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Agenda Item 3: 2023 Mediterranean Quality Status Report (2023 MED QSR): Content on Biodiversity, Non-indigenous species and Fisheries Ecological Objectives (EOs)

3.1. Chapter on EO 1
3.1.3. Mediterranean Monk Seal

2023 MED QSR: Mediterranean Monk Seal (EO1) Chapter

SPA/RAC
Tunis, 2023

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Note by the Secretariat

The 2023 MED QSR Roadmap and Needs Assessment was endorsed by COP 21 (Naples, Italy, December 2019) with Decision IG.24/4. It defines the vision for the successful delivery of the 2023 MED QSR, and outlines key IMAP-related processes, milestones and outputs to be undertaken, with their timelines.

The main assessment chapters of the 2023 MED QSR are based on assessments of Common Indicators (CI) and some Candidate Common Indicators (CCI) within Ecological Objectives (EO) for biodiversity and fisheries, pollution and marine litter and cost and hydrography clusters. Where feasible, and where the data allow, CIs are integrated within and across EOs.

As a contribution to the 2023 MED QSR biodiversity (EO1) and non-indigenous species (EO2) chapters, SPA/RAC has prepared six thematic assessment reports for benthic habitats, cetaceans, Mediterranean monk seal, seabirds, marine turtles and NIS.

Data on the Mediterranean monk seal (*Monachus monachus*) is being gathered from the national experts. Based on the availability and quality of the provided data, the assessment of the Mediterranean monk seal under IMAP EO1 will be focused on the three common Indicators (CI): CI3 – Species distribution, CI4 – Population abundance and CI5 – Population demographic characteristics.

The current proposal of the 2023 MED QSR Mediterranean monk seal chapter is submitted the CORMON Meeting as a very preliminary draft for further discussion and recommendations.

Based on the comments and suggestions raised during the (CORMON) of biodiversity and fisheries, the document will be further developed and presented for its finalization for consideration by the Meeting of the Integrated CORMONs on 27 and 28 June 2023.

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Acronyms

CI – Common Indicator
IMAP - Integrated Monitoring and Assessment Program of the Mediterranean Sea and Coast and Related Assessment Criteria
SPA/RAC – The Specially Protected Areas Regional Activity Centre
UNEP/MAP - United Nations Environment Programme / Mediterranean Action Plan
IUCN – International Union for Conservation of Nature
CMS – Convention of Migratory Species
CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora
MED QSR - Mediterranean Quality Status Report
DPSIR - Drivers, Pressures, State, Impact, Response
GES - Good environmental status
MSA - Monk Seal Alliance
MOm - The Hellenic Society for the Study and Protection of the Monk seal

1. Key messages

1. The present assessment provides insight into both the strengths and limitations of the current status of the Mediterranean monk seal across the Mediterranean basin.

- In the areas where monk seal breeding had been reported (see "Group A" countries in GES section below), the species continues to breed.
- In all areas where no monk seal breeding takes place, but repeated sightings of monk seals were reported (see "Group B" countries in GES section below), the species continues to be present, and the most recent data shared by experts, through the survey conducted to produce this assessment, indicate a moderate expansion of the specie's range.
- Consequently, if habitat suitable for the species is available (and protected), they offer good potential for new breeding episodes.
- All research and conservation groups (data providers) have agreed in reporting problems related to disturbance and habitat loss, which seem to pose a widespread threat throughout the species' range.
- The reported wider distribution of the species across the basin in recent times has led to an increase in the number of "players" in the Mediterranean monk seal conservation "game". These research and conservation groups, some of them with a need for capacity building and training initiatives, consider necessary to increase monitoring efforts. In this regard, a significant number of organizations carrying out monitoring activities on Mediterranean monk seals, were not able to respond to the set of questions focussed on demographic parameters, included in the questionnaire (see Methodology section). This lack of response suggests that in many areas an optimal level of (regular) monitoring effort was not achieved in order to obtain these parameters.
- Following up on the above, for instance, groups working in Israel and the Adriatic Sea were not able to respond to these demographic parameters, possibly as a consequence of both a low level of monitoring effort and a very low monk seal presence.
- By improving our capacity to establish the basic demographic parameters for this endangered species, we would be also advancing in our capacity to produce more fine-tuned total population estimates. Recent new approaches to infer population numbers from pup multiplier ratios may largely benefit from it, since there is still a significant knowledge gap on pup survival rates.
- Breeding caves and foraging areas need to be identified and protected. Conservation management action should not be limited to monitor resting and haul-out areas.
- There is a lot of data collected, although not always in a homogeneous format or by applying commonly agreed methodologies and procedures. Therefore, this wealth of data it is often not comparable between different sites and research groups. This important issue could be overcome through the establishment of commonly agreed monitoring protocols and a data sharing platform. New initiatives led by the Monk Seal Alliance seem to provide good *momentum* to address this recurrent request by Mediterranean monk seal researchers and conservation bodies.

