/effects on marine biodiversity

Key habitats are under various threats, mainly coastal development, pollution, fishing and other factors, such as alien species and climate change. These habitats are regional priorities of the Mediterranean Sea and a concerted action is needed both in the northern and southern countries. Research effort should be increased in all countries in the Subregion.

Economic activities cause pressure and related pressures have certain impacts/effects on marine biodiversity to various degrees. In the marine environment, pressures are often combined and they have cumulative and synergistic impacts, although it is a challenge to understand these relations clearly.

The Aegean Sea and Levantine Basin have been seriously impacted within the Mediterranean Sea (Fig. 14). Only some high sea areas are at the medium impact level and some parts are at the high or very high impact levels. The major contributors are climatic stressors, demersal fishing, hypoxia and pollution from land-based activities.

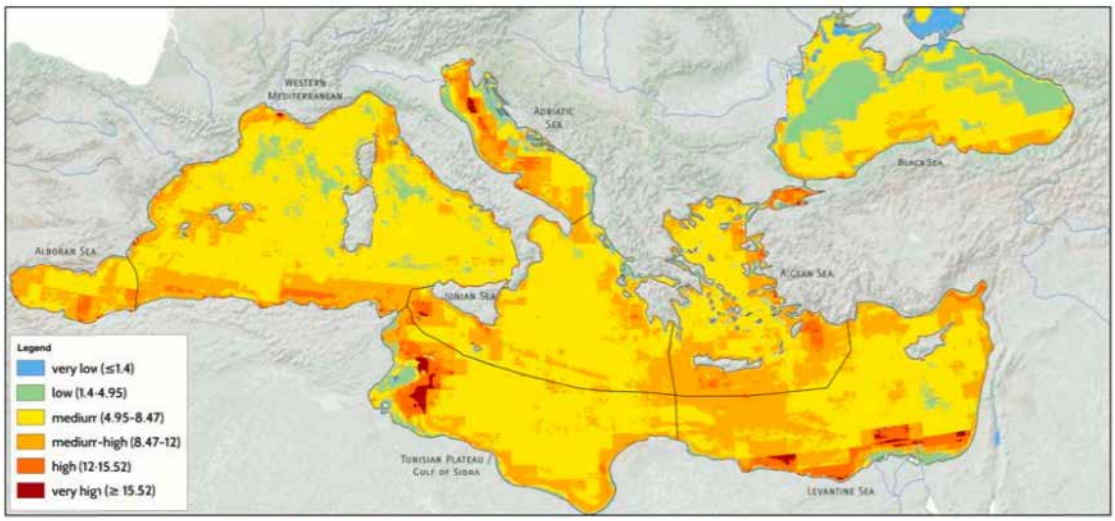

Fig. 14.

Spatial distribution of cumulative pressures and impacts on marine ecosystems of the Mediterranean and Black Seas (Micheli *et al*. 2013).

Regarding specific impacts, interactions with fisheries have already contributed to significant decrease of overall fishable biomass in the Aegean Sea, mainly of demersal species, such as hake and shrimps, due to overfishing and IUU fishing.

Sea turtles are one of the most threatened non-targeted species caught as by-catch, particularly in small scale vessels and longliners (Fig. 15). According to the reported incidental catch of the main sea turtle species in the Mediterranean Sea, between 2000- 2020, the loggerhead sea turtle was the most impacted species, contributing 98.79%.

Cetaceans, non-commercial cartilaginous fish and seabirds are also by-caught, but the full scope is not clearly known. In recent years, from a strictly numerical point of view, sea turtles have represented the highest share of total reported incidental catch of vulnerable species, followed by sharks and rays. Seabirds and marine mammals, by contrast, are the two groups least reported as bycatch (FAO, 2020).

Significance of impacts made by aquaculture on biodiversity in the Aegean Sea and Levantine Basin have already been known for some years as aquaculture has been intensively practiced in the coastal water of most countries. Nutrient enrichment occurs locally and impacts on the oligotrophic waters of the eastern Mediterranean, but the extent is not known. Marine fish farms function as floating artificial reefs – providing settlement substrates for fouling communities, acting as a vector for some alien species, and functioning as feeding stations with uneaten pellets, dead fish and fish fecal matter creating enriched water mass attracting predators such as sharks, tuna and dolphins. Improved sanitation and optimized feeding procedures are key to keeping top-predator interactions to a minimum. Overfeeding leads to the environment deterioration, negatively influences seagrass beds and change demersal invertebrate species composition.

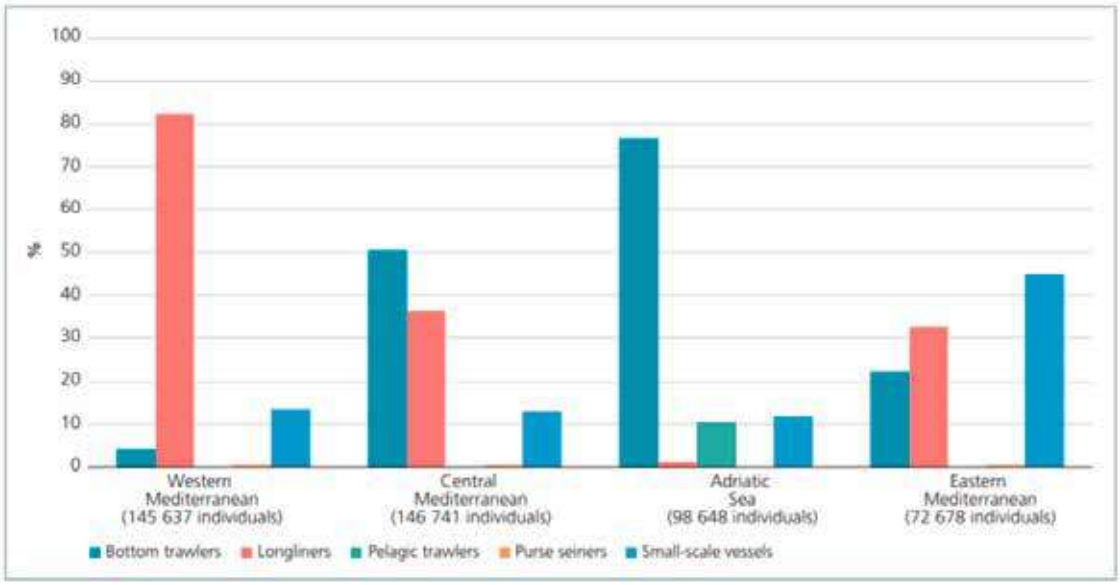

Fig. 15.
Reported incidental catch of marine turtles by vessel group and GFCM region, 2000 – 2020. (The State of Mediterranean and Black Sea Fisheries 2020, FAO)

Habitat destruction is one of the serious threats for the Aegean Sea and Levantine Basin ecosystem. Fishing practices alter marine habitats by destroying seagrass meadows, coralligenous and maërl beds and removal of target and non-target species, for example,e the date mussel (*Lithophaga lithophaga*) Habitat destruction is not only caused by fishing, but it is often a result of over-construction in the coastal area, land-based pollution and touristic activities. Seagrass (*Posidonia oceanica*) meadows are sensitive to pollution, over-sedimentation, eutrophication, as well as uncontrolled anchoring of recreational boats.

Coastal (hotels, holiday houses, etc) and marine constructions (groynes, offshore detached breakwaters, harbours, marinas, shelters) affect and alter marine habitats (e.g., sandy sediment habitats and their communities) and current direction. Installation of underwater cables can cause possible impacts on benthic communities, and endangered species including marine turtles, elasmobranchs and marine mammals should be considered. Underwater construction and drilling also have impacts on marine ecosystems.

Non-indigenous species (NIS), notably invasive alien species (IAS) are regarded as one of the main threats causing biodiversity loss in the Mediterranean Sea (Otero *et al*., 2013; Zenetos *et al*., 2015; Farrag *et al*. 2016). The countries in the Levantine Basin are most impacted from the NIS due to the closeness to the Suez Canal and the water circulation.

The main vectors for NIS into the Aegean Sea and Levantine Basin is the Suez Canal: one of the major vectors for species of Indo–Pacific origin or Lessepsian migrants is shipping: ballast water, tank sediments and hull fouling. Although the isthmus, a corridor between the Red Sea and the Mediterranean Sea, is not the vector for NIS, it has been considered as playing a major role in introducing these species. Minor vectors include aquariums, fish bait, fiah farms and recreational boats. High water temperature and turbidity in the Canal have also been considered as possible barriers in the past. However, according to Galil *et al*.

(2015), the recent enlargement of the Canal could have direct consequences in accelerating the transfer of non-indigenous species into the Mediterranean.

No matter which taxa are being introduced to the Mediterranean Sea, each of them alters food web dynamics to varying degrees. The countries in the Levantine Basin are most impacted from the NIS due to the proximity of the Suez Canal and water circulation. The 'tropicalization' of the Mediterranean is expected to provide conditions more suitable for the establishment of Lessepsian migrants.

NIS have had a variety of consequences on fisheries, biodiversity, human health and economy in the Mediterranean Sea. Some of the non-indigenous fish species have become economically important after the establishment of sustainable populations. Bariche (2012) reported that some species are appreciated locally and command high market prices, e.g., goldband goatfish (*Upeneus moluccensis*), yellowstripe barracuda (*Sphyraena chrysotaenia*), narrow-barred Spanish mackerel (*Scomberomorus commerson*), *Siganus luridus* and *Siganus rivulatus*; kuruma prawn (*Marsupenaeus japonicus*), blue crab (*Callinectes sapidus*) and speckled shrimp (*Metapenaeus monoceros*). Other species, such as lionfish (*Pterois miles*), also have some potential commercial value.

