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Back-to-back Meeting of the Ecosystem Approach Correspondence Groups on Monitoring (CORMON) Biodiversity and Fisheries and Economic and Social Analysis (COR ESA)

Videoconference, 10 -11 June 2026

Agenda Item 3: Updated Guidance Factsheets for biodiversity (EO1)

3.5. Marine mammals - Monk Seal (Common Indicator 3 – species distributional range, Common Indicator 4 – species population abundance and Common Indicator 5: population demographic characteristics)

Draft updated IMAP Common Indicator 3, 4 and 5 factsheets related to monk seals

For environmental and cost-saving reasons, this document is printed in a limited number. Delegates are kindly requested to bring their copies to meetings and not to request additional copies.

SPA/RAC
Tunis, 2026

Note by the Secretariat

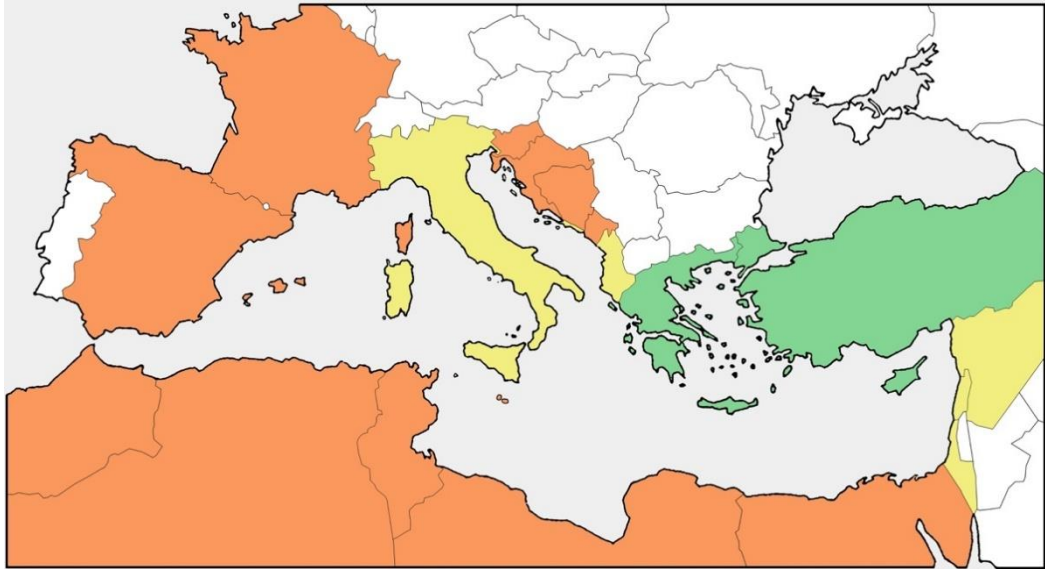
1. In 2008, the Contracting Parties to the Barcelona Convention, through COP 15 Decision IG.17/6, committed to progressively applying the Ecosystem Approach (EcAp) to the management of human activities affecting the Mediterranean marine and coastal environment. This approach aims to promote sustainable development and achieve Good Environmental Status (GES) of the Mediterranean Sea and its coasts.
2. A key component of the Ecosystem Approach is the monitoring and assessment of the marine and coastal environment. To support a coherent regional implementation framework, the Contracting Parties adopted the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) through COP 19 Decision IG.22/7 in 2016. IMAP includes 23 Common Indicators, primarily focusing on state and impact indicators.
3. To support harmonized and consistent monitoring across the Mediterranean region, Guidance Factsheets were developed for each IMAP Common Indicator. These factsheets define common monitoring and assessment approaches and serve as key technical references for Contracting Parties in the development, revision, and implementation of their national monitoring programmes. Their overall objective is to strengthen the implementation of the Ecosystem Approach and support the achievement of Good Environmental Status (GES).
4. The first version of the Guidance Factsheets was reviewed by the Meeting of the Correspondence Group on Monitoring (CORMON) on Biodiversity and Non-Indigenous Species (Madrid, Spain, 28 February–1 March 2017) and by the Meeting of the SPA/DB National Focal Points (Alexandria, Egypt, 9–12 May 2017). The outcomes of these reviews were reflected in document UNEP(DEPI)/MED WG.444/6/Rev.1 presented at the 6th Meeting of the Ecosystem Approach Coordination Group (Athens, Greece, 11 September 2017).
5. Building on the experience gained through national IMAP implementation and the findings of the 2023 Mediterranean Quality Status Report (MED QSR), the Contracting Parties initiated the revision of the Ecosystem Approach (EcAp) policy and the update of IMAP, in line with the mandate provided at COP 23. This process aims to strengthen monitoring and assessment capacities, improve data quality, and ensure more robust and reliable regional assessments.
6. As outlined in the SPA/RAC work programme, the update of the IMAP Common Indicator Guidance Factsheets is scheduled to be carried out during the 2024–2025 and 2026–2027 biennia. SPA/RAC is updating the Guidance Factsheets of the IMAP Common Indicators for Ecological Objective 1 (EO1: Biodiversity), in close consultation with the Biodiversity Online Working Group (OWG), with the objectives to:
 - i. incorporate climate change considerations into the updated Guidance Factsheets. As one of the most significant threats to biodiversity in the Mediterranean Sea, climate change requires further clarification within the Guidance Factsheets and GES definitions. Climate change impacts should be integrated into existing indicators and methodologies, particularly in the establishment of baseline and threshold values;
 - ii. take into consideration the development of Monitoring and Assessment Scales, Assessment Criteria, Thresholds, and Baseline Values for IMAP Common Indicators 3 (Species distributional range), 4 (Population abundance), and 5 (Population demographic characteristics) related to cetaceans ; and iii) integrate the latest scientific knowledge and methodological developments in marine biodiversity research, ecological monitoring, and climate change impacts to support more accurate assessments and effective conservation measures.
7. In this context, SPA/RAC has prepared the draft updated IMAP Common Indicator 3, 4 and 5 Factsheets related to Monk seal, with a view to supporting the Contracting Parties in updating their national IMAP monitoring programmes and facilitating data collection and assessment for the third IMAP assessment cycle.