2. Background information and methodology

2.1. Background

2. The three agreed Common Indicators (CIs) of the Integrated Monitoring and Assessment Program of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) on Mediterranean monk seal are:
    - Common Indicator 3: Species distributional range
    - Common Indicator 4: Population abundance of selected species
    - Common indicator 5: Population demographic characteristics
3. Mediterranean monk seals (Monachus monachus) were once widely and continuously distributed in the Mediterranean and Black Seas, and in North Atlantic waters from Morocco to Mauritania, including the Cape Verde and the Canary Islands, Madeira, and the Azores (Johnson et al. 2006). Today fewer than 700 individuals are thought to survive in isolated subpopulations in the eastern Mediterranean, the archipelago of Madeira and the Cabo Blanco area in the north-eastern Atlantic Ocean (Karamanlidis et al. 2015). The largest aggregations of Mediterranean monk seals are found near Cabo Blanco (González and Fernandez de Larrinoa 2012, Martínez-Jauregui et al. 2012). Principal sites in the Mediterranean are located in the Ionian and Aegean seas, including the National Marine Park of Alonissos (Trivourea et al. 2011) and the Gyaros Marine Protected Area (Dendrinos et al. 2008), both in Greece. An increasing presence of monk seals has been also reported in the Levantine Sea (Beton et al., 2021; Kurt and Gücü 2021; Roditi-Elasar et al., 2021; SPA/RAC-UNEP/MAP, 2020). Moreover, within the Mediterranean Basin, there are recent indications that seals might be frequenting areas within their historical range where they had been extirpated in previous decades (Bundone et al., 2019).
4. Historical evidence suggests that Mediterranean monk seals commonly used to haul out on open beaches (Johnson and Lavigne 1999, González 2015). Still, in more recent times -- probably as an adaptation to increased human disturbance -- they generally seek refuge in remote marine caves. These natural rocky shelters share common morphological characteristics, including one or more entrances above or below water level, an entrance corridor, an internal pool, and a beach that provides a dry haul out area (Dendrinos et al. 2007). While at sea, Mediterranean monk seals have been reported sleeping, either at the surface floating (vertically or horizontally) with eyes closed or resting underwater on the seafloor or over seagrass beds with eyes and nostrils shut (Karamanlidis et al. 2017, Mpougas et al. 2019). On all occasions, seals proved to be easily wakened when approached by humans.
5. The monk seal populations at Cabo Blanco in the Atlantic, and at Gyaros Island in the eastern Mediterranean, are the only large extant aggregations of the species that still preserve the structure of a colony, while remaining subpopulations in the eastern Mediterranean are usually small, fragmented groups of <20 individuals (Karamanlidis et al. 2015). Most of our knowledge about the mating system of Mediterranean monk seals come from observations made in the Cabo Blanco area. Mating has only been observed to occur in the water, where males, who are markedly larger than females (Samaranch and González 2000), patrol and defend clearly delineated long-lasting aquatic territories. Aggressive interactions with intruders are characterized by loud puffs (i.e., short, explosive burst of breath), chases, and subaquatic fights. This aquatic breeding strategy results in very low levels of polygyny, as evidenced by the observed low or null relatedness among pups belonging to the same cohort (Pastor et al. 2011).
6. Pupping periods show differences between locations; in the colony of Cabo Blanco births are recorded from April to November (González et al. 2002), while elsewhere births are concentrated between October and November (Littnan et al. 2018). For the first week after

giving birth, mothers spend much time on land lying close to their new-borns. After this time and throughout the nursing period, females leave their pups unattended for extended periods, lasting up to several hours, in order to forage. As lactation progresses, pups begin to swim and engage in short, increasingly independent trips between caves. During mother–pup encounters, mothers use nuzzling and vocalization to recognize their pups (Aguilar et al. 2007, Gazo and Aguilar 2005). Fostering and milk stealing are common patterns of behaviour for both lactating females and pups, respectively (Pires 2004, Aguilar et al. 2007). Weaning of pups gradually occurs at four to five months of age (Aguilar et al. 2007, Karamanlidis et al. 2015), when pups begin to forage on their own (Pastor and Aguilar 2003).

7. Mediterranean monk seals have a varied diet, consisting largely of demersal fishes, cephalopods (the common octopus Octopus vulgaris being the most frequent prey item), and crustaceans (Salman et al. 2001, Karamanlidis et al. 2014, Pierce et al. 2011, Pinela et al. 2010, Kiraç and Ok 2019). Body parts of green turtles (Chelonia mydas) were also recently found in the stomach of an adult seal stranded in Turkey (Tonay et al. 2016). When foraging, monk seal pups typically dive to depths of a few tens of meters (mean depth = 11.6 ± 9.5 m) and their dive performance increases with age, both in time spent diving and in dive parameters (Gazo et al. 2006). In Greece, a tagged rehabilitated monk seal performed 5–7-minute dives with a mean maximum depth of 41 m and an overall maximum dive depth of 123 m (Dendrinos et al. 2007). Tagged seals have shown to be able to descend to the limit of the euphotic zone (Littnan et al. 2018) on dives lasting up to 18 minutes (Kiraç et al. 2002).
8. Mediterranean monk seals have teetered on the brink of extinction for about one-half century (Notarbartolo di Sciara and Kotomatas 2016). After having been classified as Critically Endangered for almost two decades, their status was reassessed as Endangered on the IUCN's Red List (Karamanlidis and Dendrinos 2015). Reassessment was based on the notion that monk seal numbers in specific locations (i.e., the Madeira archipelago, Western Sahara-Mauritania, and selected localities in the Aegean Sea) have been stable or may even be increasing.
9. Since 1985, the Mediterranean monk seal was recognised within the framework of the Barcelona Convention as a species to be protected as a matter of priority. In that year, during their fourth ordinary meeting, the Contracting Parties adopted a declaration, referred to as the Genoa Declaration, which included, amongst the priority targets to be achieved in the decade 1986-1995, the "protection of the endangered marine species" with a specific reference to the monk seal. Following the Genoa Declaration, an Action Plan for the Management of the Mediterranean Monk Seal (Monachus monachus) was adopted by the Barcelona Convention's Contracting Parties (UNEP/MAP-SPA/RAC & IUCN 1988, UNEP/MAP-SPA/RAC 2003). The main aims of the Barcelona Convention's Action Plan for the Management of the Mediterranean Monk Seal are: i) to reduce adult mortality; ii) to promote the establishment of a network of marine reserves; iii) to encourage research, data collection, and rehabilitation programmes; iv) to implement information programmes targeting fishing communities and various other stakeholders; and v) to provide a framework for the coordination, review and financing of relevant activities. In 2013, Parties to the Barcelona Convention have adopted a "Regional strategy for the conservation of Mediterranean monk seal", revised and updated in 2019 (Decision IG.24/7).
10. The Mediterranean monk seal is listed in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), in Appendix I of the Convention on International Trade of Endangered Species (CITES), in Annex II Protocol on Specially Protected Areas and Biological Diversity (SPA/BD Protocol) of the Barcelona Convention, and is a priority species of Community Interest, listed in Annexes II and IV of