Conversely, other NIS in the eastern Mediterranean have negative impacts on human health, particularly pufferfishes (*Lagocephalus* spp.), lionfish (*P. miles*), striped eel catfish (*Plotusus lineatus*) and the nomad jellyfish (*Rhopilema nomadica*). Some NIS can badly affect fishing gear by causing mesh clogging, fouling and other damage, whilst other non-indigenous species have impacted native marine biodiversity, mainly through habitat competition , habitat modification and species displacement.

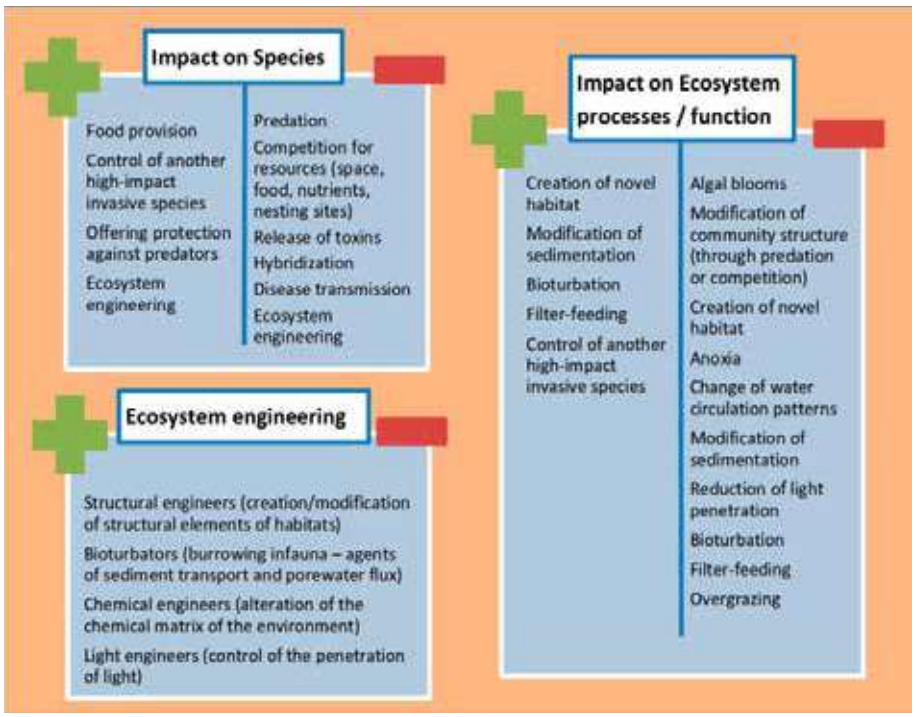

Fig. 16.
Main mechanisms through which alien species impact biodiversity (green cross: positive impacts; red minus sign: negative impacts) (Adapted from Katsanevakis *et al.*, 2014).

NIS is a common problem for the subregion due the proximity to the Suez Canal and it is necessary to make or update national plans and later collaboratively specific regional plans. Existing databases can be useful and practical in the first place. The main mechanisms through which alien species impact biodiversity have been summarized by Katsanevakis *et al*. (2014) and are shown in Fig. 16.

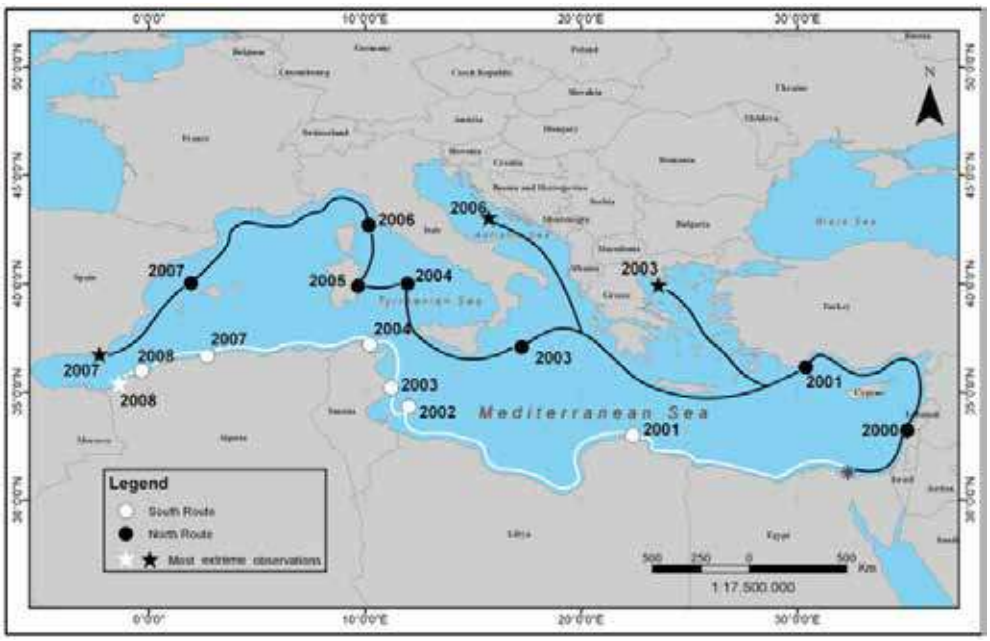

Fig. 17.
Chronological reconstruction of Fistularia commersonii invasion as indicated by record locations (circles) and furthest observations (stars) in the Mediterranean Sea. The Suez Canal exit (Port Said, Egypt) is marked by *. Adapted from Azzurro *et al*. (2013).

Furthermore, regional cooperation and an alert system are needed to monitor invasive alien species. As is shown in Fig. 17, blue spotted cornetfish, *Fistularia commersonii*, was first reported from Israel in 2000, later from Spain in 2007. Indeed, *F. commersonii* has colonized almost the entire Mediterranean region in only seven years after its first sighting. Another example of a fast-spreading species is lionfish*, Pterois miles* (Özgür-Özbek *et al*., 2017).

Climate change also affects the biota as high water temperatures will allow thermophilic NIS to have an advantage over indigenous species pushing them to deeper waters in certain cases. It also causes sea level rise which may impact some coastal habitats. The endemic stony coral (*Cladocera caespitosa*) is found both in the Aegean Sea (Chintiroglu, 1996) and Levantine Basin. It is one of the clear indicators of the effects of climate change and this effect has been recorded in the northern part of the Aegean Sea (Güresen *et al*., 2015).

The Mediterranean Sea is getting warmer and daily trend shows a warming rate ranging from 0.009 °C /year to 0.06 °C/year (Fig. 18). Large parts of the Levantine Basin show higher values. Between 1982 to 2019, the highest accumulated warming, over 1.5 °C, was found in broad areas in the Levantine Basin (Pastor *et al*., 2020). The Nile Delta is considered one of the most vulnerable sites in the world due to climate change inputs.

Climate change is here to stay and some priority habitats are more prone to degradation (wetlands, sand dunes, mediolittoral zone). A possible rise in sea level or further erosion will cause further deterioration of these important habitats. In addition, Vermetid reefs also vulnerable to climate change and ocean acidification around the Mediterranean by softening shells (Badreddine *et al*., 2019). In addition, the causes of necrosis of coralligenous assemblages affect the main builder species (e.g. *Mesophyllum* spp. and *Lithophyllum* spp.). Some Echinoderms that were common in the shallow rocky benthos such as the purple sea urchin (*Paracentrotus lividus*) were shown to be intolerant to warming conditions and as a result of climate change combined with NIS (rabbitfishes outcompeting them for algal biomass as food) have nearly disappeared from Israeli shallow waters (Yeruham *et al*., 2015).

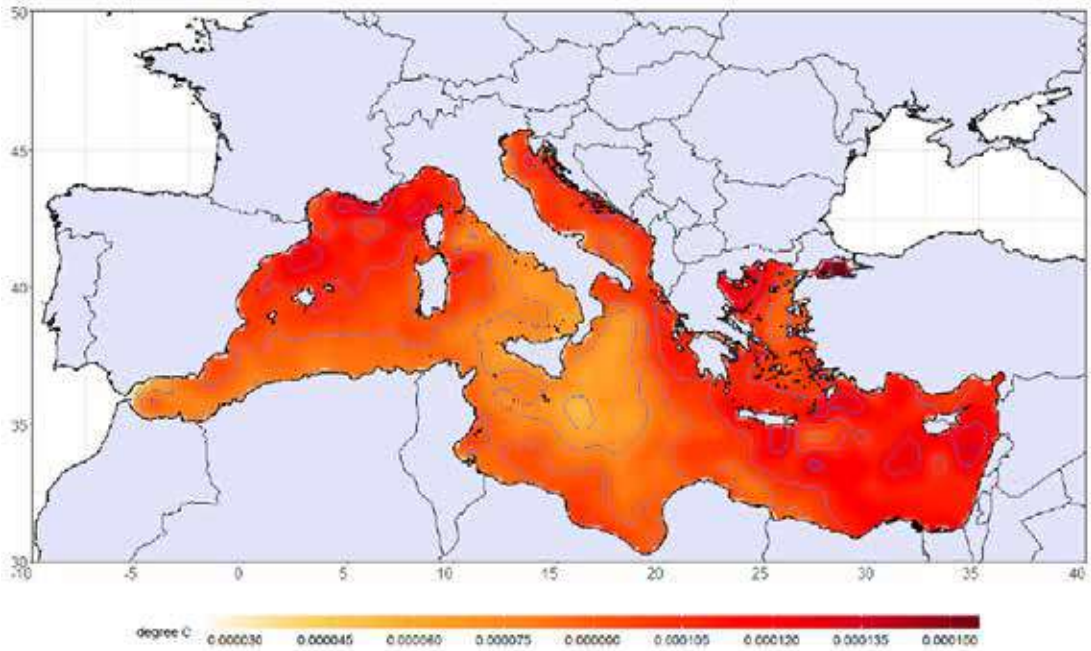

Fig. 18.
Daily warming trend in the Mediterranean basin from 1982 to 2019. Each contour denotes a change of 1.5 × 10−5 °C/day (Pastor *et al*., 2020)

Underwater noise is also important due to shipping activities, military sonars and seismic airguns extensively used in oil and gas surveying in the basin. The consequence on marine fauna is still debatable, but some cetaceans are known to be impacted severely which may result in mortality. The main threat to Cuvier's beaked whales (*Ziphius cavirostris*) is known to be active sonar (Frantzis and Cebrian, 1998).