8. This proposal was developed with the support of the Monk seal expert group of IUCN Med. The Meeting is expected to review the document and provide guidance with a view to its submission to the SPA/DB Focal Points Meeting (scheduled for May 2027) and the EcAp Coordination Group Meeting (scheduled for September 2027).

1. Common Indicator 3: Species Distributional Range

Indicator Title	Species Distributional Range (Mediterranean monk seal)	
Relevant GES definition	Related Operational Objective	Proposed Target(s)
The monk seal is present along the Mediterranean coasts with suitable habitats for the species.	Species distribution is stable or expanding, including recolonization of areas with adequate breeding and resting habitat.	The distribution of Mediterranean monk seals remains stable or expanding. The species, in favourable status of conservation, can recolonise areas offering suitable habitats.
Rationale		
<p>Common Indicator 3 measures the species’ distributional range within the Mediterranean basin, in relation to suitable habitats. Shifts in distribution may reflect changes in the occurrence of suitable habitats, availability of food resources, selective pressures from human-related activities, as well as climate change. The species’ range and extent of geographical distribution together with detailed information on the location of breeding/feeding areas, provides crucial information for management purposes.</p> <p>The Mediterranean monk seal (<i>Monachus monachus</i>), hereafter referred as monk seal is the only resident pinniped species in the Mediterranean Sea. Once widely and continuously distributed across the Mediterranean, the species occurs regularly in the eastern basin, mainly along the coasts of Greece, Türkiye and Cyprus. The largest reproductive areas are found in islands of the Ionian and Aegean Seas, and along the coasts of mainland Greece, Türkiye and Cyprus (Beton et al., 2021; Karamanlidis et al.,2023). There are recent indications of geographic recolonization indicating that seals might be frequenting areas within their historical range where they had been extirpated in previous decades (Bundone et al., 2019). The evidence of expansion in their distribution range and increase in numbers, should not be interpreted as an effective reestablishment of the species in a given area unless there are clear and confirmed signs of successful reproduction, which should then be diligently followed by targeted monitoring actions and protection measures in these sites. Although, during the last decade, the Mediterranean monk seal seems to be recovering throughout the largest part of their range, because of its small global population, it should still be considered one of the most endangered pinniped species in the world (Karamanlidis, 2024).</p> <p>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, 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 (Dendrinis et al. 2007). Nevertheless, in recent years observations of Mediterranean monk seals and their pups on open beaches in Greece are increasingly reported (Dendrinis et al., 2022), mostly coinciding with quiet months outside the tourist season (Gonzalvo et al., 2026).</p> <p>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 of the Barcelona Convention Protocol on Specially Protected Areas and Biological diversity in the Mediterranean, 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.</p> <p>In 1988, the Contracting Parties to the Barcelona Convention adopted an Action Plan for the management of the Monk Seal (AP). This was followed by the adoption of a “Regional strategy for the conservation of Mediterranean monk seal (2014-2019)” (RS) in 2013, which was updated in 2019 resulting on the RS (2020-2025), and most recently, during the 24th Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols, held in Cairo (Egypt), in December 2025, the second RS update was adopted (Annex 3 in UNEP/MED IG.27/L.2/Add.8).</p>		