the EU Habitats Directive. The species is protected throughout its range through national laws.

2.2. Methodology

11. For the 2023 MED QSR Mediterranean Monk seal assessment to be successful, the main experts working with this endangered species were contacted by SPA/RAC and were kindly asked to provide relevant data on Mediterranean monk seal, covering the three above-listed Common Indicators.
12. To facilitate the data collation process, a questionnaire was produced, as an Excel file (See document provided together with this report with all responses), including four different spreadsheets covering different aspects, namely data supplier information, species distributional range, population abundance, and demographic characteristics.
13. Participants in this survey were requested to also provide any available reports on the three CIs of Mediterranean monk seal and point out any links to additional data, data depositories and contacts of data-holders that might be beneficial to further enhance the assessment. In addition, participants that may consider that they do not have sufficient quantitative data regarding the three CIs, were encouraged to provide or point at any additional information that might allow at least for a qualitative assessment of the Good Environmental Status.
14. The 2023 MED QSR assessment for the Mediterranean monk seal does not only rely on the participation of these experts, in order to count with the most updated and detailed information, but also on the scientific literature available for the species. The above-mentioned questionnaire was shared with 29 experts from 16 countries. Annex 1 includes main information derived from the survey for all three CIs.

3. Drivers, Pressures, State, Impact, Response (DPSIR)

15. DPSIR is a cause-and-effect framework for describing the interactions between society and environment. In this case the DPSIR has been focused to a species: The Mediterranean monk seal.
16. The main threats faced by Mediterranean monk seals include: (a) deliberate killings, mostly by artisanal fishers retaliating against net depredation and damage; (b) critical habitat deterioration, destruction, and fragmentation; (c) disturbance caused by tourists entering breeding caves during the reproductive season, as well as seal–boat interactions; and (d) bycatch in fishing gear, mainly of young inexperienced individuals (Güçlüsoy et al. 2004, Karamanlidis et al. 2020, Karamanlidis and Dendrinos 2015, Mpougas et al. 2019, Notarbartolo di Sciara and Kotomatas 2016). Other threats, such as disease outbreaks (e.g., morbillivirus), toxic algal blooms, prey depletion, and contamination by pollutants and oil spills in critical habitat, also have the potential of reducing monk seal survival (Karamanlidis et al. 2015). Inbreeding also raises concern, since the species appears to be "one of the most genetically depauperate mammals on Earth" (Karamanlidis et al. 2016), a condition believed to increase the probability of extinction substantially.
17. The basic idea behind the DPSIR framework is that social, demographic and economic (indirect) drivers exert pressures on the environment, thereby changing its state and the associated flow of ecosystem services. Whilst drivers are the underlying cause of change, pressures are the actual stimulus that through alterations of the state of the system can ultimately have an impact on human well-being. The impacts of changes on the state of the system trigger societal responses in the form of human actions implemented by society and governments. These responses include the formulation of, for instance, new laws, management plans or economic and planning instruments, and reflect decisions based on

people's perception of ecosystem services, the state of the environment and acting pressures and drivers.

3.1. DRIVERS

18. Drivers are overarching causes that can drive change in the environment and contribute to the pressures on the species. For the Mediterranean monk seal DPSIR (Figure 1) the following five drivers have been considered:

- **Population growth and economic development** can be viewed as the driving forces that are influencing all the Mediterranean region where the Mediterranean monk seal still occurs. Population growth may lead to increased demand for resources, such as food and energy, while economic development may stimulate increased industrial and commercial activities in the region. These activities can have both positive and negative impacts on the monk seal population.

- **Societal attitudes** refer to the beliefs, values, perceptions, and opinions of individuals, communities, and societies towards the environment and environmental issues. These attitudes can shape the way people interact with the environment, as well as the policies and actions that are taken to manage natural resources. In the context of a DPSIR analysis for the Mediterranean monk seal these societal attitudes can influence the human behavior and decision-making, thus affecting the pressures on the species.

- **Climate change** is a major global phenomenon that is driving changes in the natural environment. In the context of a DPSIR analysis, climate change can be a driver that influences the pressures on the environment, including changes in the composition and structure of ecosystems, loss of biodiversity, and altered ecosystem services. In the case of the Mediterranean Monk seal, climate change can affect the availability of prey, alter the distribution of suitable habitat, and increase the frequency and severity of extreme weather events.

- **Pollution** from different sources, chemical contaminants, acoustic, oil spills and marine litter can affect the health and reproductive success of the species and its prey.