Recently, a microbial pathogen, *Haplosporidium pinnae*, has caused mass mortality of endemic *Pinna nobilis* in the Aegean Sea (Kersting *et al*., 2019; Lattos *et al*., 2020; Öndes *et al*., 2020; Zotou *et al*. 2020). This mass mortality is continuing and has become the cause of decline of *Pinna* populations in the Lavantine Basin.

5.

Main responses

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An urgent need for conservation of marine and coastal biodiversity in the Aegean Sea and Levantine Basin has been recognized, which is evident from the establishment of legislative and institutional frameworks, as well as the implementation of certain conservation mechanisms, measures and actions. Improved research and monitoring programmes will be required in relation to the global Sustainable Development Goals and CBD Post-2020 Global Biodiversity Framework.

5.1. Legislative framework, conservation policies and institutional capacities

All Levantine countries have national legislation for nature/environmental protection in place, which address issues such as strategic and environmental impact assessments and waste disposal. Countries have also adopted legal acts to regulate activities with impacts on marine biodiversity, such as legislation on fisheries and mariculture, marine traffic, construction and physical planning, and tourism. The EU Member States in this subregion (Greece and Cyprus), have already harmonised their legislation with the EU environmental *acquis*, notably the Marine Strategy Framework Directive (MSFD), as well as Habitats and Birds Directive, Maritime Spatial Planning (MSP) Directive, Water Framework Directive (WFD) and Common Fisheries Policy (CFP). The other countries in the Levantine Basin, such as Turkey as an EU candidate country, have partly adopted the EU requirements to the internal regulation.

Furthermore, Levantine countries are parties of international and regional (Mediterranean level) agreements on marine biodiversity conservation, notably the Barcelona Convention, SPA BD Protocol, and ACCOBAMS. They are also members of the GFCM.

It is important to stress that the MSFD, CBD and Barcelona Convention have adopted the ecosystem approach (EcAp) to manage anthropogenic activities, with the aim to reach the Good Environmental Status (GES). United Nations's Sustainable Development Goals (SDGs) are also important leverage for the conservation policy. In particular, Goal 14 Conserve and sustainably use the oceans, seas and marine resources, concerns the marine policies in the subregion.

The principalnational policy documents specific for nature conservation are national biodiversity strategies and action plans, developed under the umbrella of the CBD. These strategies are also aligned with other regional strategies, notably EU 2030 Biodiversity Strategy, as well as the Aichi Targets. The EU has also adopted and implemented the EU Strategy for member states which promotes transboundary cooperation in several areas, including environmental protection.

Furthermore, there are strategic documents and action plans dedicated to conservation of particular biodiversity component, such as the species and habitats conservation and action plans. Several species action plans have been developed within the framework of

Mediterranean Action Programme (MAP) for monk seals, cetaceans, marine turtles, marine birds, cartilaginous fish, marine vegetation, coralligenous and dark habitats.

Institutional setting includes ministries in charge of nature protection, as well as different use of marine resources and activities, notably fisheries, maritime traffic, energy production, physical planning and tourism. Ministries are usually decision-making bodies, while special government agencies provide technical and experts support for activities such as monitoring of marine and coastal biodiversity, threat assessments and implementation of conservation actions. Scientific institutions (institutes and faculties), CIESM, NGOs and other experts provide significant scientific/expertise support to governmental institutions.

NGOs, international, national and local, also act as advocates for nature conservation or promote interests of certain marine resource users, such as fisherman associations.

In countries with established marine protected areas (MPAs), those are managed by management authorities at national and local levels. Mediterranean Protected Areas Network (MedPAN) plays an important role for the networking and funding for those management bodies.

5.2. Inventorying, monitoring and GES assessments

Inventorying and monitoring in the Aegean Sea and Levantine Basin has been mostly carried out sporadically, focussed on particular species and habitats, on both national and basin levels. However, efforts are made toward more systematic monitoring, mainly in the EU countries, further to relevant EU related obligations, particularly MSFD, WFD, Habitats and Bird Directives. Greece and Cyprus are preparing habitat mapping covering all marine territories under national jurisdictions. Significant joint efforts have been made so far in increasing of knowledge on migratory species, notably cetaceans and marine turtles. Recent ACCOBAMS Survey Initiative (ASI) is a good example for such regional cooperation.

The EU Member States in the Aegean Sea and Levantine Basin have already made initial assessments of the state of marine environment, and prepared monitoring programmes for GES assessment. There is ongoing work on establishment of more systematic monitoring of priority species and habitats and pressures on biodiversity, as a basis for further GES assessments. Integrated Monitoring and Assessment Programs (IMAP) under the EcAp process have been prepared by both the non-EU and EU member states.

Monitoring of species mortality is important for understanding impacts of different human activities. Within the Aegean Sea and Levantine Basin, there are operational stranding networks, which are responsible for responding to stranding events of some species, like the Mediterranean monk seal, cetaceans and marine turtles, including assistance in rescue of injured specimens. Nevertheless, regional and national cooperation is essential for animal rescue operations.

5.3. Marine and coastal protected areas

Spatial protection is one of the oldest mechanisms for conservation of biodiversity, notably vulnerable ecosystems, habitats and species. In the Aegean Sea and Levantine Basin, there are established MPAs (Fig. 19). They can be grouped as:

1) nationally or EU level designated areas: EU Natura 2000 sites established under the EU Habitats and Birds Directive, MPAs established in one of the national categories (which are more or less related to the IUCN protected areas classification),

2) international designations/recognitions: Specially Protected Areas of Mediterranean Importance (SPAMI), Fishery Restricted Areas (FRA) under the GFCM, such as the Nile Delta area cold hydrocarbon seeps and the Eratosthenes Seamount,

3) Ecologically or Biologically Significant Areas (EBSA) under the CBD, Important Marine Mammals Areas (IMMAs), Ramsar sites, as well as Important Bird Areas (IBA)

Natura 2000 sites are more concentrated in Greece and Cyprus. Conservation objectives also include seabirds and cetaceans.

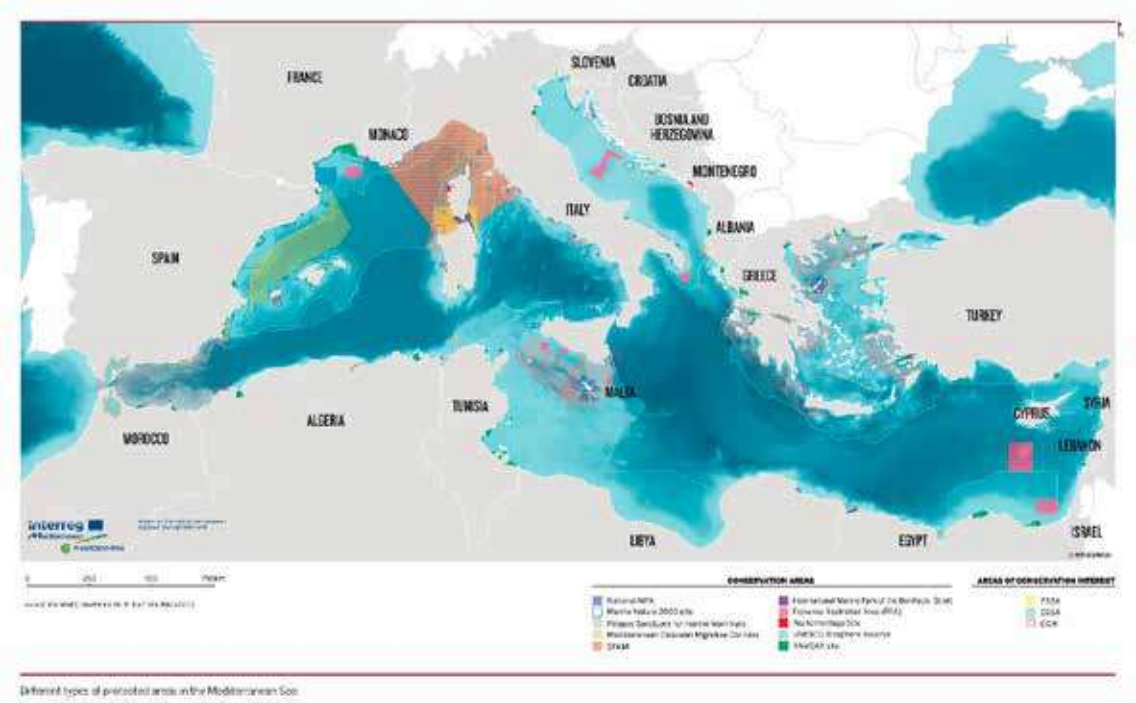

Fig. 19.
Marine protected areas in the Mediterranean Sea. Source: MAPAMED, MedPAN & UNEP-MAP-SPA/RAC (2017)

5.4. Marine biodiversity mainstreaming in other sectors

Mainstreaming of biodiversity in different sectors is a concept well embedded in the EU, international and national policies. There are also good examples implemented in the practice, such as the designation of areas like FRAs or similar nationally designated areas, where fishing activities are limited on temporary and permanent bases (no-take zones). There are also limits on the use of certain fishing gear, which may harm non-targeted species and habitats, such as *Posidonia* meadows. SCUBA diving in monk seal habitats, particularly caves, is strictly banned at least in Turkey.