Indicator Title	Species Distributional Range (Mediterranean monk seal)
Scientific References	
<p>Beton D, Broderick AC, Godley BJ, Kolaç E, Ok M, Snape RTE. 2021. New monitoring confirms regular breeding of the Mediterranean monk seal in Northern Cyprus. <i>Oryx</i>. 55(4):522-525. doi:10.1017/S0030605320000848</p> <p>Bundone L, Panou A, Molinaroli E. 2019. On sightings of (vagrant?) monk seals, <i>Monachus monachus</i>, in the Mediterranean Basin and their importance for the conservation of the species. <i>Aquatic Conserv: Mar Freshw Ecosyst</i> 29: 554–563</p> <p>Dendrinos P, Karamanlidis AA, Kotomatas S, Legakis A, Tounta E, Matthiopoulos J. 2007. Pupping habitat use in the Mediterranean monk seal: a long-term study. <i>Mar Mamm Sci</i> 23: 615–628</p> <p>González LM. 2015. Prehistoric and historic distributions of the critically endangered Mediterranean monk seal (<i>Monachus monachus</i>) in the eastern Atlantic. <i>Mar Mamm Sci</i> 31: 1168–1192</p> <p>Gonzalvo, J., Guinand, A., Pfyffer, J., Georges, C., Andres-Hervias, C., Gazo, M., 2026. Sealed Serenity: Use of Underwater Bubble Caves as Refuge against Disturbance by Mediterranean Monk Seals. <i>Oryx</i>. https://doi.org/10.1017/S0030605325102718</p> <p>Johnson WM, Lavigne DM. 1999. Mass tourism and the Mediterranean monk seal. The role of mass tourism in the decline and possible future extinction of Europe’s most endangered marine mammal, <i>Monachus monachus</i>. <i>The Monachus Guardian</i> 2: 62–81</p> <p>Karamanlidis, A. 2024. Current status, biology, threats and conservation priorities of the vulnerable Mediterranean monk seal. <i>Endangered Species Research</i>, 53, 341–361.</p> <p>Karamanlidis AA, Dendrinos P, Fernandez de Larrinoa P, Kıraç CO, Nicolaou H, Pires R. 2023. <i>Monachus monachus</i>. <i>The IUCN Red List of Threatened Species 2023</i>: e.T13653A238637039. https://dx.doi.org/10.2305/IUCN.UK.2023-1.RLTS.T13653A238637039.en.</p>	
Indicator analysis methods	
<p>Indicator Definition This indicator measures the species’ distributional range within the Mediterranean basin, in relation to suitable habitats.</p>	
<p>Methodology for indicator calculation The range of a given species is commonly represented by a distribution map. The main outputs of the monitoring under this common indicator will be therefore maps of species presence, distribution and occurrence, as well as habitat availability maps (i.e., mapping of occupied vs potentially suitable habitats).</p> <p>Monitoring this species is particularly challenging due to its low abundance, broad historical distribution, sensitivity to disturbance, and use of sea caves for hauling out, breeding and moulting, which restrict the applicability of conventional survey methods (e.g., sea surveys) that may work for other species. Data may be generated from various sources including coastal cave surveys for monk seal pupping and haul out shelters, verified sightings, strandings, acoustic detections, breeding site confirmations, opportunistic reports and historical records, citizen science (e.g., occupancy modelling) and social media reports. Data validation of will be responsibility of data providers. Non-validated data should either not be provided, or provided in a separate data-set to be treated separately applying a conservative approach.</p> <p>The use of Geographical Information Systems (GIS) is required for the compilation of the monitoring data collected at sea and the elaboration of the species distributional range maps. GIS information may be structured in different layers based on the nature of the data: Layer 1 – Confirmed Presence Type: Point or 5×5 km grid cell (recommended grid standardization). Small countries may decide to use smaller scales and use 1x1km grid cell, as considered best, on a case-by-case basis.</p> <p>Attribute fields: Country, Date (YYYY-MM-DD), Observation type (sighting, breeding, haul-out, acoustic, stranding), Verification status (validated / unvalidated), Source (survey, NGO, citizen science, authority), Evidence type (photo, video, expert confirmation, genetic)</p> <p>Layer 2 – Confirmed Breeding Sites Cave / pupping site polygons or points Buffer zone (minimum 200 m terrestrial + adjacent marine buffer where applicable)</p>	

Indicator Title	Species Distributional Range (Mediterranean monk seal)
<p>Attributes: Active / inactive, Years active (range), Monitoring method (camera, direct observation)</p>	
<p>Layer 3 – Potential Suitable Habitat Coastal cave inventory (this is highly sensitive data; it is recommended not to be shared widely or made public. Data to be used exclusively in collaborative research and/or conservation initiatives following a procedure developed ad-hoc to guarantee the responsible management of this information). Low-disturbance rocky shoreline Attributes: Habitat type, human disturbance index (low / moderate / high), protection status (MPA, Natura 2000, none)</p>	
<p>Layer 4 – Historical Distribution Digitized historical records (pre-1990 recommended baseline) Used for contraction/expansion comparison</p>	
<p>The most updated Regional Strategy for the Conservation of monk seal adopted by the Barcelona Convention Contracting Parties in December 2025 (Annex 3 in UNEP/MED IG.27/L.2/Add.8), assigns Mediterranean countries to three major groups according to the typology of observed seal presence in the country (see map below), therefore proposing different type of conservation actions for each country specificity: Group A. Countries where monk seal breeding has been reported after year 2017; Group B. Countries where no monk seal breeding is reported, but where repeated sightings of monk seals (>3) were reported since 2017; Group C. Countries where no monk seal breeding is reported, and where very rare or no sightings of monk seals (≤3) were reported since 2017.</p>	
 <p>The map displays the Mediterranean basin with countries shaded in three colors: orange (Group A), yellow (Group B), and green (Group C). Orange covers most of the western and southern Mediterranean coast, including Spain, France, Italy, Greece, and North Africa. Yellow covers parts of the central and eastern Mediterranean, including Turkey and Cyprus. Green covers the northern coast of the Aegean Sea, including Greece and Turkey.</p>	
<p>Accordingly, Group A countries is where more information is available and action is most urgent since these countries host monk seal resident breeding populations and the majority of the species population. This does not mean that monitoring should be neglected in Group B countries because they contain monk seal critical coastal habitat which is likely to be re-colonised, may constitute new resident breeding nuclei, they can also include monk seal feeding grounds and be part of the home range of the seals breeding in group A countries. Moreover, Group C countries are also important because, although they are characterised by rare monk seal occurrence, they contain historical monk seal critical habitat.</p>	
<p>Indicator units The Integrated Monitoring and Assessment Guidance recommended to use for recording the presence/absence of each species, the standardized 30 x 30 nautical mile grid map produced by</p>	