- **Fisheries**, as a generic driver of many of the pressures that will indirectly affect the species through overfishing of the monk seal's prey species, reducing food availability, or directly, by causing deaths through interaction with fishing gear and direct intentional kills due to competition for the same resource.

3.2. PRESSURES

19. Pressures are the human activities that directly and indirectly affect the species and are generated by the driving forces. They change environmental quality and the quantity of natural resources. In the case of Mediterranean monk seals we can distinguish between two broad categories of pressures:

A) Pressures affecting growth and dispersion of the species (in no particular order):

- Prey depletion
- Vulnerability to Climate Change
- Coastal Development referred to all human activities and interventions along coastlines, including the construction of buildings, infrastructure, and other facilities for residential, commercial, and industrial purposes.

- Habitat loss and degradation due to both coastal development and human disturbance, and also coastal erosion, which can reduce the availability of suitable breeding and resting sites for the species.
- Tourism can exert various pressures on the Mediterranean monk seal, such as habitat destruction, disturbance and pollution. Tourism activities can disrupt the natural habitat of the species and its behaviour which can lead to affect distribution, reduce reproductive success and lastly also increase mortality.

B**) Pressures that cause monk seal mortality** (in no particular order):

- Exposure to pollution
- Bycatch
- Intentional Killings

3.3.STATE

20. "STATE" referred to the current condition or status of the monk seal population and its habitat in the Mediterranean region. This includes aspects such as the population size and distribution, the health and reproductive success of individuals, and the availability and quality of suitable habitat.
21. The STATE component is important because it provides a baseline understanding of the current situation, which can then be used to assess the impacts of various drivers and pressures on the monk seal population and its habitat. By tracking changes in the state over time, conservation efforts can be evaluated and adjusted as needed to ensure the long-term survival of the species.
22. For Monk seals, the relevant states are the combination of the physical, chemical and biological conditions. For Monk seals, the relevant states include:

    1. Status of monk seal key habitat
    2. Status of the monk seal populations

23. The Mediterranean monk seal is negatively impacted by all of the eight pressures listed above.

3.4.IMPACTS

24. Impacts are the consequences of the pressures on the species. In the framework of a DPSIR for Mediterranean monk seals impacts have been listed as:
    - Reduced reproductive success
    - Lower genetic diversity
    - Increased mortality
    - Distribution below historical range
    - Decreased resilience to environmental and anthropogenic changes.
25. These impacts can lead to the continued decline and may contribute to the worsening of the species status.

3.5.RESPONSES

26. Responses are the actions taken when facing impacts and have effects at all levels in the DPSIR framework. Responses are grouped in three different topics, **Research activities, Conservation measures and Management and law enforcement**:
27. Research:

- Distribution
- Abundance
- Pup production
- Movements
- Foraging areas

28. Conservation Measures:
    - Protect critical pupping habitat
    - Regulate human activities
    - Improvement of surveillance
    - Habitat restoration

29. Management and Law Enforcement:
    - Regulation of Fishing activities
    - Public education and awareness
    - Management of tourism
    - Reduce anthropogenic mortality

