UNITED NATIONS

EP

UNEP/MED WG.641/4

UN environment programme

Mediterranean Action Plan
Barcelona Convention

18 May 2026
Original: English

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)

3.2. Marine birds (OE 1: 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 marine birds

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.

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/RAC 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 has updated the Guidance Factsheets of the IMAP Common Indicators for Ecological Objective 1 (EO1: Biodiversity), with the support of 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 marine turtles; 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.

In this context, SPA/RAC has prepared draft updated IMAP Common Indicator 3, 4 and 5 Factsheets related to marine turtles, 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.

7. This proposal was developed with the support of the Biodiversity Online Working Group (OWG) on marine birds. The Meeting is expected to review the document and provide guidance with a view to its submission to the SPA/RAC Focal Points Meeting (scheduled for May 2027) and the EcAp Coordination Group Meeting (scheduled for September 2027).

1. Common Indicator 3: Species Distributional Range

<table>
<tr><td>Indicator Title</td><td colspan="2">Common Indicator 3: Species Distributional Range</td></tr>
<tr><td>Relevant GES definition</td><td>Related Operational Objective</td><td>Proposed Target(s)</td></tr>
<tr><td>The distribution of selected indicator seabird species continues to occur in all their Mediterranean natural habitat.
Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. (EO1, Biodiversity).</td><td>The distributional range of selected species is maintained or improved.
The variation in the total area occupied by selected species and the geographical shifts in the occupancy area does not entail a significant net loss of distribution range for selected species regarding:

- Breeding site distribution (colonies, nest sites);
- Other distribution during breeding (at-sea distribution of pelagic birds, foraging areas etc.);
- Non-breeding distribution (e.g. offshore at-sea distribution during non-breeding for pelagic species, on-shore at-sea distribution and coastal feeding and roost sites for coastal species).</td><td>- No significant net reduction in the distributional ranges for indicator species listed as Least Concern (LC).
- Significant net increase in range for species of conservation concern (VU, EN, CR) to facilitate recovery.
- Establishment of new colonies and encouragement of population spread among alternative sites.
- The Occupancy index is ≥1 even with shift in occupied areas (e.g. due to climate change)</td></tr>
<tr><td colspan="3">Rational</td></tr>
<tr><td colspan="3">Justification for indicator selector
While many seabirds show strong site fidelity to their restricted breeding sites, they are overall highly mobile. Changes and shifts in distribution over time reflect changes in suitable habitats, availability of resources, and impacts from pressures related to human activity and climate change. Therefore, regular monitoring and assessment of ranges of breeding sites, as well as ranges occupied during breeding and non-breeding periods can reveal changes and shifts over time. Changes in range of indicator species provide crucial information on whether conservation targets regarding the management of biodiversity in Mediterranean waters are fulfilled and GES is reached.</td></tr>
<tr><td colspan="3">Policy context & Targets</td></tr>
<tr><td colspan="3">Policy context description</td></tr>
<tr><td>EU Marine Strategy Framework Directive (MSFD)</td><td colspan="2">The MSFD was put in place to protect the marine ecosystem and biodiversity upon which our health and marine-related economic and social activities depend.
In order to achieve GES, each EU Member State is required to implement strategies for its marine waters (or Marine Strategy). Following an adaptive management approach, the Marine Strategies are reviewed regularly (every 6 years).

To help EU countries achieve Good Environmental Status (GES), the directive sets out qualitative descriptors.

Article 8 of the Marine Strategy Framework Directive (MSFD) requires EU Member States to conduct regular assessments of the environmental status of their marine waters. Under Descriptor 1 “Biodiversity”: Biological diversity is maintained.</td></tr>
</table>