Balanced and sustainable use of marine space should be promoted through maritime special planning (MSP), which is still a new process, at present mostly focused on the development of MSP strategic plans. The MSP process is complemented with also partially addressed integral coastal zone management.

5.5. Mitigation or eradication of IAS

Non indigenous species, particularly invasive alien species (IAS), have already caused severe problems for marine and coastal biodiversity, fishing, tourism and human health in the Mediterranean Sea. Recently, some actions have been taken to eradicate or at least mitigate presence of some IAS, such as *Caulerpa taxifolia,* puffer fish and lionfish, by Greece, Cyprus, Turkey and Lebanon, although there is no proved or miracle technique to mitigate or eradicate IAS after their spread in wide areas so far. Recently, the governments of Cyprus and Turkey have started to compensate the damage made by pufferfish to small-scale fishers. Citizen science activities in all Levantine countries are also being successfully developed. Adequate handling of ballast waters, so to prevent the introduction of IAS, by implementing the Ballast Water Management Conventions is of utmost importance.

5.6. Financing

Marine and coastal biodiversity conservation in the Aegean Sea and Levantine Basin is supported through different sources of funding, including state budgets, EU funding, and other modes of international funding (public or private). State budgets are mainly used for maintenance of the set governmental/national institutional frameworks and capacities, as well as for certain conservation activities and to match the EU and international co-funding. Besides, it is the support from funds like EU programmes (IPA, LIFE, INTERREG, HORIZON 2020) and Global Environment Facility (GEF) that enable implementation of larger scale projects. The EU cross-border programmes are particularly important in the Aegean Sea and Levantine Basin, since they specifically enhance transboundary cooperation.

Funding is a common problem among all states but some states have urgent needs. It is obvious that without systematic and continuous funding some countries will be unable to ensure long-term marine conservation in the Levantine area. A new funding mechanism is needed, such as "Mediterranean Biodiversity Fund", similar to UN's Blue Actions Fund, for which a trust fund for all coastal states can contribute on a voluntary basis, because lack of long-term funding is an important impediment against marine conservation in the entire Mediterranean Sea, particularly for the coastal states of the Eastern Mediterranean Sea.

5.7. Transboundary cooperation

Transboundary cooperation is a necessity in the Aegean and Levantine Sea Basin in order to ensure effective marine conservation. There is already some specific cross-border cooperation, such as the activities for the conservation of certain migratory species, as well as projects dealing with mitigation of existing and growing pressures, such as marine litter.

Nevertheless, political instability in the region needs to be taken into consideration. It is obvious that there are many similarities and differences among countries and the role of the regional organizations, such as UNEP/MAP, SPA/RAC, REMPEC, ACCOBAMS and GFCM, which unite all relevant countries are of utmost importance in this subregion. Best practices have been seen in EastMed Project by FAO for Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean, the MEDITS Project as an international bottom trawl survey and ACCOBAMS Survey Initiative for cetaceans.

Despite regional difficulties, there is also some bilateral cooperation and networking between some MPAs and national authorities, as well as at the grassroots level of NGOs.

6.

Main gaps and challenges

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Many efforts have been invested so far to preserve marine and coastal biodiversity in the Aegean Sea and Levantine Basin, however, there are still many weaknesses and gaps to address and opportunities and threats to take into account (Table 2). The main strongpoint is that in the Levantine countries, national institutional and legislative frameworks are already established, combined with affiliation to EU and international policies. There is certain implementation of conservation mechanisms, mostly at national level, as well as transboundary cooperation, i.e. East Med Fish executed by GFCM and ACCOBAMS survey. Therefore, there are several main groups of gaps identified:

a) Lack of knowledge on biodiversity and their status

Baseline knowledge about certain taxa, assemblages, habitats and geographic areas in some countries is still scarce, while these important knowledge gaps pose a significant obstacle for the conservation of key and protected marine habitats and species in the subregion. Although our knowledge concerning certain taxa may be considered satisfactory, there are still vast gaps regarding the distribution, range, population and conservation status for the majority of species and habitats.

Knowledge on species and habitat groups is lacking or missing, particularly in the non-EU countries, high seas and deep sea areas. More drastically, even for marine key habitats, mainly marine vegetation, overall information has not been completed yet. These gaps are very much linked with lack of systematic monitoring surveys on species and habitats.

b) Lack of knowledge on pressures and impacts on biodiversity

There is also lack of knowledge on distribution on pressures, as well as their impacts on biodiversity, with focus on pathways and distribution of NIS and IAS, by-catch of non-targeted species mainly cetaceans, seabirds, cartilaginous fish, level of exploitation of commercial invertebrates (sponges, anthozoans, molluscs, crustaceans, echinoderms), climate change stressors and impacts, presence and pathways of marine litter, level of underwater noise.

c) Patchy overall data availability and sharing

Biodiversity data for the Aegean Sea and Levantine Basin are available but scattered under different organizations, mainly GFCM, ACCOBAMS, MEDPAN, IMO, MEDASET, IUCN, MEDCOAST, CIESM as well as some regional organisations. Some European databases are available, for example, EUNIS, EMODNET, and ELNAIS for NIS.

d) Lack of legislation fully addressing conservation of marine environment

Even though the majority of the states in the subregion have adopted legislation which covers most, if not all, marine environment conservation issues (EU Member states), this process is still not yet completed in the non-EU countries.

e) Lack of species conservation planning and implementation

Despite the fact that strategic and action plans for some habitat types and species exist at the basin-wide level, the implementation and enforcement of the national regulation is weak for species and habitat conservation. As an iconic species, the Mediterranean monk seal is legally under protection in all countries, but still deliberate killing and habitat loss are continuing. Another iconic species is grouper (*Epinephelus* spp.) but the protection measures are not adequate and efficient. Some citizen science programmes are promising

for the future monitoring on alien species, conservation of the Mediterranean monk seal, cetaceans and cartilaginous species.

f) Limited capacities

Human capacities are often limited in all institutions and organizations involved or related to conservation. To date, no precise analysis of the human and institutional capacities has been carried out in the Aegean Sea and Levantine Basin, to better understand needs in terms of number of employees, lacking capacities or existence of knowledge that could be shared. NGO's are in a weak position in terms of funding and human resources which are not secured constantly, thus their role for marine conservation, particularly for management, is limited.

g) Limited cooperation between different sectors and academia

Cooperation between different sectors and stakeholders is always challenging, but a need for good cooperation is very much required by the EU policies which are most influential in the region. In practice, this is still an ongoing process. For marine conservation, fisheries cooperatives, diving centres, tourism agencies, NGO's, coastguards and harbour authorities, relevant ministries and municipalities in the region or bordering countries should all have a strong level of cooperation between them. It is obvious that the lack of cooperation between academia and relevant ministries for regional commitments about biodiversity prevails in the subregion.

For the purpose of conservation, action plans are major commitments, thus most countries have such action plans for certain taxa, such as Mediterranean monk seals, marine turtles, and cetaceans in the Mediterranean Sea. Yet not all the countries have such plans for some other important taxa and habitats, for example, marine birds (as in the Annexe II of the SPA Protocol), coralligenous and other calcareous bio-concretions, dark habitats and cartilaginous fish. This gap should be filled by all countries in the subregion without delay with the help of experts.

