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Agenda Item 6: Any Other Business

Monitoring and Assessment Scales, Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 3, 4 and 5 related to sea birds

Note by the Secretariat

At their 19th Ordinary Meeting (COP 19, Athens, Greece, 9-12 February 2016), the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and its Protocols adopted the Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP).

At their 20th Ordinary Meeting (COP 20, Tirana, Albania, 17-20 December 2017), the Contracting Parties endorsed, in Decision IG.23/6, the key findings of the 2017 Mediterranean Quality Status Report (the MED QSR Decision), that recommend a list of directions towards the 2023 MED QSR including the definition of the reference state of habitats and species, threshold values and assessment criteria. To that effect, in line with the Programme of Work 2020-2021 adopted by COP21 (Naples, Italy, December 2019), SPA/RAC has undertaken actions aimed at developing and standardizing the monitoring and assessment methods related to IMAP Biodiversity Cluster, including present work aimed at proposing monitoring and assessment scales, assessment criteria, thresholds and baseline values for the IMAP common indicators (CI) 3, 4 and 5 related to sea birds.

The present document provides information, perspectives, recommendations, and proposals on (i) revising the existing scales of monitoring, (ii) establishing suitable scales of assessment, and (iii) establishing appropriate assessment criteria, baseline, and threshold values for the Ecological Objective (EO)1 CI 1,2 and 3 on sea birds, in coherence with the relevant Regional Sea Conventions and EU directives (MSFD, Birds Directive, etc.).

The meeting of the Correspondence Group on Monitoring (CORMON) for biodiversity and fisheries acknowledged the efforts leading to the elaboration of the document, including the mobilization of national expertise through the informal Online Working Group (OWG), and endorsed the document for its use for the purpose of the 2023 Med QSR preparation.

It should be noted that the thresholds values proposed in this document will be tested, if the available data allows it, for the regional assessment as part of the 2023 MED QSR. Any possible revisions and adjustments may be required are foreseen during the next cycle (beyond 2023) considering the recommendations and the lesson to be learned during the elaboration of the 2023 MED QSR.

The Ecosystem Approach Coordination Group Meeting is expected to take note of the progress made in the elaboration of the assessment elements and discuss their use for the purpose of the 2023 MED QSR preparation.

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Acknowledgment

This report was prepared with the participation and voluntary contribution of the Biodiversity Online Working Group (OWG) on Sea Birds.

Executive Summary

To protect marine and coastal ecosystems of the Mediterranean, the Barcelona Convention adopted a strategy called Ecosystem Approach in 2008, which aims to achieve Good Environmental Status (GES) of the Mediterranean Sea and coast. The Ecosystem Approach presents 11 Ecological Objectives to achieve GES, which are broken down to operational objectives and GES targets. Region-wide implementation of this strategy was facilitated by an Integrated Monitoring and Assessment Programme (IMAP) that includes regionally agreed common indicators for all Ecological Objectives and aims to enable quantitative, integrated analysis of the state of the marine and coastal environment of the Mediterranean. The document at hand focuses on IMAP Common Indicators related to seabirds and develops scales of monitoring and assessments, assessment criteria, baseline and threshold values. The Common Indicators are CI3: species distributional range, CI4: species abundance, and CI5: species demographic characteristics. Because monitoring all seabird species in the region for GES assessment appears neither feasible nor necessary, this report focused on representative species from a range of functional groups, which can showcase the relationship between environmental pressures and their main impacts on the marine environment. A summary table presenting the recommended scales, criteria and values for each species are provided at the beginning of the report and then detailed further in the main text.

A short introduction outlines the concept of the Ecosystem Approach under the Barcelona Convention, gives an overview of previous work in the area and presents the definition of Good Environmental Status (GES). Making use of a few rigorous selection criteria as presented in the report below, the final list of indicator species is proposed, consisting of 11 seabird species sensu lato covering 6 functional groups. The methodology for this work combines information from available IMAP national monitoring plans, other sea conventions such as HELCOM and OSPAR and available literature on focal species and monitoring methods. Finally, expert opinion from the Online Working Group on seabirds integrated in the finalisation of the assessment criteria, scales and thresholds. Definitions of the spatial and temporal scales of monitoring and assessments are adopted from IMAP's recommendations to standardise the monitoring of different marine organisms throughout the region and facilitate the assessment of GES concluding the methods chapter.