Indicator Title	Species Distributional Range (Mediterranean monk seal)
<p>FAO/GFCM or the 50 x 50 km grids used by the European Bird Census Council. In the case of the Mediterranean monk seal, a finer scale map can be used, to provide finer information. Alternatively, it is noteworthy that the EU Habitats Directive (92/43/EEC) requires Member States to report on the conservation status of habitats and species every six years under Article 17, using a standardized spatial grid system to map their distribution and range. The primary reference grid for this reporting is the 10x10 km grid based on the ETRS89 Lambert Azimuthal Equal Area (LAEA) projection. For smaller countries or more precise, localized studies, 1x1 km grids are also supported to allow for higher resolution mapping. Member States are encouraged to use these grids for setting up monitoring systems, directly supporting the assessment of favourable conservation status.</p>	
<p>List of Guidance documents and protocols available Quintana Martín Montalvo, B. & Muñoz Cañas, M. (2025). Mediterranean monk seal. A comprehensive set of monitoring and research techniques for the study and conservation of <i>Monachus monachus</i> in the Mediterranean Sea (1st ed.). Gland, Switzerland: IUCN. 89 pp.</p>	
<p>Methodology for monitoring</p>	
<p>Available Methodologies for Monitoring</p> <p>There are two main methods used to study Mediterranean monk seal distribution in land and in water. It is suggested to prioritize non-invasive methods over invasive ones.</p> <p><u>Photo-identification</u> is the technique that allows us to identify animals from images and video based on marks (e.g., scars) in different part of their body. By obtaining images of the same individual taken in different locations we are able to track the overall movements of that individual. In order to do this, it is essential reporting the date and most precise location of any sighting.</p> <p><u>Telemetry data</u> by deploying tags in a seal can provide an insight its daily and/or seasonal movements (depending on the duration of the tag). In addition, it can also provide information on habitat use, behaviour and interactions with anthropogenic activities. Tagging animals with telemetry devices is an invasive and risky procedure that can cause significant stress, and even harm, to the subject of study. Both technical expertise and in-depth knowledge of the species are essential and it should only be carried out by experienced professionals. Those considering implementing this method, if not well-experienced should look for advice and training from experts.</p> <p>Other emerging methods that can studying Mediterranean monk seal distribution include:</p> <p><u>Passive acoustic monitoring</u> to assess Mediterranean monk seal presence and abundance.</p> <p><u>Environmental DNA (eDNA)</u> aiming at evaluating the presence of Mediterranean monk seals in a given area or nearby locations by relying on the DNA remnants left in the environment (i.e., water). It is noteworthy that data collected with this method has to be taken with caution since it does not provide quantitative or qualitative data, and water currents are not always considered. However, it may be a valuable tool for preliminary or initial evaluations of monk seal presence in low density areas.</p> <p><u>Unmanned Aerial Vehicles (UAVs)</u> to assess the presence of monk seals at sea, or in remote not so accessible beaches by remotely surveying a stretch of coast. Aerial footage obtained from these rapidly evolving devices can also be used for behavioural studies and photogrammetry (e.g., obtaining body size). When operating UAVs above monk seals caution is advised in order to minimise the potential disturbance to the animals. UAVs operators must have all required authorizations, adequate training and comply with any regulations that may apply.</p>	
<p>Climate change integration</p> <ul style="list-style-type: none"> • Use of habitat prediction modelling to differentiate natural range variation from climate-driven shifts. • Overlaying at-sea distribution with climate data (to measure indicator species response to e.g. marine heatwaves) • Cross-reference with Candidate Common Indicators 39-43 (e.g. sea level rise, coastal erosion, floods and droughts, changes in sea surface temperature and circulation patterns) to explain habitat loss and range shifts • Cross-reference with indirect impacts of climate change on other Ecological Objectives and Common Indicators influencing seabirds' distributional range (e.g. EO4: Marine Food Webs; CI9 under EO3: Fish stocks) 	

Indicator Title	Species Distributional Range (Mediterranean monk seal)	
<p>Available data sources At the moment there is not any single database platform for Mediterranean monk seal that facilitates data exchange. Research groups have their own datasets and databases. Recent efforts have contributed to an improvement in the communication among different groups operating within the Mediterranean basin. This has led to the exchange of experiences and research protocols. The design and implementation of an on-line platform with contributions from everybody having monk seal photo-identification catalogues and habitat assessment data would greatly facilitate data sharing, comparison and survey follow-up, especially at regional scales or along the same and neighbouring coastlines. A common DNA database (i.e., samples from stranded / dead animals), would be also an important contribution.</p>		
<p>Temporal Scope guidance Monitoring programmes should be conducted, if not possible year-round, focusing primarily on breeding season. Temporal scale is largely affected by the conservation questions and expected outputs. Long-term projects provide robust indications on trends in distribution over time and space is selected areas. The European Union Habitats Directive requires Member States to take action to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora specified as being in need of strict protection (Council Directive 92/43/EEC). Member States are also required to undertake surveillance of these habitats and species and to report every 6 years on whether their conservation status is favourable and on the implementation of measures taken to make it happen.</p>		
<p>Outputs</p>		
<p>Expected assessments outputs Distribution maps, data allowing trend analysis (yearly) <u>Methodologies for reporting</u> Submission of all distribution range data and metadata in a standardized form to the IMAP INFO/RAC System (https://www.info-rac.org/).</p> <p>Gaps of knowledge and uncertainties Fragmented and elusive populations complicate range assessments. Some range states lack recent systematic surveys. Opportunistic sightings may be treated with caution since they may be under-reported and/or lack verification.</p>		
<p>Contacts and version Date</p>		
<p>Key contacts within UNEP for further information</p>		
Version No	Date	Author
V.1	20/07/2016	SPA/RAC
V.2	11/05/2026	SPA/RAC