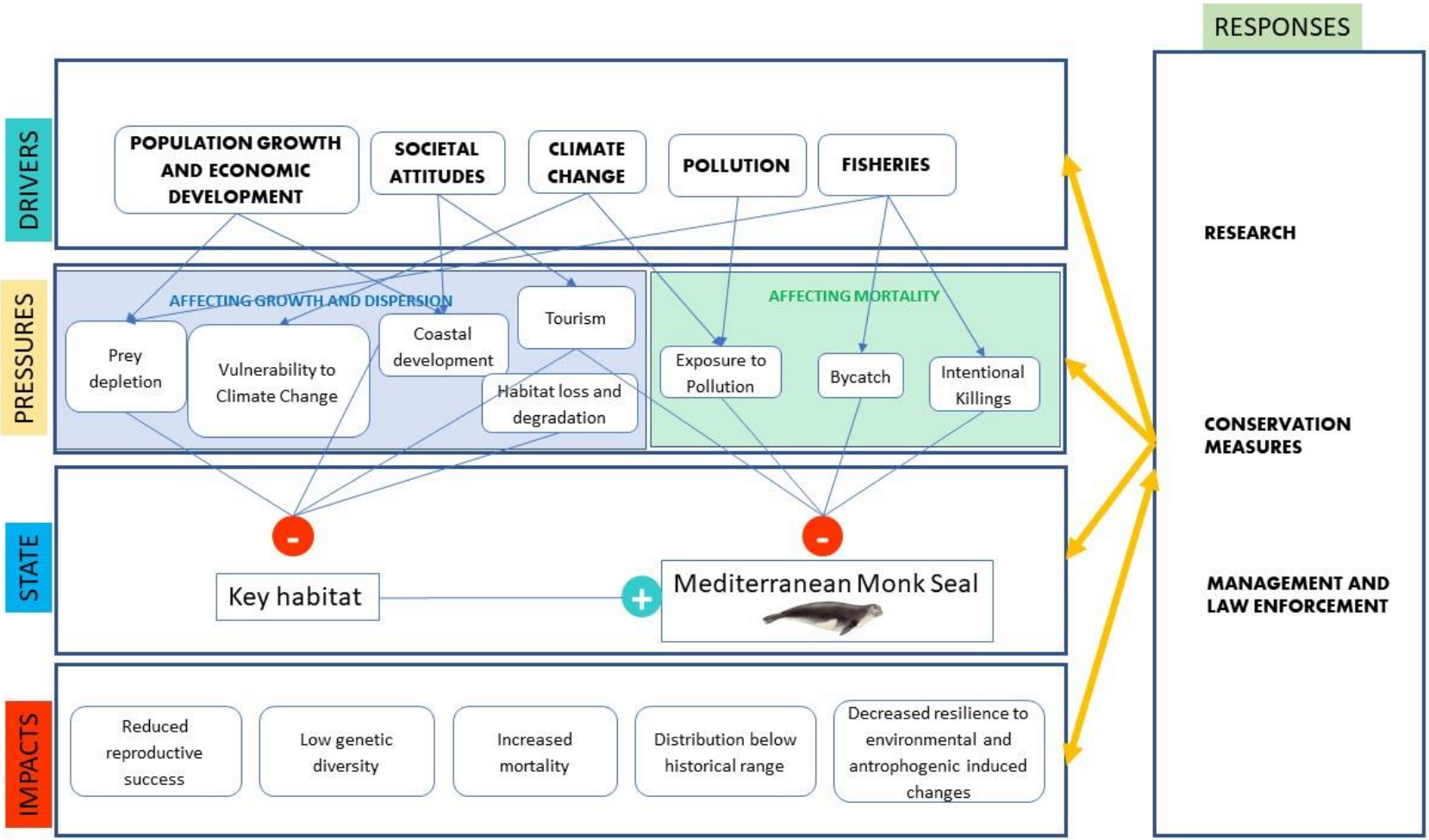

Figure 1 : Schematic diagram of the relationships among drivers, activities, pressures, state, impacts and responses for Monachus monachus populations in the Mediterranean.

4. Good environmental status (GES)

30. The main problem encountered in envisaging a region-wide Strategy derives from the quite diverse conservation status of monk seals in the different portion of the Mediterranean and by consequence the quite different priorities and responsibilities saddled onto the various monk seal Range States.
31. When developing an updated *regional strategy for the conservation of monk seal in the Mediterranean* (Decision IG.24/7) this challenge was tackled by assigning Mediterranean countries to three groups. Consequently, the following criteria has been also followed for this assessment taking under consideration the information provided by regional experts.
    - "Group A" countries, where monk seal breeding has been reported after year 2010.
    - "Group B" countries, where no monk seal breeding is reported, but with repeated sightings of monk seals (>3) were reported since 2010.
    - "Group C" countries, where no monk seal breeding is reported, and where very rare or no sightings of monk seals (≤3) were reported since 2010.

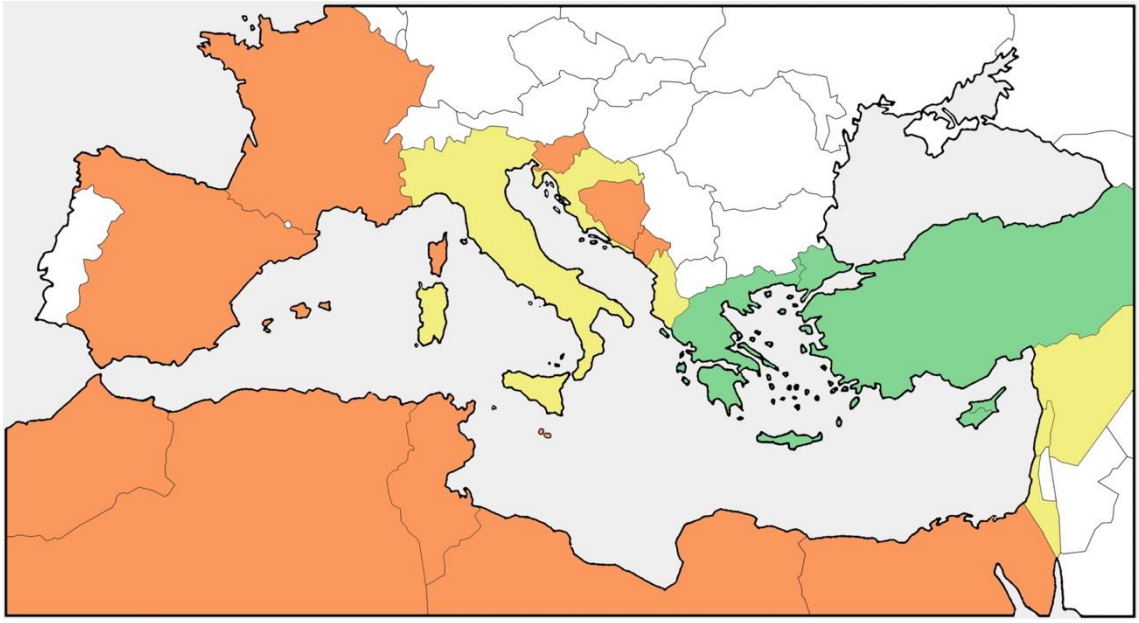

Figure 2 : Monk seal conservation status by country, adopted from updated Regional strategy for the conservation of monk seal in the Mediterranean (2019). Green: "Group A" countries; yellow: "Group B" countries; tan: "Group C" countries.

Note: Syria has been moved to Group B based on feedback produced by regional experts.

32. Based on this Countries' classification and on the DPSIR Pressures (see above) the following table applying a traffic light system was produced to facilitate the GES assessment for the related CIs.