Some countries do not have action plans and some countries only partial, despite SPA/RAC efforts. One of the priorities should be to harmonize their action plans according to the SPA/RAC guidelines. Another question is why these countries are so reluctant or negligent in order to commit themselves for action plans. It can be due to the lack of political and ecomonic incentives. It seems that national focal points are the key players and their harmonization and close contact with SPA/RAC can improve the quality of the work and efforts in term of national commitments. Again, it is strongly recommended to work with the relevant experts for the protection of marine and coastal biodiversity.

h) Lack of MPAs representation and weak management

Existing MPAs in the Aegean Sea and Levantine Basin are still not enough to cover all valuable areas or assets, which is also very much linked to the lack of knowledge. More extensive and more efficient marine protected areas are needed to reach the Aichi Targets by the countries in the Eastern Mediterranean Sea. In addition, Natura 2000 sites are a good tool for marine conservation but they concern only two countries in the subregion (Greece and Cyprus). Despite recognition of some internationally important areas, such as sperm whale feeding grounds, they are not yet designated as protected areas. Moreover, most of the MPAs are far from effective in terms of implementation and management, thus they are still at the level of 'paper parks'

i) Limited implementation of other conservation mechanisms and measures

Although there are legislative and institutional frameworks for implementation of other conservation mechanisms, notably MSP, ICZM, bycatch mitigation, these are still in early phases of implementation or with limited scope. Existing IAS mitigation and eradication activities are sporadic, targeting only a few species. Actions are often taken too late after the distribution of IAS reaches the irreversible stage, for example, the lionfish.

j) Lack of involvement of general public in conservation

The increase in awareness on values and assets of marine biodiversity is important for effective conservation. In the Aegean Sea and Levantine Basin, there are a number of activities and campaigns, targeting the general public. These activities are generally short-term and often linked to different projects implemented in the region. Public participation in marine conservation activities or initiatives is increasing but still not sufficient due to several reasons, such as ineffective communication between stakeholders, local rivalries and limited funding.

k) Insufficient funding

Funding is a crucial issue for the Aegean Sea and Levantine Basin due to socio-economic realities and difficulties faced by the majority of the riparian states. Despite already available funding, especially coming from international sources, there is still need for basic conservation-related activities, such as monitoring, management of MPAs and so on. The governments are generally reluctant in allocating the funds because marine and coastal conservation issues are not on their political agenda or among national priorities in general. It is evident that during financial crises conservation projects are primarily excluded or shortened. In addition, private sectors generally do not take collective responsibility about climate crises and have not been interested in funding the NGO's in recent years. A revolutionary and innovative funding mechanism is needed for self-sustaining funding particularly in the Levantine Basin.

Table 2.

Overview of strengths, weaknesses, opportunities and threats (SWOT), providing a snapshot of present state of marine and coastal biodiversity conservation in the Aegean Sea and Levantine Basin.

Strengths	Weaknesses
• National legislative framework for marine and coastal biodiversity is in place in majority of countries. • Aegean Sea and Levantine Basin countries are parties to relevant international and regional agreements. • At least two countries transposed the EU environmental acqui into national legislations. • Institutional frameworks for marine and biodiversity conservation are in place. • Certain knowledge on state of biodiversity exists, particularly in the EU countries. • Certain conservation mechanisms are already in place, at least to some extent (MPAs, species conservation plans, NIS and sustainable fisheries practices, etc.). • Some transboundary cooperation is in place, regarding migratory species, mapping and mitigating of pressures (e.g. marine litter and IAS). • Regional organizations are active in the region and contribute to conservation efforts. • Funding is already available and invested in conservation efforts, particularly EU programmes, GEF etc. • NGO's are getting more active and stronger, making cooperation for marine conservation. • Citizen science activities and social media facilitate bilateral communication and awareness. • More stakeholders, i.e. divers or fishermen, provide local ecological information to scientists. • Vessel monitoring systems for fishing are deployed to the fishing boats for fisheries management.	• Limited knowledge on biodiversity, particularly in high seas, deep sea and on some habitats and biodiversity components, knowledge on trends • Lack of adequate knowledge on pressures and their impacts on biodiversity, such as NIS and IAS • There are some national monitoring programme but no systematic monitoring at the basin level. • Biodiversity data are either limitedly shared or scattered on various websites or platforms. • Limited information for species conservation planning • Still limited cooperation effort between different sectors • Limited involvement of general public into conservation • Still lack of certain legislation for protection of marine biodiversity in some countries • Limited capacities, particularly of experts in some countries for marine key species, NIS and key habitats • National MPAs cover small percentage of marine area and they are concentrated in coastal waters. • Significance of high sea biodiversity and valuable areas are internationally recognised, but no conservation/management measures are in place. • Weak management plan of national MPAs • Limited implementation of MSP and ICZM • Insufficient funding, particularly for monitoring and management of MPAs • Lack of geospatial data that is free to access via standardized web services or geospatial data formats in most of the countries • Lack of long-term national marine research policy, with specific strategy, goals, coordination and funding

Opportunities	Threats
• Change of consumers' habits may contribute to reduction of some damaging products, like plastics. • Increasing growth of sustainable ecotourism can be an alternative for nature protection. • Use of existing available technologies (such as use of drones and similar devices) and application of new ones facilitates conservation related activities, particularly monitoring. • Possibility to involve general public and other stakeholders, for example to promote citizen-science. • EU funds and international funds are still available for implementation of conservation activities. • Other funding possibilities and modes are available – private, private-public partnerships etc. • Research infrastructures are well advanced in some countries, such as Greece, Turkey, Israel and Egypt, which is an advantage for the whole region in terms of regional cooperation. • Promotion of the blue economy and growth is a new trend. • New consumer type for organic or bio fish farming is a growing demand. • Considerable increase of Ocean Literacy (OL) in society • UN Decade on Ecosystem Restoration (2021-2030) • UN Decade of Ocean Science for Sustainable Development (2021-2030)	• Biodiversity is still not a priority on the political agenda in majority of the countries. • Financial crises usually takes toll on nature conservation. • Increase in intensity of already harmful anthropogenic activities in and focused on marine environment • Still focused on fossil fuels – intention of oil and gas exploration, particularly in the Levantine Basin • Intensive construction in the coastal areas, both related to tourism, shipping infrastructures and urbanization • Increase of marine traffic, combined with increasing raise of sea temperature (promoted by climate change) threatens to intensify introduction and establishment of NIS • Marine litter and microplastics are growing problems. • Anthropogenic underwater noise is also a growing threat in the basin. • Land-based pollution mainly from untreated sewage can cause human health problem. • Changing of conditions due to climate change can also facilitate introduction of new microbial pathogens. • Political instability

7.

Main opportunities for future transboundary collaboration

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Based on the national reports submitted by the countries in the Aegean and Levantine Basin on Post 2020 SAPBIO, several categories of needs for joint interests could be emphasized (Table 3). The majority of the countries pointed out the needs to enhance inventorying, mapping and monitoring of priority species and habitats (EU directives, SPA/BD Protocol) and to ensure sustainable financing for conservation activities. A need for capacity building was also further emphasized.

It should be stressed that all identified needs have potential for transboundary cooperation. However, several needs stand out as the most relevant: enhanced inventorying and monitoring of migratory species, better data sharing and availability; improved addressing of pressures (NIS/IAS, climate change, by-catch, underwater noise, marine litter, pollution), including better implementation of MSP and ICZM; adequate MPA representativity and management; improved legislation and law enforcement for conservation of some species; better human capacities (exchange of expertise), more significant stakeholders involvement, raised awareness and more sufficient financing.

There have been some successful transboundary cooperation uo to now, such as EastMed Project, MEDITS Project and ACCOBAMS Survey Initiative. The future plans can be elaborated reflecting the results and experience obtained in these projects.

Funding of transboundary cooperation could be continued through the use of already available international and EU level funds specifically allocated for bilateral or subregional cooperation. In addition, the EU Member States have at their disposal EU Structural Funds and the EU Maritime and Fisheries Fund. However, this funding has to be supported through national funding and not specifically allocated for biodiversity. In addition, other funding possibilities should be explored, including private funds, private-public partnerships etc.

Table 3.

Overview of the needs expressed by the Aegean Sea and Levantine Subregional countries in the 2020 national reports related to Post 2020 SAPBIO. Needs with particular (but not exclusive) potential of further future transboundary cooperation are marked as *

Country	Cyp	Egy	Gre	İsr	Leb	Syr	Tur
Need							
Knowledge on biodiversity							
Enhancement of inventorying, mapping and monitoring of priority habitats (EU directives SPA/BD Protocol), such as pelagic habitats, coralligenous, Fucales forests, seagrass (Posidonia) meadows etc.							
Enhancement of inventorying and monitoring of priority species (EU directives, SPA/BD Protocol), including migratory species (cetaceans, marine turtles, seabirds) and Pinna nobilis*							
Establishment of national stranding network for marine mammals and marine turtles							
Scientific research on connectivity, food-webs and eco-system processes							
IUCN Red list assessment							
Improved data availability and sharing*							

Country	Cyp	Egy	Gre	İsr	Leb	Syr	Tur
Assessment/mapping and understanding of ecosystem services provided by biodiversity (ecosystem services)							
Addressing specific anthropogenic pressures and impacts							
Establishment of monitoring of NIS pathways (early warning systems), IAS and concerted actions to mitigate spreading of IAS, such as constructing hypersaline barriers at the Suez Canal and creating market-based incentives for already established species*							
Assess impacts of fisheries, with focus on bycatch and food webs, reconstruction of baselines, ecosystem-based fisheries management*							
Fully understand effects of climate change*							
Improvement of knowledge on impacts of maritime traffic*							
Map anthropogenic noise sources*							
Improvement of the marine litter management*							
Improvement of monitoring, control and surveillance in fisheries, with the emphasis on recreational fisheries and illegal fisheries							
Improvement of knowledge on cumulative impacts*							
Better application of existing integrated conservation mechanisms and tools, with emphasis on marine spatial planning (MSP), as well as ICZM*							
Improvement of EIAs procedures							
Adequate MPA representativity and management of all PAs							
Designation of new MPAs, identification of Natura 2000 sites (non-EU countries particularly) *							
Improvement of MPA management and effectiveness							
Improvement of coastal wetlands management*							
Legislation framework and conservation policies							
Improvement of legislation framework (incl. revision of protected species)							
Proclamation of legal protection of Vermetid platforms or/and improvement of law enforcement in countries with legal protection*							
Development of national action plans for marine species and habitats (stony coral, marine vegetation) and species (cetaceans, marine turtles, cartilaginous fish, and seabirds)							
Development of the new National Biodiversity Strategy							
Institutional and human capacity building							
Improvement of institutional and human capacities (such as expertise on certain species and habitats, capacities on MPA management etc.)*							
Cooperation between sectors and stakeholders' involvement							
Improvement of cooperation between different sectors, such as ministries responsible for nature conservation, fisheries etc.							
Improvement of stakeholders' involvement in conservation (fishermen, scientists)*							
Awareness raising							
Public awareness campaigns, targeted at general public or specific marine sectors*							
Raising awareness of fishermen							
Financing							
Stable financial resources for monitoring, MPAs and conservation actions*							

8.