Indicator Title	Common Indicator 3: Species Distributional Range
EU Marine Strategy Framework Directive (MSFD)	The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. Common Indicator D1C4 refers to Distributional Range (a secondary criterion) and includes seabirds: The species' distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.
EU Birds Directive (part of the EU Nature Directives)	The Birds Directive aims to protect all naturally occurring wild bird species present in the EU and their most important habitats. In addition to halting the decline or disappearance of bird species, the Directive aims to allow bird species to recover and thrive over the long-term. To achieve these aims, EU countries are required to take any necessary measures to maintain or restore bird populations. Every six years, all EU Member States are required to report on the implementation of the directives. This report includes updates on the distribution of breeding, wintering and passage bird populations. Distributional range assessment under the EU Birds Directive is a core component of the reporting obligations for Member States, primarily conducted under Article 12 of the Directive (2009/147/EC). These assessments require Member States to submit data on the size, distribution, and trends of all naturally occurring wild bird species, which are then aggregated to evaluate the status of birds at the EU level. Key aspects of the distributional range assessment include: - Breeding vs. Wintering Range: Reports cover all regularly occurring breeding species. Additionally, wintering and passage distribution data are required for specific taxa (e.g., Annex I taxa and those triggering SPA designations). - Distribution Trend Analysis: Member States report on trends in the breeding distribution, typically over a long-term (e.g., >20 years) and short-term (last 12 years) period, indicating if the range is increasing, stable, or decreasing. - Methodology and Quality: The range maps reflect where breeding is "confirmed" or "probable." Assessments identify the method used—either a complete survey, partial data extrapolation, or expert opinion—and indicate the quality of the data. - Thresholds for Assessment: While population size is often the main metric, changes in distribution (range) are crucial for determining the overall status of the bird population, including identifying if a species is "Secure," "Declining," or "Threatened". - Range Size Calculation: The total surface area of the range, expressed in km², is reported to evaluate the overall extent of the species' presence in the territory
Targets	
For seabirds, MSFD sets the following targets under D1C4: - To maintain or enhance the breeding distribution range, and at-sea distribution range (breeding and non-breeding) of seabird species - To ensure that the distributional range shows no reduction due to direct or indirect anthropogenic pressures.	

Indicator Title	Common Indicator 3: Species Distributional Range

The MSFD also calls for regional cooperation meaning "cooperation and coordination of activities between Member States and, whenever possible, third countries sharing the same marine region or subregion to facilitate achievement of GES status in the marine region or subregion concerned

The Birds Directive sets the following targets for distributional range:

- To ensure that distributional ranges and patterns are maintained or restored in line with natural, geographical, and climatic conditions, achieving Good Environmental Status (GES). Key objectives include protecting breeding and foraging habitats through the Natura 2000 network, with specific focus on species listed in Annex I of the Directive.
- To protect habitat within the range by establishing and managing Special Protection Areas (SPAs) that encompass crucial breeding sites, foraging areas, and marine connectivity corridors. Managing includes mitigation of direct and indirect anthropogenic pressures (e.g. bycatch, IAS, light pollution).

Indicator Definition and list of indicator taxa

Indicator Definition

Variation in the total area (trends in the number of occupied grid cells) occupied by selected taxa of various functional ecological groups in the breeding areas, and at sea during the breeding and non-breeding seasons. Variation is assessed against a baseline, taking into account thresholds.

List of indicator taxa – seabirds

The following eleven seabird taxa sensu lato from various functional ecological groups are prioritized for the monitoring of distributional range given their role as indicators, each of them at least fulfilling some of the following criteria:

- A relative wide distribution across the Mediterranean
- Suitability for regional assessment of GES
- Of major conservation concern in the Mediterranean
- Representing the various functional groups well

Osprey *Pandion haliaetus* (Coastal top predator)
Kentish Plover *Charadrius alexandrines* (Intertidal benthic feeder)
Mediterranean Shag Gulosus *aristotelis desmarestii* (Inshore benthic feeder)
Audouin's Gull *Ichthyaetus audouinii* (Offshore surface feeder)
Slender-billed Gull *Chroicocephalus genei* (Inshore surface feeder)
Lesser-crested Tern *Thalasseus bengalensis emigrates* (Inshore surface feeder)
Sandwich Tern *Thalasseus sandvicensis* (Inshore surface feeder)
Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* (Offshore surface/ pelagic feeder)
Scopoli's Shearwater *Calonectris diomedea* (Offshore surface/ pelagic feeder)
Yelkouan Shearwater *Puffinus yelkouan* (Offshore surface/ pelagic feeder)
Balearic Shearwater *Puffinus mauretanicus* (Offshore surface/ pelagic feeder)