The indicator species account presents the assessment criteria, baseline and threshold values, as well as scales for monitoring and assessment (both spatially and temporally), systematically and in detail for each indicator species and each relevant common indicator (CI3-CI5).

A reference list at the end of the document presents all publications that were consulted and referenced as part of the report at hand.

Finally, the document includes an annex that briefly describes various assessment processes from the Mediterranean and other regional seas conventions. Creating links and synergies with these existing assessment processes is believed to benefit the assessment processes under IMAP.

	Species	Common Indicator	Assessment Criteria	Baseline	Threshold	Scales of Assessment	Scales of Monitoring
1	Osprey *Pandion haliaetus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: pristine conditions baseline with widest known range in the last 100 years. Modern baseline: If no reliable historic data are available, modern baseline with widest known range in last 20 years	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Annual, with reporting every six years	Spatial: National, surveys covering at least all known breeding areas Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to IMAP reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance (annual abundance / baseline abundance)	Reference-based (modern) baseline: Abundance at the start of the implementation of BD (1981) Alternatively: highest breeding abundance estimate in the last 20 years Additionally: Highest abundance of wintering population in the last 20 years	Deviation from baseline: annual relative breeding and wintering abundance > 0.7	Spatial: Regional and sub-regional (all sub-regions, but with main focus on Western Mediterranean Sea) Temporal: Aiming at annual assessment with reporting every six years	Spatial: National or sub-national (aiming at 100% of known nesting sites) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate: Reproductive	Model-based baseline: Population	Deviation from baseline: Population	Spatial: Regional, sub-regional and national	Spatial: National or sub-national, aiming at 100% assessment

			success of monitored nests Survival rates of adult and young from capture-mark-resighting (colour-ringing of nestlings)	growth rates in the last assessment cycle	growth rate of 1.0 or higher	Temporal: Annual breeding success and survival rates with reporting every 6 years	(all known nests) of reproductive success Representative subsample of accessible nests for colour-ringing of nestlings Temporal: Annual for breeding success and survival via reading of colour rings
2	Kentish Plover *Charadrius alexandrinus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding and wintering populations % Shift in occupancy for breeding and wintering population	Reference-based baseline for breeding and wintering population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Sub-regional Temporal: Every six years	Spatial: National Temporal: Annual
		CI 4: Population abundance	For breeding birds: Annual relative breeding bird abundance For non-breeding birds Annual relative wintering bird abundance	Reference-based (modern) baseline: Highest breeding abundance estimates and wintering abundance estimates (separately) in the last 20 years	Deviation from baseline: annual relative breeding and wintering abundance > 0.7	Spatial: Sub-regional Temporal: Every 6 years, linked to IMAP reporting cycle, alternatively every 3 years linked to NE-Atlantic flyway count initiative	Spatial: Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population,) Non-breeding population: sub-national representative number of known sites

							Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests reproductive success Adult survival rates from capture-mark-resighting of monitored nests (colour-ringing of breeding adults) Immature survival rates from capture-mark- resighting (via colour ringing of chicks directly after hatching	Model-based baseline: Population growth rates in the last 6 to 12 years where data is available	Population growth rate to be set close to 1.0 over a 6 years average as requirement to reach GES	Spatial: Sub-regional Temporal: Annual: breeding success from sub-samples Every six year: adult and immature survival	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual: breeding success Every six year: adult and immature survival
3	Mediterranean Shag *Gulosus aristotelis desmarestii*	CI3: Species Distributional Range	Distribution of breeding colonies, and separately, distribution during non-breeding (July roosts)	Reference-based baseline for breeding and non-breeding population separately: Widest known range in the last 20 years, except a major and reversible decline in	Not more than 10% deviation from baseline, (potentially re-evaluated at higher threshold due to potentially strong fluctuations between years, alternatively:	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to MSFD reporting cycle

				the range is known to have taken place before	10% deviation between averages)		
		CI 4: Population abundance	For breeding birds: Annual relative breeding bird abundance For non-breeding birds: Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: Annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Every six-years	Spatial: Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population) Non-breeding population: sub-national: relevant, representative sites during mid-winter counts Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests (alternatively count of fledglings pre-dispersal to reduce disturbance) Adult survival rates from capture-mark-resighting of monitored nests (colour-ringing of breeding adults) Immature survival rates from capture-	Model-based baseline: Population growth rates in the last assessment cycle	Deviation from baseline: Population growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Every six year: adult and immature survival Annual: reproductive success	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Relevant, representative sites for mid-winter counts Temporal: Annual

			mark- resighting (via colour ringing of chicks),additionally by ratio adult vs first year birds at roosts (July counts).				
4	Audouin's Gull *Ichthyaetus audouinii*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Maximum range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1981)	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National, surveys covering all known (major) breeding colonies per country Temporal: Annual highly recommended! (where not feasible 1 to 2 times within a 6 years reporting cycle)
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait): Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid-winter, bottleneck during outbound migration Temporal: Annual