2. Common Indicator 4: Species Population Abundance

Indicator Title	Species population abundance (Mediterranean monk seal)	
Relevant GES definition	Related Operational Objective	Proposed Target(s) ¹
Population numbers are adequate to achieve and maintain a favourable conservation status; ideally, qualifying to <i>Least Concern</i> Category of IUCN Red List for Threatened species, or with abundance estimates allowing the species to move away from more critical IUCN categories.	Population size is increasing or, at least, maintained.	<p>Monk seal breeding nuclei are effectively protected from deliberate and accidental killings, habitat degradation and human disturbance, so that seal numbers increase and seals are able to disperse to and re-colonise the surrounding areas.</p> <p>Monk seal presence in sites where they are repeatedly seen permanently established, and breeding resumes.</p> <p>Monk seal presence is reported repeatedly in the species' historical habitat and, eventually, breeding resumes in those sites also.</p>
Rationale		
<p>This indicator focuses on Mediterranean monk seal population abundance estimates and assess trends over time within the Mediterranean Basin.</p> <p>Population abundance refers to the total number of individuals in a specified area in a given timeframe, to inform about the growth or decline of a population. The Mediterranean monk seal has teetered on the brink of extinction for about one-half century. After having been classified as Critically Endangered for almost two decades, its status was first reassessed as Endangered on the IUCN's Red List, and most recently as Vulnerable, under Red List Criterion D1, based on the notion that the global number of mature animals for the species is likely 444-600 individuals (Karamanlidis et al. 2023).</p> <p>Population trends can be caused by man-made pressures, as well as natural fluctuations and environmental dynamics and climate changes. The main threats faced by Mediterranean monk seals are (1) habitat loss and degradation that has or is resulting in the occupation of unsuitable habitat and limited prey availability (the latter also caused by overfishing), (2) disturbance caused by tourists entering breeding caves during the reproductive season, as well as seal–boat interactions, (3) interactions with fisheries that result in accidental entanglement or deliberate killings in response to damages to catches and/or fishing gear, (4) unpredictable threats, including cave collapses and mass mortality events, (5) pollution and (6) climate change (Karamanlidis, 2024; Karamanlidis et al. 2023; Mpougas et al., 2019; Gonzalvo et al., 2026). Hence, it is important to produce reliable population abundance estimates through systematic monitoring, at regular intervals, to inform effective conservation and review the efficiency of measures already implemented.</p>		
Scientific References		
<p>Gonzalvo, J., Guinand, A., Pfyffer, J., Georges, C., Andres-Hervias, C., Gazo, M., 2026. Sealed Serenity: Use of Underwater Bubble Caves as Refuge against Disturbance by Mediterranean Monk Seals. Oryx. https://doi.org/10.1017/S0030605325102718</p> <p>Karamanlidis, A. 2024. Current status, biology, threats and conservation priorities of the vulnerable Mediterranean monk seal. <i>Endangered Species Research</i>, 53, 341–361.</p> <p>Karamanlidis AA, Dendrinou P, Fernandez de Larrinoa P, Kiraç CO, Nicolaou H, Pires R. 2023. <i>Monachus monachus</i>. The IUCN Red List of Threatened Species 2023: e.T13653A238637039. https://dx.doi.org/10.2305/IUCN.UK.2023-1.RLTS.T13653A238637039.en.</p>		

¹ Adapted from Goals defined in *updated Regional Strategy for the conservation of monk seal in the Mediterranean* adopted during the 24th Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols, Cairo (Egypt), December 2025 (Annex 3 in UNEP/MED IG.27/L.2/Add.8).