Methodologies and protocols for monitoring, reporting and assessment

Methodologies and protocols for monitoring and assessment of CI3 for each indicator species should be:
- Developed/ updated by a group of experts;
- Following best practice from established programs (e.g. UK, Irland: Mitchell et al. 2004, O'Hanlon et al. 2024);

- Standardized across the Mediterranean basin;
- Feasible and agreed upon by all CPs;
- In line and temporally compatible with other policy context of monitoring and assessment programs relevant for (part of) the region (see below, e.g. MSFD, EU Birds Directive);
- In line with approaches taken under the African-Eurasian Migratory Waterbird Agreement (AEWA: https://www.unep-aewa.org/);
- In line with approaches taken for conventions for sea basins in the wider region (e.g. OSPAR);
- Complemented with approaches taken by other survey initiatives in the region (e.g. for at-sea distributions: ACCOBAMS ASI-II: https://accobams.org/accobams-survey-initiative-ii/; CONCEPTU MARIS: https://www.lifeconceptu.eu/en/, which have main focus on other taxa, but also collect data on marine birds

Methodologies for monitoring

Depending on species and stage, data collection via standardized surveys
- "Classic" breeding surveys
- Playback surveys
- Remote sensing (e.g. UAV, camera traps, ARU (audio), thermal imaging)
- Telemetry (GPS/ GLS tracking) of representative subsample of populations
- Vessel-based / aerial transects
- Roost/ raft assessments
- Synchronized mid-winter counts (IWC: https://europe.wetlands.org/home-2/our-work/wetland-biodiversity/african-eurasian-waterbird-census/)
- include validated data from citizen science databases and stochastic observations for distribution assessments where suitable

Spatial resolution and scope of monitoring:

- Units: The European (ETRS89) 10x10km² grid (1x1km² or 5x5km² for small contracting parties) is used for mapping the distribution range.
- Data collection by each CP
- Trans-boundary collaboration where necessary (e.g. for synchronised monitoring within the four main subregions)
- Overall scope is Mediterranean basin (to be discussed: monitoring and assessment of non-breeding distribution of taxa which leave the Mediterranean basin)

Temporal resolution of monitoring

At least once per assessment cycle for each stage, for highly mobile species ideally more frequently. Up to yearly monitoring, e.g. for mid-winter census.

Methodologies for reporting

Submission of all distribution range data and metadata in a standardized form to the IMAP INFO/RAC System (https://www.info-rac.org/).

Methodologies for assessment

- Baseline setting: Adoption of a modern baseline approach, defined as the widest known range constructed using for each stage every grid cell occupied at any time within the past 20 years.
- Threshold setting: Not more than 10% deviation (range reduction) from the baseline range between assessment cycles

Indicator Title	Common Indicator 3: Species Distributional Range

- Integration of distributional patterns across range: Integrating data provided by each CP to assessment of distribution range within subregions and within the whole basin assessment

Assessment increases in value if it includes levels of certainty (e.g. possible, probably, confirmed breeding), corrections for survey effort and data gaps, UD calculations for at-sea distributions (especially for highly mobile species), rather than simple presence/absence per grid cell.

- Climate change integration

  - 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 (e.g. reduction in nesting site area) 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)

  Potentially allow for use of "Shifting Baselines" (see baselines and thresholds above) to acknowledge climate-driven shifts in distribution

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Indicator Title	Common Indicator 3: Species Distributional Range

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Indicator Title	Common Indicator 3: Species Distributional Range

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Indicator Title	Common Indicator 3: Species Distributional Range

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Contact 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