		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies All important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration Temporal: Annual for breeding success, adult and immature survival
5	Slender-billed Gull *Chroicocephalus genei*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Average range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1980)	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National, surveys covering all known (major) breeding colonies per country Temporal: Annual if feasible, alternatively 1 to 2 times within a 6 years reporting cycle

		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at roosting areas during post-breeding Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Average breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: Annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid-winter Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies All important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals Temporal: Annual for breeding success, adult and immature survival

			cross-assessment of reproductive output				
6	Lesser-crested Tern *Thalasseus bengalensis emigratus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Maximum range of breeding colonies as measured in the last 20 years	Not more than 10% deviation from baseline, set as a preliminary value, potentially to be set lower due to restricted range	Spatial: Sub-regional Temporal: Every six years	Annual for breeding success, adult and immature survival
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait) Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid-winter, bottleneck during outbound migration Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging,	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional, national (Libya) Temporal: Annual: breeding success, immature and adult	Spatial: National or sub-national All colonies Representative subsample of nests/ chicks from these sample colonies All mid-winter aggregations

			immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output if feasible			survival rates with reporting every six years	per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration Temporal: Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance
7	Sandwich Tern *Thalasseus sandvicensis*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding and wintering birds % Shift in occupancy for breeding and wintering population	Maximum range of breeding colonies as measured in the last 20 years	Not more than 10% deviation from baseline	Spatial: Sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Relative abundance for breeding and wintering birds	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Annual relative abundance > 0.7	Sub-regional Annual where feasible, with reporting every six-years	Sub-national: Breeding: high and low pressure areas > sample of nests Wintering: selection of high and low pressure areas or all

							known areas Temporal: annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at mid-winter roosts for cross-assessment of reproductive output if feasible	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Regional, Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Temporal: Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance
8	Mediterranean Storm-petrel *Hydrobates pelagicus melitensis*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles

		CI 4: Population abundance	Annual relative breeding bird abundance	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: Relative annual abundance > 0.8	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017)) Temporal: every 3 to 6 years
		CI5: Population Demographic Characteristics	Population growth rate: Adult survival rates from capture-mark-recapture of monitored colonies	Model-based baseline: Average population growth rates if available in the last 6 to 12 years	Average growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Aiming at annual monitoring and assessment with reporting every six years	Spatial: National or sub-national, representative subsamples Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual
9	Scopoli's Shearwater *Calonectris diomedea*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird	Reference-based (modern) baseline:	Deviation from baseline: Relative	Spatial: Regional or sub-regional	Spatial: National or sub-national (at least 40% of the

			abundance supported by or substituted with raft counts where deemed suitable, following the confirmation of connectivity of rafts with certain colonies by means of GPS-tracking	Abundance at the start of the implementation of BD (1980): needs to be discussed Highest breeding abundance estimate in the last 20 years	annual abundance > 0.8	Temporal: Aiming at annual monitoring and assessment with reporting every six	national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017)) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate of at least 1.0	Spatial: Regional Temporal: Annual	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual
10	Yelkouan Shearwater *Puffinus yelkouan*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird	Reference-based (modern) baseline:	Deviation from baseline: annual	Spatial: Regional and sub-regional	Spatial: National