Indicator Title	Species population abundance (Mediterranean monk seal)
<p>Mpougas E, Waggitt JJ, Dendrinou P, Adamantopoulou S, Karamanlidis A. 2019. Mediterranean Monk Seal (<i>Monachus monachus</i>) Behavior at Sea and Interactions with Boat Traffic: Implications for the Conservation of the Species in Greece. <i>Aquat Mamm</i> 45: 419–424</p>	
<p>Indicator analysis methods</p>	
<p>Indicator Definition Assessment of the abundance (total number of individuals) of priority species within a defined area and timeframe. For the Mediterranean monk seal, a species of exceptional conservation concern, it is critical evaluating whether population levels are improving, stable, or declining across its range. Population abundance data directly reflects species recovery or decline in response to management actions (e.g., protected areas, fisheries interactions, human disturbance reduction).</p>	
<p>Methodology for indicator calculation Because Mediterranean monk seals are cryptic, low in number, and distributed patchily, population abundance estimation relies on several species-specific approaches. The choice of the method to estimate population numbers will depend on the context and on existing tools to monitor the monk seal population of a given area. In any case, it is important to include information on captures and recaptures (photo-identification) to establish a population framework for specific time periods, which will help us not only to gain information on population size, but also on relevant demographic data (see CI5 below).</p> <p>The use of Geographical Information Systems (GIS) is required for the compilation of the monitoring data collected and, possibly, for the elaboration of the predictions of species density and abundance, as well as habitat availability models.</p> <p>Survey Design & Data Requirements To generate robust Mediterranean monk seal population estimates, monitoring programmes, ideally, should (1) be systematic and repeated on an annual or multi-year basis, use consistent spatial frames (e.g., 5×5 km coastal grid) and effort documentation, (2) include effort metrics (e.g., km surveyed, hours on observation) to standardize abundance estimates, (3) promote data sharing, harmonization and complementarity of methodologies across range states.</p>	
<p>Indicator units The Integrated Monitoring and Assessment Guidance recommended to use for recording the presence/absence of each species, the standardized 30 x 30 nautical mile grid map produced by FAO/GFCM or the 50 x 50 km grids used by the European Bird Census Council. In the case of the Mediterranean monk seal, a finer scale map can be used, to provide finer information. Alternatively, it is noteworthy that the EU Habitats Directive (92/43/EEC) requires Member States to report on the conservation status of habitats and species every six years under Article 17, using a standardized spatial grid system to map their distribution and range. The primary reference grid for this reporting is the 10x10 km grid based on the ETRS89 Lambert Azimuthal Equal Area (LAEA) projection. For smaller countries or more precise, localized studies, 1x1 km grids are also supported to allow for higher resolution mapping. Member States are encouraged to use these grids for setting up monitoring systems, directly supporting the assessment of favourable conservation status.</p>	
<p>List of Guidance documents and protocols available Quintana Martín Montalvo, B. & Muñoz Cañas, M. (2025). Mediterranean monk seal. A comprehensive set of monitoring and research techniques for the study and conservation of <i>Monachus monachus</i> in the Mediterranean Sea (1st ed.). Gland, Switzerland: IUCN. 89 pp.</p>	
<p>Methodology for monitoring</p>	
<p>Available Methodologies for Monitoring and Monitoring Protocols</p> <p>Efforts for cave and/or beach monitoring through non-invasive methodologies should be maximised coinciding with the breeding period.</p> <p><u>Photo-identification and related catalogues</u> can be used to estimate the minimum reliable number of identified seals in a given population using capture/recapture studies, count the number of seals within a catalogue. Data on survival rates will have to be considered before adding individuals to the population estimates.</p>	

Indicator Title	Species population abundance (Mediterranean monk seal)
<p>It is encouraged to use adults for population estimates, while using numbers of juveniles and pups with caution.</p> <p>Opportunistic sightings of Mediterranean monk seals can also provide useful information. However, a few considerations have to be made:</p> <ul style="list-style-type: none"> - They can provide useful information on presence, distribution, and breeding activity (if pups have been observed) Yet, such records alone are insufficient to assess population size or dynamics. - When photographs enable individual identification, they can contribute to already existing photo-ID catalogues. - Images including multiple seals can confirm presence and provide approximate counts at a given place and time, even without identifying individuals. Although these data cannot be used to estimate total population size, they can still contribute to decide and implement timely conservation actions. <p>For well-studied populations in which individuals are identified the possibility to monitor the number of births and offspring survival to first moult on a yearly basis, allows to implement a method used in recent study by Karamanlidis (2024), who produced a <u>population estimate by extrapolating the number of adults in a given population from the number of pups.</u></p> <p>Climate change integration</p> <ul style="list-style-type: none"> • Use of habitat prediction modelling to differentiate natural range variation from climate-driven shifts. • Overlaying at-sea distribution with climate data (to measure indicator species response to e.g. marine heatwaves) • Cross-reference with Candidate Common Indicators 39-43 (e.g. sea level rise, coastal erosion, floods and droughts, changes in sea surface temperature and circulation patterns) to explain habitat loss and range shifts • Cross-reference with indirect impacts of climate change on other Ecological Objectives and Common Indicators influencing seabirds' distributional range (e.g. EO4: Marine Food Webs; CI9 under EO3: Fish stocks) 	
<p>Available data sources</p> <p>At the moment there is not any single database platform for Mediterranean monk seal that facilitates data exchange. Research groups have their own datasets and databases. Recent efforts have contributed to an improvement in the communication among different groups operating within the Mediterranean basin. This has led to the exchange of experiences and research protocols. The design and implementation of an on-line platform with contributions from everybody having monk seal photo-identification catalogues and habitat assessment data would greatly facilitate data sharing, comparison and survey follow-up, especially at regional scales or along the same and neighbouring coastlines.</p>	
<p>Temporal Scope guidance</p> <p>Estimates of density of abundance relate to a specific time and area and may vary on annual or seasonal basis. Ideally, seasonal monitoring programmes should be conducted, especially during the late summer-fall (coinciding with peak breeding period).</p> <p>Long-term projects provide robust indications on trends over time and space in selected areas and are important project for photo-identification programmes.</p> <p>Monitoring programmes should be conducted focusing on breeding and moulting seasons. Temporal scale is largely affected by the conservation questions and expected outputs. Long-term projects provide robust indications on trends in distribution over time and space in selected areas. The European Union Habitats Directive requires Member States to take action to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora specified as being in need of strict protection (Council Directive 92/43/EEC). Member States are also required to undertake surveillance of these habitats and species and to report every 6 years on whether their conservation status is favourable and on the implementation of measures taken to make it happen.</p>	
<p>Outputs</p>	