2. Common Indicator 4: Species Population Abundance

<table>
<tr><td>Indicator Title</td><td colspan="2">Common Indicator 4: Species Population Abundance</td></tr>
<tr><td>Relevant GES definition</td><td>Related Operational Objective</td><td>Proposed Target(s)</td></tr>
<tr><td>The population abundance of selected indicator seabird species has abundance levels qualifying to Least Concern Category of the IUCN Red List or has abundance levels that are improving and moving away from the more critical IUCN category.</td><td>The population abundance of selected species is maintained or improved.
The variation in the total population sizes by selected species does not entail a significant net loss for taxa listed in the Least Concern category and entails a significant net increase for taxa of higher conservation concern. Populations sizes of selected species refers to:
- Breeding population sizes (number of breeding pairs)
- Non-breeding population sizes (e.g. wintering population counted at roost sites)</td><td>- Populations of indicator taxa of Least Concern Category are maintained
- Populations of indicator taxa of higher conservation concern recover toward natural levels.
- Populations of indicator taxa do not experience any human-induced decrease in abundance</td></tr>
<tr><td colspan="3">Rational</td></tr>
<tr><td colspan="3">Justification for indicator selector
Population abundance is a critical parameter for determining population growth or decline in response to environmental dynamics and human pressures including climate change. Therefore, regular monitoring and assessment of breeding and non-breeding population abundances of indicator species provide crucial information on whether conservation targets regarding the management of biodiversity in Mediterranean waters are fulfilled and GES is reached.</td></tr>
<tr><td colspan="3">Policy context & Targets</td></tr>
<tr><td colspan="3">Policy context description</td></tr>
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In order to achieve GES, each EU Member State is required to implement strategies for its marine waters (or Marine Strategy). Following an adaptive management approach, the Marine Strategies are reviewed regularly (every 6 years).
To help EU countries achieve Good Environmental Status (GES), the directive sets out qualitative descriptors.

Article 8 of the Marine Strategy Framework Directive (MSFD) requires EU Member States to conduct regular assessments of the environmental status of their marine waters. Under Descriptor 1 “Biodiversity”: Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. Common Indicator D1C2 refers to Population Abundance (a primary criterion) and includes seabirds: The species’ population abundance is not adversely affected by anthropogenic pressures, thus maintaining long-term viability.</td></tr>
<tr><td>EU Birds Directive (part of the EU Nature Directives)</td><td colspan="2">The Birds Directive aims to protect all naturally occurring wild bird species present in the EU and their most important habitats. In addition to halting the decline or disappearance of bird species, the Directive aims to allow bird species to recover and thrive over the long-term.</td></tr>
</table>

Indicator Title	Common Indicator 4: Species Population Abundance

EU Birds Directive (part of the EU Nature Directives)

To achieve these aims, EU countries are required to take any necessary measures to maintain or restore bird populations.

Every six years, all EU Member States are required to report on the implementation of the directives. This report includes updates on the distribution of breeding, wintering and passage bird populations.

Under the EU Birds Directive, breeding, non-breeding and passage population abundances of wild birds under the EU Birds Directive are a core component of the reporting obligations for Member States, primarily conducted under Article 12 of the Directive (2009/147/EC). The assessments require Member States to submit data on the size, distribution, and trends of all naturally occurring wild bird species, which are then aggregated to evaluate the status of birds at the EU level.

Key aspects of the population abundance assessment include:

- Reporting covers all wild bird species listed under Article 1 of the Directive that regularly occurs in the Member State's territory.
- Frequency and Cycle: Article 12 reporting occurs every 6 years, synchronized with Article 17 of the Habitats Directive.
- To calculate total EU figures, Member States report data using common, defined units—usually breeding pairs for breeding birds, and individuals for wintering species.
- Assessments focus on quantifying short-term (roughly 12 years) and long-term (since 1980) population trends.
- Data is collected for the breeding season, but significantly abundant wintering/migratory species are also monitored, particularly for migratory waterbirds.
- Member States are required to provide information on the methods used for estimation, classifying data quality, and citing sources to ensure an accurate, documented, and transparent audit trail.
- Data helps determine the status, i.e. if a species is "secure" or requires conservation action (e.g., in Special Protection Areas - SPAs).

Targets

For seabirds, MSFD sets the following targets under D1C2:

- To maintain or increase the breeding population abundance of seabird species over time (12-year period), accounting for natural ecological variability
- To ensure viability, i.e. population abundance levels must be indicative of long-term viability and must not show human-induced decreases.
- IUCN Status-Related Targets
  - Least Concern (LC) Species: The target is to maintain these species within the "stable" category, characterized by no significant increase or decline (generally less than 5% change per year)
  - Threatened Species (VU, EN, CR): The conservation objective is to restore these populations to "Least Concern" status. This requires a target of achieving a significant increase in abundance before leveling off at a safer population level
  - Variation Limits: Good Environmental Status (GES) is often interpreted as maintaining population sizes with less than a 30% variation over a time period equivalent to three generation lengths

Indicator Title	Common Indicator 4: Species Population Abundance

The MSFD also calls for regional cooperation meaning "cooperation and coordination of activities between Member States and, whenever possible, third countries sharing the same marine region or subregion to facilitate achievement of GES status in the marine region or subregion concerned.