			abundance by combination of methods including CMR in colonies; supported by land-based passage counts in the evening, combined with telemetry were deemed suitable	Highest breeding abundance estimate in the last 20 years	relative breeding abundance > 0.9	Temporal: Every six years	Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Annual	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual
11	Balearic Shearwater *Puffinus mauretanicus*	CI3: Species Distributional Range	Distributional pattern: % change in occupancy in distribution range of breeding birds Distributional pattern: % change in at-sea distribution (50% KDE), modelled from representative number of tracked	Reference-based 'modern' baseline: Due to unfavourable conservation status (CR): maximum ranges (at sea and regarding breeding colonies) e.g. since start of the implementation of BD (1980)	No negative deviation in range size between assessment cycles due to precarious conservation status. Maximum 10% in range shift between assessment cycles	Spatial: Sub-regional (Balearic islands for breeding, Western Mediterranean Sea (mainly) for at-sea distribution during breeding (relevant OSPAR sub-region during non-breeding) Temporal: Every six years	For breeding range: Balearic Islands, covering at least all known breeding areas Temporal: Annual

			individuals and/or transect line counts % Shift in occupancy				
		CI 4: Population abundance	Annual relative breeding bird abundance Annual count net maxima of individuals passing bottleneck on migration	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: annual relative breeding abundance annual relative breeding abundance 1.0 or larger	Spatial: Regional (Western Mediterranean Sea) Temporal: Aiming at annual monitoring and assessment with reporting every six years	Spatial: Sub-national (ideally 100% but at least 90% of the population) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate 1.0 or higher	Spatial: sub-regional Temporal: Annual with reporting every six years	Spatial: Sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

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I. Introduction

1. Overview

1. At their 15th meeting in January 2008, the Contracting Parties to the Barcelona Convention adopted the Ecosystem Approach (EcAp) and agreed a roadmap for its implementation to promote the sustainable use of the Mediterranean marine and coastal environment (COP 15 Decision IG.17/6, 2008). The ultimate objective of EcAp Roadmap is to achieve and maintain a Good Environmental Status (GES) of the Mediterranean Sea and coasts.

2. The EcAp Roadmap includes defining an ecological vision for the Mediterranean, setting common strategic goals, developing ecological objectives with indicators and target levels and developing relevant action plans and programmes for the assessment of these targets.

3. Under the vision of "A healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations", Contracting Parties adopted 11 Ecological Objectives, addressing all key elements of the Mediterranean marine and coastal environment. These Ecological Objectives have been further broken down into Operational Objectives together with GES definitions (COP 17 Decision IG.20/4, 2017) and targets (COP 18 Decision IG.21/3, 2013).

4. With the aim of establishing a region-wide framework for monitoring and assessment of the status of the Mediterranean marine and coastal environment, Contracting Parties (CPs) adopted the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (COP 19 Decision IG.22/7, 2016) in 2016.

5. The Action Plan for the Conservation of Marine and Coastal Bird Species listed in Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean adopted in 2003 and updated in 2017 (UNEP(DEPI)/MED IG.23/23) urges the CPs to achieve monitoring programmes to fill gaps in knowledge of threatened sea bird species in light of the IMAP.

6. IMAP presents 27 regionally agreed common and candidate indicators (i.e. recommended to be monitored in the initial phase of IMAP on a pilot and voluntary basis) for all Ecological Objectives (EO) for the integrated monitoring and assessment of biodiversity and fisheries, pollution and marine litter, and coast and hydrography clusters and to enable quantitative, integrated analysis of the state of the marine and coastal environment of the Mediterranean. The ultimate goal is to assess the status of the Mediterranean Sea and coast, as a basis for enhanced action.

7. Regarding the assessment of biodiversity, it should be noted that the quantitative definition of Good Environmental Status (GES) is difficult, considering the variety of assessment elements. The conceptual approach for a quantitative GES setting can be framed in a way that the resilience of the ecosystem is suited to accommodate the quantified biodiversity, or, in other words, it will be accounted in the determination of the GES boundaries as the “acceptable deviation from a reference state which reflects conditions largely free from anthropogenic pressures (COP 19 Decision IG.22/7, 2016)

8. For the high quality of assessment, baselines and thresholds will need to be agreed on following agreed scales of assessment (COP 19 Decision IG.22/7).

9. This work aims to present the baseline and threshold values, assessment criteria, scales of assessment and monitoring developed for IMAP common indicators (CI) related to seabirds and for

selected indicator species. The IMAP common indicators related to seabirds that are covered by this work are:

- CI3: Species distributional range
- CI4: Population abundance
- CI5: Population demographic characteristics

2. Definition of Good Environmental Status (GES)

10. This work follows the GES definitions (COP 17 Decision IG.20/4) and targets (COP 18 Decision IG.21/3) of the IMAP process of the Barcelona Convention, defined following the principles of an ecosystem-based approach to management of human activities, ensuring the collective pressure of such activities is at levels compatible with the achievement of GES, and that the marine and coastal ecosystems have the capacity to respond to human-induced changes and enable sustainable use of marine goods and services.