Indicator Title	Species population abundance (Mediterranean monk seal)	
<p>Expected assessments outputs</p> <ul style="list-style-type: none"> - Total number of individuals observed per monitoring unit and year. - Density estimates (individuals/km²). - Confidence intervals around abundance estimates. - Abundance trends (multi-year time series). - Notes on survey effort, detection probability corrections. <p><u>Methodologies for reporting</u> Submission of all distribution range data and metadata in a standardized form to the IMAP INFO/RAC System (https://www.info-rac.org/).</p> <p>Gaps and uncertainties</p> <ul style="list-style-type: none"> - The lack of baseline estimates on monk seal abundance makes it difficult to confirm the species' apparent increase in population numbers and geographic expansion in recent years; collating such baseline data is thus a necessary step to support the identification of priority monitoring sites. - Low detection probability due to remote caves and rare sightings. - Uneven monitoring capacity among Mediterranean countries. - Population fragmentation, as well as lack on information sharing, makes basin-wide synoptic abundance estimates difficult. 		
Contacts and version Date		
Key contacts within UNEP for further information		
Version No	Date	Author
V.1	20/07/2016	SPA/RAC
V.2	11/05/2026	SPA/RAC

3. Common Indicator 5: Population demographic characteristics

Indicator Title	Population demographic characteristics (Mediterranean monk seal)	
Relevant GES definition	Related Operational Objective	Proposed Target(s)
Mediterranean Monk seal population shows low human-induced mortality, balanced reproductive rate and sex ratio, appropriate pupping patterns and high annual pup production.	Population condition of selected species is maintained or improved.	Decline in human-induced deaths and stable or increasing pup production
Rationale		
<p>The objective of this indicator is to assess demographic parameters of the Mediterranean monk seal that reflect population health and dynamics within the Mediterranean waters. Demographic characteristics provide insight into the functional state of a population beyond simple counts and may be used to assess its conservation status by analysing the following parameters for the population:</p> <ul style="list-style-type: none"> -Age structure; reveals whether juveniles are being recruited. -Sex ratio; indication of mating potential and future population growth. <p>Fecundity (rates of birth) and mortality (death) rates; determine population trajectories to assess whether the species is stable, declining, or recovering.</p> <p>Mediterranean monk seal pupping periods show differences between locations; in the colony of Cabo Blanco births can take place throughout the year (Gazo et al., 1999; González et al. 2002; Karamanlidis et al., 2023), while elsewhere, in the eastern Mediterranean Sea and the archipelago of Madeira births are concentrated mainly between October and November (Karamanlidis, 2024). For the first week after giving birth, mothers spend much time on land lying close to their newborns. 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. Weaning of pups gradually occurs at four to five months of age (Aguilar et al. 2007, Karamanlidis et al., 2023).</p> <p>Monitoring the above-mentioned demographic parameters for Mediterranean monk seals is challenging because these are long-lived and elusive animals occupying remote and difficult-to-access breeding sites (i.e., caves), requiring innovative and not-so-conventional survey techniques. Nevertheless, a thorough understanding of population demographics is important in planning and evaluating conservation actions.</p>		
Scientific References		
<p>Aguilar A, Cappozzo LH, Gazo M, Pastor T, Forcada J, Grau E. 2007. Lactation and mother-pup behaviour in the Mediterranean monk seal <i>Monachus monachus</i>: an unusual pattern for a phocid. <i>Journal of the Marine Biological Association of the United Kingdom</i> 87: 93–99.</p> <p>Gazo M, Layna JF, Aparicio F, Cedenilla MA, Gonzalez LM, Aguilar A. 1999. Pupping season, perinatal sex ratio and natality rates of the Mediterranean monk seal from the Cabo Blanco colony. <i>Journal of Zoology</i> 249:393–401</p> <p>González LM, Cedenilla MA, Fernández de Larrinoa P, Layna JF, Aparicio F. 2002. Changes in the breeding variables of the Mediterranean monk seal (<i>Monachus monachus</i>) colony of Cabo Blanco Peninsula after a mass mortality episode. <i>Mammalia</i> 6: 173–182.</p> <p>Karamanlidis, A. 2024. Current status, biology, threats and conservation priorities of the vulnerable Mediterranean monk seal. <i>Endangered Species Research</i>, 53, 341–361.</p>		
Indicator analysis methods		
Indicator Definition		
Assessment of the demographic structure and vital rates of the Mediterranean monk seal population to determine whether it maintains the biological characteristics necessary for long-term viability and recovery.		
Methodology for indicator calculation		
The choice of the methodology to be used will depend on the context and on existing tools to monitor the Mediterranean monk seal population of a given area. In any case, it is important to include information encompassing population size, mortality, births, and other relevant demographic data.		