The Birds Directive sets the following targets for population abundance:

- To ensure that population abundances of wild birds are maintained or restored in line with natural, geographical, and climatic conditions, achieving Good Environmental Status (GES), i.e. the majority of species is in a "secure" or "improved" population status;
- For species listed in Annex I, specific habitat conservation measures are required to ensure their survival and reproduction, targeting the restoration of depleted, threatened or vulnerable populations and reversing long-term declines;
- For non-Annex I species, the aim is to ensure they do not become threatened, focusing on maintaining favorable population levels and reversing human pressure induced declines.

Indicator Definition and list of indicator taxa

Indicator Definition

Variation of the total breeding and nonbreeding population sizes (counted or estimated) of selected taxa of various functional ecological groups in a specified area. Variation is assessed against a baseline, taking into account thresholds.

List of indicator taxa – seabirds

The following eleven seabird taxa sensu lato from various functional ecological groups are prioritized for the monitoring of distributional range given their role as indicators, each of them at least fulfilling some of the following criteria:

- A relative wide distribution across the Mediterranean
- Suitability for regional assessment of GES
- Of major conservation concern in the Mediterranean
- Representing the various functional groups well

Osprey *Pandion haliaetus* (Coastal top predator)
Kentish Plover *Charadrius alexandrines* (Intertidal benthic feeder)
Mediterranean Shag *Gulosus aristotelis desmarestii* (Inshore benthic feeder)
Audouin's Gull *Ichthyaetus audouinii* (Offshore surface feeder)
Slender-billed Gull *Chroicocephalus genei* (Inshore surface feeder)
Lesser-crested Tern *Thalasseus bengalensis emigrates* (Inshore surface feeder)
Sandwich Tern *Thalasseus sandvicensis* (Inshore surface feeder)
Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* (Offshore surface/ pelagic feeder)
Scopoli's Shearwater *Calonectris diomedea* (Offshore surface/ pelagic feeder)
Yelkouan Shearwater *Puffinus yelkouan* (Offshore surface/ pelagic feeder)
Balearic Shearwater *Puffinus mauretanicus* (Offshore surface/ pelagic feeder

Methodologies and protocols for monitoring, reporting and assessment

Methodologies and protocols for monitoring and assessment for CI4 of each indicator species should be:

- Developed/ updated by a group of experts;
- Following best practice from established programs (e.g. UK, Irland: Mitchell et al. 2004, O'Hanlon et al. 2024);
- Standardized across the Mediterranean basin;

Indicator Title	Common Indicator 4: Species Population Abundance

- Feasible and agreed upon by all CPs;
- In line and temporally compatible with other policy context of monitoring and assessment programs relevant for (part of) the region (see below, e.g. MSFD, EU Birds Directive);
- In line with approaches taken under the African-Eurasian Migratory Waterbird Agreement (AEWA: https://www.unep-aewa.org/);
- In line with approaches taken for conventions for sea basins in the wider region (e.g. OSPAR);
- Complemented with approaches taken by other survey initiatives in the region (e.g. for at-sea distributions: ACCOBAMS surveys, CONCEPTU MARIS surveys, which have main focus on other taxa, but also collect data on birds).

Methodologies for monitoring

Depending on species and stage, data collection via standardized surveys

- "Classic" breeding abundance surveys (e.g. nest counts)
- Playback surveys
- Population size modelling from capture- mark- recapture (CMR, including region-wide coordinated colour ring programs for relevant species)
- Remote sensing (e.g. UAV, camera traps, ARU (audio), thermal imaging)
- Vessel-based / aerial transects
- Roost/ raft/ bottleneck passage assessments
- Synchronized mid-winter counts (IWC: https://europe.wetlands.org/home-2/our-work/wetland-biodiversity/african-eurasian-waterbird-census/)
- Synchronized roost counts (e.g. of Gulosus aristotelis desmarestii in late summer)
- Include validated data from citizen science databases and stochastic observations where suitable

Data analyses include levels of certainty (e.g. possible, probably, confirmed breeding) and error estimates, corrections for survey effort and data gaps.