11. Within the first phase of the IMAP implementation (2016-2019), guidance factsheets were developed for each common indicator to provide concrete guidance and references to CPs, resulting in the elaboration/update of monitoring programmes aligned with the requirements of IMAP in view of the methodological approach taken.

II. Working methods for the elaboration of this document

1. Selection of Indicator Species

12. The IMAP Decision (IG.22/7) acknowledges that it is not possible to monitor all species in the region and therefore proposes focusing on representative species from a range of functional groups, which can showcase the relationship between environmental pressures and their main impacts on the marine environment. Accordingly, the guidance factsheets of the IMAP CI on seabirds (UNEP(DEPI)/MED WG.444/6/Rev.1) suggest a list of priority species, which includes 11 indicator species selected from Annex II of the Barcelona Convention out of five functional groups to be utilized for the assessment of the three relevant IMAP CIs related to seabirds.

13. This list was further amended to cover members of all relevant functional groups.

14. An Online Working Group (OWG), formed following the recommendation of the Integrated Meetings of the Ecosystem Approach Correspondence Groups on IMAP Implementation (CORMONs) and consisting of seabird experts representing various Mediterranean countries, was consulted for the selection of species.
The OWG agreed on the following decision criteria for the selection of species:

- marine species *sensu lato*, ideally with a wide distribution across the Mediterranean;
- species suitable to regional assessment of GES;
- species of major conservation concern in the Mediterranean; and
- species representing the various functional groups well.

15. Based on the discussion with the OWG and the consultation phase, 12 species were being suggested as indicator species for this work (Table 1). However, one species, namely F. eleonorae was especially questioned as a suitable indicator species and was therefore omitted leading to a final list of 11 indicator species.

16. It should be noted that the Contracting Parties who have the necessary means and are willing to do so can go beyond the monitoring requirements of this reference list.

Table 1 Indicator species from all relevant functional groups selected for this work, species in light grey: pre-selected but omitted from latest list.

Functional Group	Minimum list as appear in the IMAP Decision	Species	
Coastal top predators	---	*Pandion haliaetus*	Osprey
		~~*Falco eleonorae*~~	~~Eleonora's Falcon~~
Intertidal benthic-feeders	---	*Charadrius alexandrinus*	Kentish plover
Inshore benthic feeders	*Phalacrocorax aristotelis (Linnaeus, 1761)*	*Gulosus aristotelis desmarestii*	(Mediterranean) Shag
Offshore surface-feeders	*Larus audouinii (Payraudeau, 1826)*	*Ichthyaetus audouinii*	Audouin's gull
Inshore surface feeders	*Sterna spp.*	*Croicocephalus genei*	Slender-billed Gull
		Thalasseus bengalensis emigratus	Lesser Crested Tern
		Thalasseus sandvicensis	Sandwich Tern
Offshore (surface or pelagic) feeders	*Puffinus spp.*	*Hydrobates pelagicus melitensis*	Mediterranean Storm-petrel
		Calonectris diomedea	Scopoli's Shearwater
		Puffinus yelkouan	Yelkouan Shearwater
		Puffinus mauretanicus	Balearic Shearwater

2. Review of national monitoring plans prepared during the first phase of the IMAP implementation (2016 -2019)

17. During the first phase of IMAP implementation (2016-2019 and within the EcAp-Med II Project), national monitoring programmes for marine Biodiversity were developed for Algeria, Egypt, Israel, Lebanon, Libya, Morocco, and Tunisia. In addition, integrated monitoring programmes for Albania and Montenegro were elaborated under the GEF Adriatic Project (UNEP/MAP-PAP/RAC-SPA/RAC, MET and NAPA 2021, UNEP/MAP-PAP/RAC-SPA/RAC and MESPU 2021) as well as thematic Monitoring programmes for the same countries. These Plans were reviewed to understand the priorities and the capacity of each country in monitoring the common indicators related to biodiversity, including seabirds. The review focused only on selected indicator species and relevant action plans for

each country. Information on the status of seabird monitoring, data availability and capacity for monitoring for each country were noted and considered when defining baselines, thresholds and scales of monitoring and assessment.