Conclusions and recommendations for needed actions and subregional strategic orientations

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8.1. Conclusions

The Aegean Sea and Levantine Basin Subregion

The Aegean Sea and Levantine Basin is rich in biodiversity, with priority habitat types and species recognized both under the SPA/BD Protocol and relevant EU directives, including migratory species, such as cetaceans, marine turtles, seabirds and cartilaginous fish. Besides, an iconic species, the Mediterranean monk seal has the largest population in the region. Furthermore, seamounts, cold seeps, hydrothermal vents and other peculiar habitats are found in the Aegean Sea and Levantine Basin. However, there is still lack of or limited knowledge on biodiversity components, particularly in non-EU countries, high sea and deep sea areas. Various anthropogenic activities are drivers of pressures, of which intensity is even more increased due to semi-enclosure of the region. Although knowledge on these pressures is limited, it appears that significant issues include climatic stressors, all industrial fisheries, pollution from land-based activities and coastal development. NIS/IAS have heavily impacted the Levantine Basin due to the geographical closeness to the isthmus communicating with the red Sea and the functional depletion of marine predators due to long-time overfishing. Marine litter and underwater noise are already present with a growing trend.

Overall, the experts active in the subregion have already substantial knowledge and skills, but there is a slight imbalance in these capacities, with experts in some fields missing, particularly in the countries in the Levantine Basin.

Transboundary cooperation is required for effective conservation, particularly for monitoring and conservation of migratory species, addressing of NIS/IAS, climate change, marine litter, underwater noise, as well as exchange of knowledge, expertise and functionality of MPAs. In the Post 2020 SAP BIO process, countries expressed particular needs for enhancement of inventorying, mapping and monitoring of priority species, assurance of sustainable funding and capacity building (exchange of expertise).

The proposal of actions to solve gaps and other issues affecting biodiversity is further elaborated in Table 4. Down to the national level, a synthesis of conclusions from the national reports on Post 2020 SAPBIO, is given as follows:

Cyprus

Cyprus is a member of the European Union and responsible for the implementation of the European Directives and National Legislation concerning marine environment. Cyprus is an island country, characterized by rich marine and coastal biodiversity, which is also recognized at international level through designation or recognition of special protected areas. Under the obligation of EU, Cyprus tries to improve the quality of the marine sciences and environment protection. Recent MPA's designation efforts highlight the importance given to the protection of the marine biodiversty as a whole. Its surrounding water harbours significant habitats and species such as dark habitats and vermetid reefs. The main pressures come from tourism and urbanization, affecting coastal habitats. Knowledge on

biodiversity is limited, as well as on NIS/IAS. Due to damage of the pufferfish (*Lagocephalus sceleratus*) government has compansated small-scale fishers in recent years. Amongst the most urgent actions concerns surveillance and a better control of MPAs and activities of interest that can negatively impact the marine environment. Measures to establish and implement an effective surveillance system for the strict protection of the MPAs and other important areas and illegal activities are needed urgently.

Greece

Greece has rather diverse coastlines with numerous bays and islands. This is reflected in the biodiversity of habitat types and species. Tourism is one of the most important economic activities and pressures are coming from this sector, but also related to fisheries. NIS/IAS is one of the growing issues to address. Greece is a member of the European Union and responsible for the implementation of the European Directives and National Legislation concerning marine environment. Greece is in the strong position among all countries in terms of scientific capacity and human resources, which is shown by its report. Greece, thanks to the effort of HCMR, has been found from the very beginning to be part of international initiatives implementing monitoring of marine biodiversity and functioning of marine ecosystems by integrating genomics, organismal, and environmental data. Greece, along with the other Mediterranean countries, has legal obligations to designate MPAs according to various agreements, policies, and laws (e.g. the Specially Protected Areas and Biological Diversity Protocol of 1995). Substantial funding for conservation also comes from the EU funds. MPAs and Natura 2000 networks are established in the marine area. Transboundary cooperation already exists, with focus on migratory species, marine litter, climate change, and underwater noise.

Israel

Israel also has shown an increasing interest in marine conservation and it has good infrastructure in terms of biodiversity study as well as human resources. The main threat is Lessepsian migration and its impacts to the biota, environment and consequently to society. Construction and marine litter, linked to tourism, pose significant pressures.

Comprehensive mapping of the extent, sources and ecosystem impacts of solid waste, mainly micro and macro plastics through a national plastic and litter reduction program is needed. The function and efficacy of MPAs will be monitored and evaluated. The function and efficacy of the new fisheries reform will also be monitored and evaluated. Solutions for regional and transboundary issues, especially concerning bioinvasions (the largest driver of biotic change in the Levantine Basin), oil pollution preparedness and solid wastes will be promoted. A national plan and directed legislation regarding invasive species mitigation and control should be formed.

Egypt

Egypt has increased its effort, capacity and infrastructure to monitor and protect biodiversity. It needs continuous financial support for all activities, but monitoring is the most urgent issue. Among many issues, the following ones demand most urgency: effective MPA management and declaration of more MPAs, integrated monitoring and assessment, NIS, climate change, sustainable fisheries, mainstreaming of biodiversity in all relevant sectors, tourism, ICZM, public awareness, more legislation and law enforcement.

One of the major difficulties facing the management and conservation of marine biodiversity in the Egyptian part of the Mediterranean Sea is the lack of a detailed, geographically comprehensive database. In addition, information available on marine species, habitats and ecosystems are not consistent, perhaps due to unclear spatial and temporal patterns. Meanwhile human activities in the coastal and marine environment have made considerable changes leading to depletion of fish stocks, pollution in all different forms (oil, debris, plastics, noise), fragmentation of habitats, increase of number of invasive species, and the possible impacts of climate change. Nevertheless , Egypt has strong scientific traditions and scientific community.

Lebanon

Lebanon is improving its scientific infrastructure and capacity. Conservation effort for biodiversity have increased in recent years. Meanwhile, regular funding is essential for the continuation of the routine work. Urgent needs concern institutional, legal and governance levels to ensure the implementation of the ratified international conventions by issuing applicable decrees and by enforcing existing domestic laws concerning the protection of marine ecosystems. Monitoring, training and capacity building, and in ensuring financial and technical support for sustainable research and management is needed.

Action plans concerning species introductions and invasive species in Lebanon includes data collection and updating at a national level, dissemination, capacity building for experts and awareness in addition to coordination at national, Mediterranean and international levels. Capacity building programmes for coast guards, police and civil societies on mainly key marine habitats and highly mobile species is needed. Monitoring, training and capacity building, and in ensuring financial and technical support for sustainable research and management is needed.

Syria

Syria has been in an extraordianary condition because of political unstability and needs fund to continue monitoring marine biodiversity as well as to maintain existing infractructure and human resources in the country. Sustainable fisheries are their priorities because of their contribution to the national food security. The following issues need to be handled urgently: an action plan for integrated management to mitigate environmental risks and threats to the Syrian coastal and marine environment; study and monitoring on marine key habitats and some endangered marine species; combating all kinds of pollution mainly land base and plastic, including biological pollution, resulting from the impact of invasive

species on marine biodiversity; supporting the preparation of the guiding framework for the maritime strategy, documenting marine biodiversity in a national database with related distributional mapping; establishing criteria to identify areas of critical importance for coastal and marine ecosystem services; completing the steps to establish a national network of wetland reserves and marine and coastal reserves by declaring new protected areas and proposing their integrated management plans.

Turkey

The Turkish part of the Aegean Sea and Levantine Basin provides home to various marine and coastal biodiversity. At the same time, economic activities are most intensive along the Turkish coast. As a consequence, there are significant pressures and impacts on marine biodiversity, particularly related to NIS and tourism activities. Considering limited capture production carried out by Turkey in the Aegean Sea and Mediterranean, the impact of fisheries activities on biodiversity of the Aegean and Mediterranean Seas is considered quite limited.

Climate change is an important issue that needs to be addressed. Institutional and legislation frameworks are set but not coherent with the legislation and the policies are in line with the EU requirements yet fully. However, Turkey has strong cooperation with GFCM and ICCAT for protection and management plan of the all fisheries resources, mainly of bluefin tuna and swordfish, and highly migratory species. In addition, Turkey ratified ACCOBAMS recently for the conservation of cetaceans. There are numerous MPAs and coastal PAs of national designations, both along the eastern and southern coast of the country including a recent one in Finike Seamount (Anaximender) area. Implementation of ICZM is ongoing. Turkey also has critical scientific infrastructure and human resources, but weak implementation for MPAs and lack of management plan for some of the protected area is impediment for conservation. Despite more fund has been allocated in recent years to marine scientific studies, more research effort is needed to collect basic data for the biodiversity and species conservation.