Spatial resolution and scope of monitoring:

- Units: Breeding pair numbers, total numbers of non-breeding population, differentiated (mature individuals versus immature) where possible;
- Data collection by each CP;
- Trans-boundary collaboration where necessary (e.g. for synchronized midwinter counts, at-sea non-breeding distribution);
- Overall scope is Mediterranean basin;
- Where adequate, monitoring and assessment can include the non-breeding abundance of taxa which leave the Mediterranean basin elsewhere.

Temporal resolution of monitoring

At least once per assessment cycle for each stage, for fluctuating and for highly mobile species ideally more frequently. Up to yearly monitoring, e.g. for mid-winter census.

Methodologies for reporting

Submission of all population abundance data and metadata in a standardized form to the IMAP INFO/RAC System (https://www.info-rac.org/).

Indicator Title	Common Indicator 4: Species Population Abundance

Methodologies for assessment

- Population abundance changes: Percentage change in population numbers of indicator taxa regarding:
    - breeding pairs
    - non-breeding population
- Use of the rtrim package on CRAN (replacing discontinued standalone TRIM software).
- Baseline setting: Adoption of a modern baseline approach, defined as the highest abundance estimate at any time within the past 20 years or (if known and higher) at the start of the Birds Directive implementation
- Threshold settings (resilience-based):
    - Relative abundance > 0.8 for species laying one egg (e.g., Shearwaters).
    - Relative abundance > 0.7 for species laying multiple eggs (e.g., Gulls/Terns).
- Integration of population abundance across range: Integrating data provided by each CP to assessment of population abundances of indicator taxa within subregions and within the whole basin assessment
- Climate change integration

    - Complement/replace trend analysis with Generalized Additive Modelling (GAM) to include abiotic factors like sea temperature, winter air temperature, precipitation (floods and droughts), storm frequency and amplitude etc. as covariates. This allows for long-term assessments of climate change effects on abundance;
    - Cross-reference with Candidate Common Indicators 39-43 (e.g., changes in sea surface temperature and circulation patterns) to explain changes in abundance;
    - Cross-reference with indirect impacts of climate change on other Ecological Objectives and Common Indicators influencing seabirds' population abundance (e.g. EO4: Marine Food Webs; CI9 under EO3: Fish stocks);
    - If necessary, allow for use of "Shifting Baselines" (see baselines and thresholds above) to acknowledge climate-driven changes in abundance;

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Contact and Version Date

Key contacts within UNEP for further information

Version No	Date	Author
V.1	07/2016	SPA/RAC
V.2	11/05/2026	SPA/RAC

3. Common Indicator 5: Population demographic characteristics

<table>
<tr><td>Indicator Title</td><td colspan="2">Common indicator 5: Population demographic characteristics</td></tr>
<tr><td>Relevant GES definition</td><td>Related Operational Objective</td><td>Proposed Target(s)</td></tr>
<tr><td>The populations of indicator seabird taxa exhibit natural levels of relevant demographic characteristics to allow for stable or growing populations.</td><td>The populations of indicator species in various functional ecological groups are maintained or growing long-term by:
- Ensuring that fecundity (the ratio of fledged birds to total monitored clutches) remains at expected natural levels.
- Maintaining sustainable survival rates for both young and adult birds.
- Reducing incidental catch mortality and other human-induced mortality to negligible levels, especially for species of conservation concern.</td><td>Populations of indicator species of Least Concern are maintained stable in the long term according to population models, while indicator species of higher conservation concern are characterised by growing population trends in the long term to be able to recover. Incidental bycatch mortality and other human pressures are kept at negligible levels. Overall target is expected long-term annual population growth rates to be around 1.0 or higher.</td></tr>
<tr><td colspan="3">Rational</td></tr>
<tr><td colspan="3"><u>Justification for indicator selector</u>
Demographic parameters of a population, such as reproductive success and survival rates, provide an early warning system against environmental changes. They can identify the life stages most affecting population growth or decline in response to environmental dynamics and human pressures, including climate change. Therefore, regular monitoring and assessment of breeding and demographic characteristics of indicator species provide crucial information on whether populations are viable and conservation targets regarding the management of biodiversity in Mediterranean waters are fulfilled and GES is reached.</td></tr>
<tr><td colspan="3">Policy context & Targets</td></tr>
<tr><td colspan="3">Policy context description</td></tr>
<tr><td>EU Marine Strategy Framework Directive (MSFD)</td><td colspan="2">The MSFD was put in place to protect the marine ecosystem and biodiversity upon which our health and marine-related economic and social activities depend.