Indicator Title	Population demographic characteristics (Mediterranean monk seal)
<p>A minimum dataset should include:</p> <ul style="list-style-type: none"> -Individual identification records (photo-ID catalogue) -Annual pup production data -Resighting histories (≥ 3 consecutive years minimum) -Mortality/stranding records with cause-of-death assessment -Age-class classification of observed individuals, including, whenever possible, the following categories: pup (0-2 months), juvenile (2months–2 years), subadult (2-3 years to 5 years) and adult (males, over 4-5 years old; females 3-5 years old or proven reproduction). Stable or increasing proportion of juveniles would indicate adequate recruitment, while persistent absence of juveniles would be cause of demographic concern. -Number of reproductive females. <p>Confidence and data quality scoring to be done by assigning each parameter to one of these categories: High confidence $\rightarrow \geq 5$ years robust capture-mark-recapture data Medium \rightarrow partial data coverage Low \rightarrow opportunistic data only</p>	
<p>Indicator units</p> <p>The main demographic parameters are defined in the following units:</p> <ul style="list-style-type: none"> - adult survival probability: range between 0 and 1 - juvenile survival probability: range between 0 and 1 - fecundity, or breeding productivity: pup production per years; average no. of young produced per sexually mature female per year; pupping seasonality - age class distribution: percentage of each age class - sex ratio: percentage 	
<p>List of Guidance documents and protocols available</p> <p>Quintana Martín Montalvo, B. & Muñoz Cañas, M. (2025). Mediterranean monk seal. A comprehensive set of monitoring and research techniques for the study and conservation of <i>Monachus monachus</i> in the Mediterranean Sea (1st ed.). Gland, Switzerland: IUCN. 89 pp.</p>	
<p>Methodology for monitoring</p>	
<p>Available Methodologies for Monitoring</p> <p>There are several monitoring challenges derived from the Mediterranean monk seal small population size, often uneven monitoring effort among countries, limited cave accessibility and climate impacts on breeding caves.</p> <p>Available methodologies for monitoring demographic parameters on Mediterranean monk seals include: <u>Photo-identification</u>, a non-invasive method used to identify individual seals based on their distinctive natural features (e.g., fur patterns, colouring, spots, scars), will allow us to estimate survival rates, track reproductive history of females, assess age structure and support definition of sex ratio (see also C4 above).</p> <p><u>Cave remote camera monitoring of breeding caves</u> (also considering implementing remote monitoring of open beaches where there is evidence/suspicion of being used as a breeding site). The possibility of continuously monitoring of a cave provides comprehensive information on the species and its habitat. Seal disturbance is to be minimised by limiting punctual visit to the caves to what it is absolutely necessary to guarantee continuous battery coverage and do adjustments as required. Beach monitoring is likely to become increasingly valuable, as monk seals are being observed more often hauling out on beaches and, on rare occasions, breeding.</p> <p><u>Direct field observations (Land/Boat-Based)</u> will also can also be used to conduct photo-identification effort, to estimate age structure, determine sex-ratio (when visible) and record group composition. It needs caution, when conducted form a boat, to minimize disturbance to the animals and it is also affected by some detection bias.</p>	

Indicator Title	Population demographic characteristics (Mediterranean monk seal)	
<p>Data derived from <u>Stranding and Mortality Monitoring Network</u> can lead to accurate estimates of mortality rates and provide further insights by helping determining death causes and understanding the most significant threats faced by the species (e.g., deliberate killings, bycatch, diseases) in order to inform conservation action and threat mitigation measures.</p> <p><u>UAVs (drone-assisted surveys)</u> may help to estimate age class proportions by applying photogrammetry as well as to facilitate behavioural observations (see C3 above)</p>		
<p>Available data sources</p> <p>At the moment there is not any single database platform for Mediterranean monk seal that facilitates data exchange. Research groups have their own datasets and databases. Recent efforts have contributed to an improvement in the communication among different groups operating within the Mediterranean basin. This has led to the exchange of experiences and research protocols. The design and implementation of an on-line platform with contributions from everybody having monk seal photo-identification catalogues and habitat assessment data would greatly facilitate data sharing, comparison and survey follow-up, especially at regional scales or along the same and neighbouring coastlines.</p>		
<p>Temporal Scope guidance</p> <p>Demographic studies on Mediterranean monk seals, which are long-living species, require long-term projects, to allow robust indications on trends in population size and demographic parameters over time. Accordingly, multi-year datasets covering ≥ 5–10 years will be required for robust trend detection.</p>		
<p>Output</p>		
<p>Expected assessments outputs</p> <ul style="list-style-type: none"> - Age / stage structure (pups, juveniles, subadults, adults) - Sex ratio (overall and breeding segment) - Fecundity / pup production - Survival rates (especially pup survival) - Human-induced mortality rate - Reproductive seasonality and breeding site fidelity 		
<p>Methodologies for reporting</p> <p>Submission of all distribution range data and metadata in a standardized form to the IMAP INFO/RAC System (https://www.info-rac.org/).</p>		
<p>Gaps and uncertainties</p> <ul style="list-style-type: none"> - Available demographic data remain scarce and fragmented across the Mediterranean region. - Data on age structures and vital rates are very limited or incomplete - Baseline demographic estimates are lacking in many range states and require enhanced monitoring. (Data gaps limit the ability to determine whether GES has been achieved on a basin-wide scale) 		
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