3. Methodology for the definition of baseline and threshold values

18. To define baseline and threshold values, established methodologies from other regional sea conventions were reviewed and adapted or modified according to species or data availability in the Mediterranean. The aim in taking the other sea conventions as a reference was to achieve maximum harmonisation of the methodologies in the Mediterranean. Within the GEF Adriatic Project, Towards an Integrated Marine Good Environmental Status (GES) Assessments were elaborated for Albania and Montenegro, as well as thematic documents for EO1, EO2, EO5, EO7, EO8, EO9 and EO10. These are the first approaches within IMAP for an integrated GES, which also included, at the extent possible, alignment with MSFD.

19. Major difficulties overall are seen in the large heterogeneity in available data, lack of data, uncertainty and/or lack of historic data that would allow definition of a ‘pristine state’, as well as heterogeneity in resources and/or capacities of different CPs in monitoring.

20. Here, we propose ways forward to implement methodologies for the establishment of baseline and threshold values for each of the relevant common indicators. These will then be further specified and where possible applied in the species section below. In some cases, potential alternatives to be discussed and decided by the OWG are listed as well. A summary of the methodologies related to each Common Indicator is given in Table 2.

Table 2 A summary of Common Indicators related to seabirds

Common Indicator 3: Species Distributional Range	
The objective of this indicator is to determine the species range of the seabirds that are present in Mediterranean waters; especially the species selected by the Parties	
GES Definition:	The distribution of seabird species continues to occur in all of their Mediterranean natural habitats. 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)
Operational Objective:	Species distributional range is maintained for species of LC or increased for species with conservation concerns (NT, VU, EN, CR)
GES Target:	No significant reduction in the population distributional range in the Mediterranean in all indicator species which are listed as LC; significant increase in the population distributional range in the Mediterranean in all indicator species which are currently listed with conservation concern New colonies are established, and the population is encouraged to spread among several alternative breeding sites, especially for species with conservation concern
Target Evaluation Method:	Evaluation of changes in the distribution range and shifts in occupancy against a reference-based baseline for the selected species (most importantly for breeding but also for non-breeding populations) every six years
Common Indicator 4: Species Population Abundance	
The objective of this indicator is to determine the population status of selected species by medium to long term monitoring to obtain population trends for these species	
GES Definition:	The species population has abundance levels allowing 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
Operational Objective:	Breeding population size of selected species is maintained or, where depleted, it recovers to natural levels
GES Target:	No human induced decrease in population abundance. Population recovers towards natural levels where depleted. The total number of individuals is sparse enough in different spots
Target Evaluation Method:	Evaluation of annual relative breeding and non-breeding bird abundance against a reference-based baseline
Common Indicator 3: Population Demographic Characteristics	
The objective of this indicator is to determine changes in parameters that govern population dynamics of the species	
GES Definition:	Species populations are in good conditions: Natural levels of breeding success and acceptable levels of survival of young and adult birds
Operational Objective:	The population condition of selected species is maintained

GES Target:	Populations of all taxa, particularly those with IUCN threatened status are maintained in the long-term following the indication of population models. Incidental catch mortality and other anthropogenic pressures are at negligible levels, particularly for species of conservation concern
Target Evaluation Method:	Evaluation of population growth rate against a model-based baseline

EO1 CI3 - Distributional range

21. IMAP Common Indicator Guidance Facts Sheets define this indicator as "Variation in the total area (trends in the number of occupied grid cells) occupied by selected species at sea during the breeding and wintering seasons." Besides variation in the size of the area a species occupies, it is recommended to include geographical shifts in the area explicitly in the definition of this common indicator.

22. Agreed methodologies to set baselines and thresholds for CI3 are not yet established, neither in the entire region nor for the European part. Defining baselines for CI3 regarding the breeding range is feasible for most if not all indicator species, especially when the modern baseline approach (after current state assessment) is used, as the majority of seabirds breed in colonies, tend to return to the same area each year and data on their breeding distribution is available for most species and sub-regions. However, defining sensible baselines for foraging areas and especially for non-breeding populations during the breeding period such as immature birds and for birds outside the breeding period, when they are not central-place foragers, appears currently less feasible for many of the indicator species and sub-regions. We recommend adopting a phased approach and focusing on harmonising and streamlining data collection processes for at sea distribution of the species to be able to define baselines and thresholds of at-sea range at a later stage but as soon as possible. This is especially a priority for pelagic species.