In order to achieve GES, each EU Member State is required to implement strategies for its marine waters (or Marine Strategy). Following an adaptive management approach, the Marine Strategies are reviewed regularly (every 6 years).

To help EU countries achieve Good Environmental Status (GES), the directive sets out qualitative descriptors.

Article 8 of the Marine Strategy Framework Directive (MSFD) requires EU Member States to conduct regular assessments of the environmental status of their marine waters. Under Descriptor 1 “Biodiversity”: Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.

Common Indicator D1C3 refers to Population Demographic characteristics and includes seabirds: The population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity, and survival rates) of the species are indicative of a healthy population which is not adversely affected due to anthropogenic pressures.</td></tr>
</table>

Indicator Title	Common indicator 5: Population demographic characteristics

Targets

For seabirds, MSFD sets the following targets under D1C3:

- Ensuring Healthy Populations: Demographic characteristics must be indicative of a healthy population that is not adversely affected by anthropogenic pressures.
- Long-term Viability: Populations of all taxa, especially those listed with IUCN threatened status, must be maintained in the long term according to the indications of population models.
- Population Growth Rate: A primary quantitative target for reaching Good Environmental Status (GES) is to achieve an expected long-term annual population growth rate of 1.0 or higher.
- Negligible Human-Induced Mortality: Mortality resulting from incidental catch (bycatch) and other anthropogenic pressures must be reduced to negligible levels, particularly for species of conservation concern.
- Natural Demographic Structure: In alignment with EU Nature Directives, the status is considered favourable only if reproduction, mortality, and age structure do not deviate from natural levels.
- Thresholds for Decline: A large decline, such as a loss of more than 1% per year or a population structure that deviates strongly from normal, is classified as "unfavourable".
- Condition of Life Stages: Populations must exhibit natural levels of breeding success (fecundity) and acceptable survival rates for both young and adult birds.
- Metapopulation Connectivity: Assessments should consider connectivity through dispersal (emigration and immigration) between discrete colonies to determine if local populations are sustainable "sources" rather than "sinks"

The MSFD also calls for regional cooperation meaning “cooperation and coordination of activities between Member States and, whenever possible, third countries sharing the same marine region or subregion to facilitate achievement of GES status in the marine region or subregion concerned.

Indicator Definition and list of indicator taxa

Indicator Definition

Mathematical description of population growth of indicator taxa of various functional ecological groups, using parameters such as adult and juvenile survival and breeding productivity (fecundity).

List of indicator taxa – seabirds

The following eleven seabird taxa sensu lato from various functional ecological groups are prioritized for the monitoring of distributional range given their role as indicators, each of them at least fulfilling some of the following criteria:

- A relative wide distribution across the Mediterranean
- Suitability for regional assessment of GES
- Of major conservation concern in the Mediterranean
- Representing the various functional groups well

Osprey *Pandion haliaetus* (Coastal top predator)
Kentish Plover *Charadrius alexandrines* (Intertidal benthic feeder)
Mediterranean Shag *Gulosus aristotelis desmarestii* (Inshore benthic feeder)
Audouin’s Gull *Ichthyaetus audouinii* (Offshore surface feeder)
Slender-billed Gull *Chroicocephalus genei* (Inshore surface feeder)
Lesser-crested Tern *Thalasseus bengalensis emigrates* (Inshore surface feeder)