    - Green = GES achieved.
    - Orange = GES Unsure
    - Red = GES not achieved

Table 1 : Traffic light system applied to countries and their classification on the DPSIR Pressures and their GES

SUB REGIONS	COUNTRY *	DPSIR - Pressures							
		Prey depletion	Vulnerability to Climate	Coastal development	Tourism	Habitat loss and degradation	Exposure to pollution	Bycatch	Intentional killings
WESTERN MEDITERRANEAN SEA	Spain								
	France								
	Italy								
	Morocco								
	Algeria								
ADRIATIC SEA	Italy								
	Slovenia								
	Croatia								
	Montenegro								
	Albania								
CENTRAL AND IONIAN SEA	Albania								
	Italy								
	Malta								
	Tunisia								
	Libya								
	Greece								
AEGEAN AND LEVANTINE SEAS	Greece								
	Turkey								
	Syria								
	Lebanon								
	Cyprus								
	Israel								
	Egypt								

* Group C Countries (no seals reported) were not considered

4.1. GES assessment for CI3 (Distribution)

Table 2 : GES assessment for CI3 (Distribution)

SUB REGIONS	SUB DIVISIONS	COUNTRY
WESTERN MEDITERRANEAN SEA	NWMS	Spain
		France
		Italy
	ALBS	Spain
		Morocco
		Algeria

	TYRS	France
		Italy
ADRIATIC SEA	NADR	Italy
		Slovenia
	MADR	Italy
		Croatia
	SADR	Italy
		Montenegro
		Albania
CENTRAL AND IONIAN SEA	CEN	Malta
		Tunisia
		Lybia
	IONS	Albania
		Greece
		Italy
AEGEAN AND LEVANTINE SEAS	AEGS	Greece
		Turkey
	LEVS	Greece
		Turkey
		Syria
		Lebanon
		Cyprus
		Israel
		Egypt

4.2. GES assessment for CI4 (Population abundance)

Table 3 : GES assessment for CI4 (Population abundance)

SUB REGIONS	SUB DIVISIONS	COUNTRY
WESTERN MEDITERRANEAN SEA	NWMS	Spain
		France
		Italy
	ALBS	Spain
		Morocco
		Algeria
	TYRS	France
		Italy
ADRIATIC SEA	NADR	Italy
		Slovenia
	MADR	Italy
		Croatia
	SADR	Italy
		Montenegro
		Albania
CENTRAL AND IONIAN SEA	CEN	Malta
		Tunisia
		Lybia
	IONS	Albania
		Greece
		Italy
	AEGS	Greece

AEGEAN AND LEVANTINE SEAS		Turkey
	LEVS	Greece
		Turkey
		Syria
		Lebanon
		Cyprus
		Israel
		Egypt

4.3. GES assessment for CI5 (Population demographic characteristics)

33. Various types of data need to be gathered to enable accurate description of Mediterranean monk seal population demographics. Key demographic data and survivorship are logistically difficult to determine, requiring access to the seals in remote locations and long-term uninterrupted monitoring to build individual historical series. Consequently, these data have not been systematically gathered and reported across the region, which led the authors of the present report to propose it GES unsure for “Group A” countries.

Table 4 : GES assessment for CI5 (Population demographic characteristics)

SUB REGIONS	SUB-DIVISIONS	COUNTRY
WESTERN MEDITERRANEAN SEA	NWMS	Spain
		France
		Italy
	ALBS	Spain
		Morocco
		Algeria
	TYRS	France
		Italy
ADRIATIC SEA	NADR	Italy
		Slovenia
	MADR	Italy
		Croatia
	SADR	Italy
		Montenegro
		Albania
CENTRAL AND IONIAN SEA	CEN	Malta
		Tunisia
		Lybia
	IONS	Albania
		Greece
		Italy
AEGEAN AND LEVANTINE SEAS	AEGS	Greece
		Turkey
	LEVS	Greece
		Turkey
		Syria
		Lebanon
		Cyprus
		Israel
		Egypt

5. Key findings for CI

34. Med QSR 2017 identified key knowledge gaps needed to be further addressed towards achieving GES.

5.1. CI3-distributional range and 2023 data gaps

35. The Med QSR 2017 targeted marine mammals in general, therefore not focusing specifically on the Mediterranean monk seal. However, most of the key findings and knowledge gaps could be fully attributed to this species. In this sense, the most important knowledge gaps stemmed from the disparity in the global distribution of research effort, with more effort having been made and being made in northern Mediterranean countries, while in some southern Mediterranean countries information on occurrence and distribution came primarily from anecdotal data and very localised research projects. The resulting knowledge gap compromised the identification of protection measures aimed at the conservation of the species on local and regional scales. Accordingly, more sampling and monitoring effort was identified as a basic requirement in the least monitored areas. Since then, a new initiative, the Monk Seal Alliance (MSA), consisting of a consortium of like-minded foundations optimising resources to trigger collaborative conservation and rehabilitation of the Mediterranean monk seal, has committed significant funds to support new research initiatives. Among them, for instance, the Med-Monk seal Project: Enhancing knowledge and awareness on monk seal in the Mediterranean, located in, Algeria, Egypt, Italy, Lebanon, Libya, Morocco, Syria, Tunisia and led by Specially Protected Areas Regional Activity Centre (SPA/RAC), aims at filling the gap of knowledge on the occurrence in these countries categorized as low density countries in relation to the presence of the monk seal and where no breeding episodes have been reported. In this regard, new initiatives, and current monitoring efforts (see Annex 1) should be yielding valuable information in the early future.