23. For baseline identification, OSPAR and HELCOM use two different approaches for the same indicator, though for marine mammals (seals);

- Pristine conditions approach (e.g. 100 years ago)
- Modern baseline approach: Used when pristine conditions cannot be achieved due to irreversible long-term changes in the environment (e.g. depleted fish stocks due to increased fishing effort and climate change) or when pristine conditions are not known. The modern baseline approach focuses on occupancy at currently available sites (for breeding, roosting, feeding, etc.).

24. It is recommended using the modern baseline (current state) approach for seabirds, because pristine conditions in many cases cannot be achieved (e.g. due to urban development) and because past pristine conditions are unknown for many species and sub-regions in the Mediterranean. Furthermore, some larger breeding colonies for some species and in some regions have only been described recently (e.g. two large colonies of Yelkouan Shearwaters in Greece have been discovered in recent years (Portolou pers. comm.) Using a precautionary modern baseline approach, a hypothetical baseline that includes all known breeding locations since 1980 (start of the implementation of BD in Europe) can be defined. However, the data availability and therefore feasibility of this method should be further discussed with the OWG. As a potentially more feasible alternative, we recommend defining a baseline with the widest range constructed using every colony active at any given time within the past 20 years.

25. For setting threshold values, Palialexis et al. (2021) suggest testing a methodology for the Mediterranean according to Humphreys et al., (2014), which proved feasible in the Atlantic and Baltic Seas.

26. According to this method below parameters are calculated to measure the deviation from baseline:

- Distributional pattern – percentage change in occupancy for a given spatial unit;

$$\Delta_{distribution} = \left(\frac{B}{N} - \frac{A}{N}\right) * 100$$

27. Where A is the number of spatial units (e.g. sub-areas, grid cells) occupied by birds during reference period A; B is the number of units occupied in a subsequent period B, and N is the total number of spatial units within the assessment area.

- Shift in occupancy – an index to describe the overall shift in the distribution of a bird species between sub-areas or grid cells over time.

$$Shift = \frac{2(A\&B)}{A + B}$$

28. Where A is the number of spatial units (e.g. sub-areas, grid cells) occupied by birds during reference period A; B is the number of units occupied in a subsequent period; A&B is the number of identical units occupied in both periods. The shift index value is between 0 and 1: a value of 0 indicates that there has been a complete shift in the spatial units occupied; a value of 1 indicates there has been no shift.

29. For testing the method proposed by Humphreys et al. (2014) in the Mediterranean, regularly collected data on species range (at least over two assessment cycles) would be needed and therefore the feasibility of calculating a threshold value using this method should be further discussed according to data availability in the Mediterranean. As a potentially more feasible alternative, we recommend quantifying these parameters and using 10% deviance from baseline threshold for the assessment of CI3, as recommended for HBD range assessments in the EU CPs.

Potential methodologies for assessing the CI3

30. Breeding (nest sites): Simple, geographically sensitive annual presence/ absence data (ideally with confirmation of nesting, but not reproductive success) for each species (relatively early) during the respective breeding season on a defined grid, with grid size as small as feasible (suggested 10x10 km squares and 5x5 or 1x1 km squares for small countries). If necessary, this can be then transferred on larger scales (e.g. 50x50 km squares).

31. Breeding (foraging range): at sea distribution (transect line counts, depending on methodology also reveals geographically sensitive abundance or density data (important for MPA trigger and for monitoring CI4); tracking of representative subsamples from colonies, modelling

32. Non-breeding: Presence-absence at stopover sites on migration, moulting areas for relevant species, coastal and offshore (transect line counts), tracking of representative subsamples (modelling)

33. Non-breeding: Winter distribution (mid-winter (roost) counts for coastal wintering birds), coastal and offshore, tracking of representative subsamples - extension into regions outside the Med.