Transboundary cooperation exists but further efforts are needed, mainly for NIS, since Turkey is severely affected by NIS and IAS. For example, due to damage made by the pufferfish (*Lagocephalus scelaratus*), Turkey started to compansate the fishermen for their damages since 2020.

8.2. Recommendations

Based on analysis of the present state of marine and coastal biodiversity in the Aegean Sea and Levantine Basin, including identification of gaps and expressed needs, five sets of more concrete activities are proposed (Table 4). Improvement of knowledge on biodiversity is very much required, as a basis for any conservation-related planning. In order to ensure healthy marine environment, efforts are needed to address specific anthropogenic pressures with active cooperation between all interest groups. Actions related to NIS/IAS

and climate change are of the highest importance, followed by addressing marine litter and anthropogenic underwater noise. Implementation of ecosystem-based management tools, such as MSP and ICZM is needed. Capacity building, stakeholders' involvement, and networking are of high relevance in the Levantine Basin, with focus on exchange of expertise and promotion of the use of available and new technologies to facilitate monitoring and conservation in general. All conservation related activities have to be supported through sufficient funding, which include better use of already available funds, but also seeking of new funding mechanisms, such as private-public partnership etc. The human power behind these actions are multilateral organizations, national authorities, scientific institutions (experts), NGOs and other stakeholders, including the general public. All the activities could be linked to regional and global policies, with an emphasis on Post 2020 Global Biodiversity Framework of the CBD, EU 2030 Biodiversity Strategy, including the ACCOBAMS strategy for cetacean conservation.

Marine key habitats are under various threats, mainly fishing pressure and other factors, such as alien species and climate change. These habitats are a regional priority for the Mediterranean Sea and a concerted action is needed both in the northern and southern countries. More research intensity is recommended for all countries in the subregion.

Recommendations concerning each issue are listed below.

- Establish a mechanism for continuous collection of regionally comparable data on marine conservation and monitoring programs at both national and subregional levels.
- Enhance the current level of funding for marine conservation or biodiversity. More investment is needed from the national research budget of the states.
- Assess the impact of the Covid-19 pandemic on marine life and marine conservation.
- Encouraging designation of the new MPAs to reach Aichi Target 11.
- Capacity building dedicated to the investigations of bird species is expected to contribute to fill the gaps to some extent. This includes taxonomy and identifications of species in particular. Regional cooperation in terms of data collection, sharing, and management is crucial for the protection of these vulnerable highly migratory species. Species deserving action to mitigate and possibly eliminate bycatch include Scopoli's shearwater, Yelkouan shearwater, Mediterranean shag and Balearic shearwater. Very little is known about deeps sea biodiveristy and more research effort and funding is needed.
- Promote and encourage education and training, capacity building programs for the protection of marine biodiversity through regional organizations, such as GFCM, ACCOBAMS, IMO, EU, Barcelona Convention and others.
- Citizen science can also play an important role for research. The Mediterranean Sea is in great need of scientific efforts to establish the current trends in distribution and abundance of shark species, and citizen science has great potential to fulfil this role.

Increase effort for citizen science in the subregion particularly for data collection concerning NIS, elasmobranchs and marine mammals.

- Singular habitats, such as canyons, cold seeps, hydrothermal vents, and mud volcanoes, as well as non-singular habitats, such as caves, coralligeneous, and rhodoliths, need more investigation. Regional cooperation is also important for the exchannge of information. Regional summer schools can be useful to improve knowledge on this issue.

- Some countries have action plans such as those for Mediterranean monk seals, marine turtles, and cetaceans. However, some countries do not yet have such plans or for particular taxa or habitats, such as marine birds as in the Conservation of Bird Species inventoried in the Annexe II of the SPA Protocol, coralligenous and other calcareous bio-concretions in the Mediterranean, dark habitats and cartilaginous fishes. This gap should be filled by all countries in the subregion without delay.

- Harmonize the action plans of the countries according to the SPA/RAC guidelines. Close contact with SPA/RAC can improve the quality of the work and efforts in terms of national commitments.

- Establish a long-term funding mechanism, such as “Mediterranean Biodiversity Fund” (a proposed name by this report), similar to the UN’s Blue Actions Fund, which is a trust fund for all the coastal states with the contribution of all Mediterranean/non-Mediterranean countries.

Table 4.

Proposal of main actions for conservation of marine and coastal biodiversity in the Aegean and Levantine Basin until 2035, as contribution to the development of the Post 2020 SAP BIO Strategy

KNOWLEDGE ON BIODIVERSITY Objective: Improve knowledge on biodiversity, with focus on priority species and habitats (SPA/BD Protocol and EU directives) Indicator of objective achievement: Sufficient data/information/knowledge to assess at least 50% of GES under EcAP in implemented national assessments							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level 1	Possible sources of funding2	Link to other relevant strategies	Possible actors3
1.1.	Carry out inventory and identify distribution of priority habitat types in coastal, deep sea and high sea waters, based on new research and using comparable classification and level of detail. Focus is on seagrass (Posidonia) meadows, Cystoseira forests, coralligenous, Rhodoliths, maerl beds, photophilic communities, marine caves and deep seahabitats	Targeting to finish habitat maps at national levels.	All countries. For Posidonia except for Israel and Lebanon.	Very High	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy4	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
1.2.	Carry out distribution and abundance surveys of priority invertebrate species with focus on C.rubrum, Savalia savaglia, Isidella elongatais, P.nobilis, Lithophaga lithophaga, Spongia officinalis, Cladocora caespitosa particularly in the least known areas	Distribution and abundance are undertaken and data used for new assessments	All countries. C.rubrum, S. savaglia and I. elongatais focus on Greece and Turkey.	High	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs, other stakeholders

1. Very high- immediate activity implementation, High – activity implementation until 2025, Medium-activity implementation until 2030, Low-activity implementation until 2035
2. IP – international public, NF – national funding, O – other sources, such as private funding
3. Multilateral organisations, national authorities (including experts agencies), scientific institutions, NGOs or other stakeholders involved
4. Naming of strategic documents means that there are linkages of general nature to the Post 2020 SAP BIO sub-regionally proposed actions. But, when more clear targets/actions are being stipulated in both document, this will be specifically indicated next to the title of the particular strategic document.

KNOWLEDGE ON BIODIVERSITY

Objective: Improve knowledge on biodiversity, with focus on priority species and habitats (SPA/BD Protocol and EU directives)

Indicator of objective achievement: Sufficient data/information/knowledge to assess at least 50% of GES under EcAP in implemented national assessments

No.	Activity	Expected results/ outputs	Relevant countries	Priority level 1	Possible sources of funding2	Link to other relevant strategies	Possible actors3
1.3.	Carry out more detailed abundance and distribution surveys of cetaceans and marine turtles in the least known areas, such as the Levantine Basin	Distribution and abundance are undertaken and data used for new/updated assessments	All countries	High	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
1.4.	Continue monitoring of cetaceans and marine turtles at the entire Aegean Sea and Levantine Basin	Aerial and boat surveys are regularly undertaken and data are used for new/ updated assessments	All countries	High	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
1.5.	Continue monitoring of the Mediterranean Monk Seal, reassessment is needed.	Field Survey	Cyprus, Greece and Turkey	High	IP, NF	EU Biodiversity Strategy, Post-2020 biodiversity	All stakeholders
1.6.	Monitoring of vermetid platforms, which are sensitivee to the sea level rise	Field survey	All Levantine states	High	IP, NP	EU Biodiversity Strategy, Post-2020 biodiversity	All stakeholders
1.7.	Establish functional cetacean stranding network for the entire Aegean Sea and Levantine Basin, contributing with data to existing regional databases	All countries have established stranding networks and regularly update mortality trends/injured animals	All countries	High	NF	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy ACCOBAMS Strategy	National authorities, scientific institutions, expert NGOs and other stakeholders
1.8.	Promote scientific research of foodwebs and ecosystem functionality in general, particularly related to GES assessment under IMAP and MSFD	Publication of new scientific papers on the topic	All countries	Very high	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs

KNOWLEDGE ON BIODIVERSITY **Objective: Improve knowledge on biodiversity, with focus on priority species and habitats (SPA/BD Protocol and EU directives)** **Indicator of objective achievement: Sufficient data/information/knowledge to assess at least 50% of GES under EcAP in implemented national assessments**							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level 1	Possible sources of funding2	Link to other relevant strategies	Possible actors3
1.9.	Assess current data sharing and exchange practices and propose concrete improvement actions	Assessment reports	All countries	Low	IP	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs

ADDRESSING SPECIFIC PRESSURES ON BIODIVERSITY AND INTEGRATED COASTAL ZONE MANAGEMENT **Objective: Mitigate anthropogenic pressures on marine and coastal biodiversity in the Aegean Sea and Levantine Basin, with active cooperation of all relevant stakeholders** **Indicator of objective achievement: Positive trends in GES assessment under IMAP and MSFD**							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level	Possible sources of funding	Link to other relevant strategies	Possible actors
2.1.	Assess accurately by-catch of relevant non-targeted species (cetaceans, marine turtles, sea birds, cartilaginous fish) and implement acceptable mitigation techniques	Intensity of by-catch is assessed (including hotspots) and mitigation activities have started	All countries	High	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 4 ,SDG's EU 2030 Biodiversity Strategy (3.3.4. Improving knowledge, management and skills) ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
2.2.	Assess presence and distribution of selected IAS at the Levantine level (IAS under EU Regulation and IMAP)	Accurate map of most significant IAS in the Levantine Basin	All Levantine countries	Very high	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 5 EU 2030 Biodiversity Strategy 2.2.10. Addressing IAS	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders

ADDRESSING SPECIFIC PRESSURES ON BIODIVERSITY AND INTEGRATED COASTAL ZONE MANAGEMENT Objective: Mitigate anthropogenic pressures on marine and coastal biodiversity in the Aegean Sea and Levantine Basin, with active cooperation of all relevant stakeholders Indicator of objective achievement: Positive trends in GES assessment under IMAP and MSFD							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level	Possible sources of funding	Link to other relevant strategies	Possible actors
2.3.	Establish system for monitoring of NIS and their pathways at the Levantine level (early warning systems)	Monitoring system is set and functional with active cooperation between all countries	All Levantine countries	Very high	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 5 EU 2030 Biodiversity Strategy 2.2.10. Addressing IAS	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
2.4.	Identify GES thresholds for NIS/IAS in the Aegean and Levantine Basin	GES thresholds for NIS/IAS are set and implemented in GES assessments	All countries	High	IP, NF	Post-2020 Global biodiversity framework (GBD) (contribution to Target 5) EU 2030 Biodiversity Strategy 2.2.10. Addressing IAS	National authorities, scientific institutions, expert NGOs and other stakeholders
2.5.	Undertake mitigation and eradication actions for selected, most problematic IAS, such pufferfish, striped eel catfish and lionfish. Develop markets of these IAS if possible. Cyprus and Turkey already compensate small scale fishers for Pufferfish	Actions have been taken at least for the most problematic species.	All countries	Medium	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 5 EU 2030 Biodiversity Strategy 2.2.10. Addressing IAS	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
2.6.	Establish monitoring of effects of climate change. Define macro descriptors species including marine acidity.	Special monitoring programmes are in place, with focus on most sensitive areas and species.	All countries	Very high	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 7 EU 2030 Biodiversity Strategy SDG's ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
2.7.	Identify marine litter/ ghost nets hotspots in the Aegean and Levantine Basin	Marine litter hotspots are mapped.	All countries	High	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 6 EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders

ADDRESSING SPECIFIC PRESSURES ON BIODIVERSITY AND INTEGRATED COASTAL ZONE MANAGEMENT Objective: Mitigate anthropogenic pressures on marine and coastal biodiversity in the Aegean Sea and Levantine Basin, with active cooperation of all relevant stakeholders Indicator of objective achievement: Positive trends in GES assessment under IMAP and MSFD							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level	Possible sources of funding	Link to other relevant strategies	Possible actors
2.8.	Further raise awareness on negative impacts of plastic waste and ghost nets	Number of public awareness campaigns and other activities increases.	All countries	High	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 15 EU 2030 Biodiversity Strategy 2.2.9 Reducing pollution ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
2.9.	Assess distribution and impact of anthropogenic underwater noise and mitigate such impacts on cetaceans and other species	Anthropogenic noise is mapped in the entire basin and hotspots are identified.	All countries	High	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 6 EU 2030 Biodiversity Strategy 2.2.9 Reducing pollution ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
2.10.	Establish active cross-border cooperation to address over-exploitation and illegal fishing practices	Mitigate IUU fishing	All countries	Medium	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 3 SDG's EU 2030 Biodiversity Strategy	National authorities, GFCM
2.11.	Establish active cross-border cooperation to address oil spill contingency and recovery plans	Mitigate ship- originated pollution.	All countries	Medium	IP, NF	Post-2020 Global biodiversity framework (GBD) EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, IMO, REMPEC NGOs and other stakeholders
2.12.	Develop and apply MSP and ICZM plans	MSP and ICZM tools are applied at least some countries.	All countries	High	IP, NF	Post-2020 Global biodiversity framework (GBD) EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders

COHERENT NETWORK OF MARINE AND COASTAL PROTECTED AREAS Objective: Improve representativity of marine and coastal protected areas and status of biodiversity in them Indicator of objective achievement: Effectiveness of marine and coastal areas (MPAs) is improved							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level	Possible sources of funding	Link to other relevant strategies	Possible actors
3.1.	Extend the current MPA network in the Aegean Sea and Levantine Basin	New MPAs are designated in the Aegean and Levantine Basin. Reaching Aichi Target 11.	All countries	Very high	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 2 EU 2030 Biodiversity Strategy 2.1. Coherent network of protected areas	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
3.2.	Improve management and effectiveness of the already established MPAs, including FRA	Management plans are developed and implemented in all marine Natura 2000 sites/ national MPAs, nature parks and FRA	All countries	High	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 2 EU 2030 Biodiversity Strategy 2.1. Coherent network of protected areas ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
3.3	Identify and report existing and/or future potential OECMs in the subreion	List of existing and potential OECMs in the subregion	All countries	Middle	IP, NF	EU 2030 Biodiversity Strategy 2.1. Coherent network of protected areas	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
3.4	Harmonize national legislations for MPAs and FRAs	Improved quality of conservation of transboudary species and ecosystem services	All countries	Middle	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 2 EU 2030 Biodiversity Strategy 2.1. Coherent network of protected areas	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
3.5	Standardize monitoring methodologies and protocols for MPAs, FRAs and OECMs	Improved connectivity and networking of PAs	All countries	Middle	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 2 EU 2030 Biodiversity Strategy 2.1. Coherent network of protected areas	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders

CAPACITY BUILDING, STAKEHOLDERS INVOLVEMENT AND NETWORKING Objective: Improve experts' capacities at the Adriatic level and involvement of stakeholders Indicator of objective achievement: All Aegean and Levantine countries have needed expertise for GES assessment under IMAP or MSFD, supported with engaged general public							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level	Possible sources of funding	Link to other relevant strategies	Possible actors
4.1.	Organize joint capacity building activities and exchange knowledge on certain topics, including NIS/IAS, jellyfishes, migratory species, use of existing and new technologies in monitoring, law enforcement and other activities	Number of trained experts is increased. Available and new technologies are used in monitoring and conservation in general.	All Aegean and Levantine countries	Very high	IP, NF	Post-2020 Global biodiversity framework (GBD) EU 2030 Biodiversity Strategy 3.3.4. Improving knowledge, education and skills	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
4.2.	Engage fishermen, general public and other stakeholder in monitoring (citizen science) and conservation activities	Citizen science projects are implemented.	All countries	Medium	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 19 EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs, general public and other stakeholders
4.3.	Improve existing MPAs, network bilaterally or via MedpPAN	Effective and functional network of MPAs	All countries	Low	IP, NF	Post-2020 Global biodiversity framework (GBD) EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
4.4.	Establish a subregional network of experts for priority species and habitats and specific conservation activities	Compile, publish on web and update list of active experts in the region. Levantine Task Force for unusual stranding and similar events is established.	All countries	Medium	IP, NF	Post-2020 Global biodiversity framework (GBD) EU 2030 Biodiversity Strategy ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
4.5.	Establish a Levantine network for harmful algae species	An informative fast and effective network for monitoring harmful algae is established.	All countries	Medium	IP, NF		Multilateral organizations, national authorities, IOC, scientific institutions, stakeholders
4.6.	Promote blue growth, blue economy, such as aquaculture and sustainable fisheries	Courses for blue economy and investment are held.	All countries	Medium	IP, NF		Relevant ministries, GFCM, local NGO's, private companies

FINANCING Objective: Ensure sufficient long-term funding for conservation activities Indicator of objective achievement: Funding for most of the Post 2020 SAP BIO activities ensured and activities are implemented							
No.	Activity	Expected results/ outputs	Relevant countries	Priority level	Possible sources of funding	Link to other relevant strategies	Possible actors
5.1.	Enhance implementation of national and transboundary project on different topics, such as Horizon 2020, Life, etc	Number of joint projects covering priority topics is increased.	All Aegean Sea and Levantine countries	Very high and ongoing	IP, NF	Post-2020 Global biodiversity framework (GBD) Target 18 EU 2030 Biodiversity Strategy ACCOBAMS Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
5.2.	Investigate Public Private Partnerships (PPP) possibilities to leverage funds from the business sectors and foundation to co-finance conservation	Industry-related activities are organized.	All countries	High	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 18 EU 2030 Biodiversity Strategy	Multilateral organizations, national authorities, scientific institutions, expert NGOs and other stakeholders
5.3.	Investigate funds for ship- originated pollution, noise pollution, eco-friendly aquaculture practices	Pollution mitigation measures are elaborated.	All countries	Medium	IP, NF, O	Post-2020 Global biodiversity framework (GBD) Target 18 EU 2030 Biodiversity Strategy	Shipping, energy, food industries, foundations, private companies philanthropic organizations
5.4.	Establish a long-term funding mechanism, such as "Mediterranean Biodiversity Fund", a trust fund for all the coastal states in the Mediterranean	Long-term funding of biodiversity projects	All countries	High	IP	All	World Bank, European Investment Bank, private donors

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SPA/RAC WORKING AREAS

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

POST-2020
SAPBIO

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

Marine turtles

Cetaceans

Mediterranean Monk Seal

Cartilaginous fishes
(Chondrichtyans)

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

SPAMI

Specially Protected Areas of Mediterranean Importance

Specially Protected Areas

Monitoring

Coralligenous and other calcareous bio-concretions

Marine vegetation

Dark Habitats

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

Species introduction and invasive species

POST-2020

SAP BIO

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

UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC
The Mediterranean Biodiversity Centre

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