5.2. CI4-Abundance and 2023 data gaps

36. In reference to this CI, the MedQSR2017 focused mainly on knowledge gaps of cetacean species, highlighting the need to provide abundance and density estimates through synoptic levels and to implement the conservation priorities listed by the European directives and the Ecosystem Approach. For the Mediterranean monk seal there are no density or abundance estimates, and although there is restrictive and specific legislation for the conservation of the species, both in European directives and in regional and national strategies, implementation of these laws is not yet widespread. In this sense, one of the knowledge gaps cited in the MedQSR2017, the lack of baseline critical information is therefore detrimental to conservation and especially in the assessment of trends. Currently it seems that the species is expanding its range with new monitoring initiatives being developed in countries such as Italy, Croatia, Albania, Montenegro and Israel. However, the lack of a baseline estimate makes difficult to validate this (likely) expansion.

5.3. CI5-Demographic characteristics and 2023 data gaps

37. The need for a systematic monitoring programme over time to establish time series is necessary to determine the basic demographic parameters of the species.

38. Counts of pups seem to have been established as a valid measure of the annual production of the species, on the one hand, and, on the other, by means of different pup multiplier ratios to determine the gross number of adults. However, although pups could be efficiently monitored (and sexed) before their first moult, after this event the monitoring of youngsters results very difficult. This being the case, as indicated in MedQSR 2017, continuous monitoring programmes by means of photo-identification and repeated at regular intervals should be established, since it is the most accurate, and non-invasive way to establish the life story of individual monk seals.

6. Measures and actions required to achieve GES

39. As presented in sections 4 and 5, for CI3-distribution, GES has not been achieved for all Group B countries, while it has been achieved by Group A countries except for Cyprus. Therefore, actions dedicated to facilitating the widespread distribution of the species in all Group B countries and Cyprus should be a priority. Such actions should include not only the set-up of a good monitoring network but also the protection of key habitats for the species and the reduction of any potential threats (e.g.., intentional killings, tourism disturbance).
40. When looking at Mediterranean monk seal population abundance (CI4), the lack of a baseline estimates makes difficult to validate the (likely) expansion of the species reported in recent years. Based on the reported information by regional experts, it seems that most (rough) population estimates come mainly from the minimum photo-identified individuals. However, a new approach by MOm (Greece) using pup-multipliers method may be taken as a new way forward for reliable abundance estimates. A common strategy for producing population estimates should be agreed on to be able to compare information among researchers.
41. It must be pointed out that monk seal photo-identification is a widespread practice across the region; therefore, the creation and implementation of a data-sharing platform would offer great potential to establish reliably information on movements and home range establishment. Such initiative is currently in the portfolio of actions to be supported by the Monk Seal Alliance.
42. Data reported by regional experts manifests the difficulty to study the population demographic characteristics (CI5). Since key demographic data and survivorship are logistically difficult to determine, new actions should focus on providing opportunities for long-term uninterrupted monitoring to allow building individual historical series, key to assess basic demographic trends. New technologies, combined with the long-term regular use of more traditional methods (e.g., individual tags and photo-identification) may shed light on these aspects.
43. As presented in the newly drafted Mediterranean monk seal DPSIR framework, the following measures and actions should be taken in order to achieve GES for the species.

Research Actions aimed at responding the following questions:

- Distribution
- Abundance
- Pup production
- Movements
- Foraging areas

Conservation Measures:

- Protect critical pupping habitat
- Regulate human activities
- Improvement of surveillance
- Habitat restoration

Management and Law Enforcement measures:

- Regulation of Fishing activities
- Public education and awareness
- Management of tourism
- Reduce anthropogenic mortality

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Annex I

NOTES on C3, C4 & C5 Survey results (as reported by data providers)

• Common Indicator 3: Species distributional range
• Common Indicator 4: Population abundance of selected species
• Common indicator 5: Population demographic characteristics

Survey Activities:
1= Assessment of potential monk seal caves
2 = Surveys to verify monk seal traces/collect samples
3 = Survey to install/recover camera traps
4 = Coastal waters boat surveys to verify monk seal presence/absence
5 = Other

Survey Inspection:
1 = Direct visit to historical/known caves;
2 = Visual inspection from boat followed by swimming inspection of observed aerial openings;
3 = Inspection of coast by swimming followed by entrance of aerial openings or underwater ones through free breath dives;
4 = Inspection of submerged cave entrances through free breath/scuba diving entrance into caves;
5 = Boat surveys and observations from shore;

Subregions
MWE = Western Mediterranean Sea
MAD = Adriatic Sea
MIC = Central and Ionian Seas
MAL = Aegean and Levantine Seas

Country	**Subregion**	**Indicator**	**Survey Activities**	**Survey Inspection**	**Notes**
Albania	MAD	C3 Dist.	1, 2, 3	1, 2, 3, 4	At Karaburun-Sazan MPA; monitoring since 2019; one survey every two months; 10 monk seal reports from third parties (85% by fishers)
Albania	MAD	C4 Abun.			Since 2020; 2 monk seals (minimum n. photoidentified individuals)
Albania	MAD	C5 Demo.			No Data
Albania	MAD	C3 Dist.	1, 2, 3, 4	1, 2, 3, 4	At Karaburun-Sazan MPA; between 2018-2020, 24 sightings reports (no evaluation of the origin of the reports)
Albania	MAD	C4 Abun.			*No resident population and only occasional sightings* (based on analysis of literature,