Indicator Title	Common indicator 5: Population demographic characteristics

Sandwich Tern *Thalasseus sandvicensis* (Inshore surface feeder)
Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* (Offshore surface/ pelagic feeder)
Scopoli's Shearwater *Calonectris diomedea* (Offshore surface/ pelagic feeder)
Yelkouan Shearwater *Puffinus yelkouan* (Offshore surface/ pelagic feeder)
Balearic Shearwater *Puffinus mauretanicus* (Offshore surface/ pelagic feeder)

Methodologies and protocols for monitoring, reporting and assessment

Methodologies and protocols for monitoring and assessment for CI5 of each indicator species should be:
- Developed/ updated by a group of experts;
- Following best practice from established programs (e.g. UK, Irland: Mitchell et al. 2004, O'Hanlon et al. 2024);
- Standardized across the Mediterranean basin;
- Feasible and agreed upon by all CPs:
- In line and temporally compatible with other policy context of monitoring and assessment; programs relevant for (part of) the region (see below, e.g. MSFD, EU Birds Directive);
- In line with approaches taken for conventions for sea basins in the wider region (e.g. OSPAR).

Methodologies for monitoring

Depending on the species, data collection via repeated, standardized surveys
- Representative subset of sites/ colonies/…
- Breeding success monitoring
- Long-term capture- mark- recapture programs (CMR) at breeding sites, including region-wide coordinated colour ring programs for relevant species, re-sightings of colour-ringed individuals also outside breeding areas
- Link monitoring of survival rates and reproductive success rates with monitoring of cumulative anthropogenic pressures under related Ecological Objectives:
    - EO3: Unintentional Bycatch
    - EO2: Invasive Alien Species
    - EO10: Marine Litter
- Monitoring of immigration and emigration

Spatial resolution and scope of monitoring:
- Representative sub-samples of populations, colonies depending on feasibility
- Data collection by each CP
- Trans-boundary collaboration where necessary (e.g. for monitoring dispersal and estimation of exchange between colonies (immigration and emigration), monitoring if subpopulations are a source or a sink
- Overall scope is Mediterranean basin

Temporal resolution of monitoring

Ideally annually.

Methodologies for reporting

Submission of all data on population demographic characteristics, including metadata in a standardized form to the IMAP INFO/RAC System (https://www.info-rac.org/).

Methodologies for assessment

Indicator Title	Common indicator 5: Population demographic characteristics

- Population growth rates: Calculated from monitoring data on fecundity and survival rates of representative sub-populations. Use of six-year rolling means of reproductive success and adult survival to calculate/ model annual growth rates;
- Baseline and threshold settings:
    - Over a six-years cycle, the average growth rate is 1.0 for indicator taxa that are listed as of Least Concern in the region
    - Over a six-years cycle, the average population growth rate is > 1.0 for indicator taxa that are of higher conservation concern in the region to allow for population recovery
    - Specific average thresholds are set for each indicator species regarding reproductive success and annual survival rates to reach the six-years average growth rate of 1.0 or higher.
- Integration of demographic characteristics across range: Integrating data provided by each CP to assessment of demographic parameters of indicator taxa within subregions and within the whole basin assessment to assess overall population dynamics in the region.
- Climate change integration:
    - Monitoring of direct impact of climate change on reproductive success (e.g. monitoring protocols can link reduced fledging success with increased temperature at nest sites (measured with temperature data loggers "iButton", nest- and clutch loss due to increased storm frequency and amplitude);
    - Monitoring of direct impact of climate change on survival rates (e.g. seabird wrecks caused by increase in severe weather events such as cyclones, floods, droughts, changes in precipitation, increase in storm frequency and amplitude, coastal erosion);
    - Use demographic data in Population Viability Analyses (PVA) to estimate extinction risk under climate change scenarios (e.g., extreme weather events reducing fledgling success);
    - Cross-reference with Candidate Common Indicators 39-43 (e.g., changes in sea surface temperature and circulation patterns) to highlight climate driven changes in reproductive success and survival rates;
    - Cross-reference with indirect impacts of climate change on other Ecological Objectives and Common Indicators influencing seabirds' demography (e.g. EO4: Marine Food Webs; CI9 under EO3: Fish stocks).

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Version No	Date	Author
V.1	20/07/2016	SPA/RAC
V.2	11/05/2026	SPA/RAC