Country	Subregion	Indicator	Survey Activities	Survey Inspection	Notes
					citizen science and infrared cameras)
Albania	MAD	C5 Demo.			No Data
Albania	MAD-MIC	C3 Dist.	1, 2, 3, 4	1, 2, 3, 4, 5	Since 2018, monitoring of coastline and marine caves from Velipoja to Cape of Stillo, questionnaires to fishers. 27 sightings reported (70% by fishers, 20% tour boats; 10% tourism sector)
Albania	MAD-MIC	C4 Abun.			Since 2019, 3 monk seals photoidentified
Albania	MAD-MIC	C5 Demo.			No Data
Greece	MIC	C3 Dist.	3	1, 2, 3, 4, 5	Monitoring in the Central Ionian Sea since 1985; 500+ reports by third parties (no evaluation of the origin of the reports)
Greece	MIC	C4 Abun.			Since 2018; 40-45 monk seals (minimum n. photoidentified individuals and M-R)
Greece	MIC	C5 Demo.			In 2022; At least 4 mature females, 8 adult males, around 10 subadults and 11 pups. No evaluation of birth rates because the total number of mature females is unknown.
Greece	MIC-MAL	C3 Dist.	1, 2, 3, 4, 5 (acoustic monitoring)	1, 2, 3, 4, 5	Since 1990, year-round monitoring effort. From 2000, 4,039 reports (Adamantopoulou et al. 2022)
Greece	MIC-MAL	C4 Abun.			Greek population estimate, in 2022, of 338-450 individuals based on pup multipliers method.
Greece	MIC-MAL	C5 Demo.			The total number of mature animals (i.e., male and female, as per IUCN definition) has been estimated at 188-

Country	Subregion	Indicator	Survey Activities	Survey Inspection	Notes
					263; no number available for sub-adults; 75 pups.
Croatia	MAD	C3 Dist.			Istria; about 130 reports collected through citizen science and direct observation between 2010-14
Croatia	MAD	C4 Abun.			*No resident population and only occasional sightings* (based on analysis of literature, citizen science and direct observations)
Croatia	MAD	C5 Demo.			No Data
Croatia	MAD	C3 Dist.			Since 2005, assessment of potential seal caves and citizen science/ social media. About 70 seal reports; most of them through citizen science.
Croatia	MAD	C4 Abun.			*No resident population and only visiting animals*
Croatia	MAD	C5 Demo.			*One mature female visiting*
Croatia	MAD	C3 Dist.	1	1, 2, 3, 4	Since 2020, two confirmed reports
Croatia	MAD	C4 Abun.			*There is no established population in the area for now, but only occasional sightings.*
Croatia	MAD	C5 Demo.			No Data
Italy	MAD	C3 Dist.	1, 2, 3, 4	1, 2, 3, 4	Salento (Puglia); 2018-2010 (visual inspections and camera traps); 2000-2023 about 20 monk seal report mostly through social media
Italy	MAD	C4 Abun.			*No resident population and only occasional sightings* (based on analysis of literature, citizen science and fishers' interviews)
Italy	MAD	C5 Demo.			No Data
Cyprus	MAL	C3 Dist.	1, 2, 3, 4	1, 2, 3, 4, 5	Since 2010, visual inspections and camera

Country	Subregion	Indicator	Survey Activities	Survey Inspection	Notes
					traps. Collection of data from third parties since 1999 resulting is aprox. 400 reports
Cyprus	MAL	C4 Abun.			Since 2010, 18-20 seals (minimum photoidentified)
Cyprus	MAL	C5 Demo.			In 2023, estimated 8 mature females, 1 mature male, 9 subadults and 2 pups. Birth rate 0.25; mortality rate 0.95
Montenegro	MAD	C3 Dist.	1	1, 3	Cave monitoring conducted between 2019-22; 2 seal reports confirmed through footage provided by underwater fisher
Montenegro	MAD	C4 Abun.			*No resident population and only occasional sightings* (based on analysis of literature, citizen science
Montenegro	MAD	C5 Demo.			No Data
Israel	MAL	C3 Dist.	1, 3, 4, 5	1, 2, 5	Since 2015, year-round monitoring (including camera traps). Since 2009, 98 reports by third parties (26% - coastal structures crew; 25% - recreational boaters, 22% - fishers, 14% - locals; 9% - Israeli navy, 3% - researchers)
Israel	MAL	C4 Abun.			Since 2009; 2 monk seals (minimum n. photoidentified individuals); random sightings with no permanent residents
Israel	MAL	C5 Demo.			One of them considered as a mature female
Syria	MAL	C3 Dist.	1, 4, 5 (fishers)	5	Since 2002, 9 confirmed monk seal reports (most of them by fishers and local people)

Country	Subregion	Indicator	Survey Activities	Survey Inspection	Notes
Syria	MAL	C4 Abun.			Unknown population size, 22 sightings
Syria	MAL	C5 Demo.			No reliable data
Turkey	MAL	C3 Dist.	1, 2, 3	2	Between 2015-2016; 92 sightings reported in Foca; in 2017, 11 sightings reported by fishers in Candarli Bay.
Turkey	MAL	C4 Abun.			Between 2012-2022, 120 adults estimated (minimum n. photoidentified individuals and M-R) for all Turkish coasts.
Turkey	MAL	C5 Demo.			Under analysis
Turkey	MAL	C3 Dist.	1, 2, 3, 4	1, 2, 3, 4, 5	Since 1987, monitoring through visual inspections of caves and camera traps. Since 1987, 2600+ monk seal reports (Fishers - 20%; Tour boats- 20%; recreational boaters- 30%; Other- 30%)
Turkey	MAL	C4 Abun.			No Data
Turkey	MAL	C5 Demo.			No Data
Libya	MIC	C3 Dist.	1, 2, 3, 5 (interviews to local community)	1, 2, 3, 4, 5	In 2008 camera traps and cave surveys
Libya	MIC	C4 Abun.			No Data
Libya	MIC	C5 Demo.			No Data