General consideration for CI3

34. Seabirds are highly mobile and especially members of the offshore functional pelagic group can travel large distances for foraging even during the breeding period when they are central place foragers. Therefore, it is suggested that a presence-absence data matrix for at sea distribution alone provides limited value. Taking abundance, densities or core areas of use (e.g. 50% KDE) into consideration seems crucial when defining distribution ranges that are biologically relevant. This can be achieved by a systematic combined approach of tracking the individuals with biologgers (e.g GPS or GLS depending on scale) and/or transmitters (e.g. GPS-GSM, argos-satellite tags, ICARUS-tags), distance sampling along transect lines at sea (e.g. following ESAS methodology, (Tasker et al.,1984; Garthe, 2004), (vessel-based or aerial)) and modelling, ideally with effort spread equally across the region as for instance transferability of track-based modelling between colonies has been shown to be limited (Péron et al., 2018). Vessel-based counts at sea can also be done opportunistically (e.g. along ferry lines) and vessel-based and aerial counts can be integrated in the surveys for cetaceans (EO1, marine mammals). Without the availability of such range data across the Mediterranean, it will hardly be possible to define baselines and thresholds for distribution ranges offshore in the region.

EO1 CI4 – Abundance

35. Definition: The Population size of selected species of seabirds is maintained.

36. In general, methodologies to achieve baseline and threshold values for seabirds are furthest developed for the assessment of abundance data CI4 (corresponding to MSFD D1C2) and to a larger extent regarding the breeding population size of particular species.

37. Indicator Definition: The index of population abundance reflects the variation over time of the total population size (counted or estimated) of selected species. Population size is the number of individuals present in a population at the appropriate scale.

38. Data requirements: The number of individuals (e.g. as breeding pairs) present in a population at the appropriate scale in time (ideally annually) and space with data on e.g. 6 years or 10 years for calculating the average used as the baseline.

39. Methodology: According to methodologies initially set by UNEP/MAP (2017) a trend-based approach is taken for the RSC with trends in abundance and density as indicators for GES. Seabird species in the IUCN category Least Concern (LC) are allowed a maximum range of 30% deviation over three generations. The index of population abundance is a numerical value of species population abundance relative to the population size at base time. The average breeding population size during at least a decade is suggested as the base level (UNEP/MAP, 2017). To calculate an index of population abundance, one of the available software is the Species Trends Analysis Tool for birds (BirdSTATs), which is the standard software used across Europe by the European Bird Census Council (EBCC). The BirdSTATs tool is programmed to use and automatically run the program TRIM (TRends and Indices for Monitoring data) in batch mode to perform the statistical analysis for a series of bird counts in the dataset. In this way, it is suitable for use in all European countries participating in the Pan European Common Bird Monitoring Scheme (PECBMS). For data available at lower frequencies (e.g., every 2,

3, or 6 years), a linear trend can be estimated using simple arithmetic methods. This option increases the level of uncertainty, so an extra warning of caution must be added when making interpretations based on this kind of data (UNEP/MAP, 2018). It is recommended to take the same approach on a national scale for all Contracting Parties to the Barcelona Convention and then to integrate the results across the region, similar to the countries participating in the PECBMS.

40. Indicator Units: The index of population abundance is a numerical value of species population abundance relative to the population size at base time. The average breeding population size during at least a decade is suggested as the baseline level (UNEP/MAP, 2017).

41. Alternatives from other RSC, which take a reference-based approach: The operational marine birds' indicator in the RSC HELCOM and OSPAR estimates GES of population abundance by deviation from a modern baseline. The method has been highlighted as a good practice for the Baltic Sea and the NE Atlantic, as it achieves a high level of harmonization within and across the two regions, however it has been questioned whether the available dataset for marine species in the Mediterranean would allow an immediate implementation (Palialexis et al., 2021).

42. The assessment uses a simple and straightforward calculation where relative abundance = annual abundance/ baseline abundance. The single species assessment values use two different values that are designed to reflect the resilience of different species to decline in their population (see ICES, 2008, 2010, 2011). It is desirable for the annual relative abundance of a species to be above, either:

- 0.8 (i.e., 80% of the baseline) – for species that lay one egg; or
- 0.7 (i.e., 70% of the baseline) – for species that lay more than one egg.

43. An issue to explore further is related to the objective baseline, which entails some additional work from the regional bird experts. The method requires time-series of species abundance data at a sub-region scale; however, differences in national monitoring data (Palialexis et al. 2021) can be weighted by the number of sample sites. It is also possible to set thresholds for population abundance by estimating a possible carrying capacity of the environment for a species. An advantage of the methodology is that it is also established for community assessment where GES is reached if for instance at least 75% of assessed species reach the desirable annual relative abundance. The community approach could also be applied on different geographical scales (e.g. sub-regions, MPAs) or for functional groups.

44. In the RSC OSPAR and HELCOM, some progress has been made by replacing the classical TRIM analyses (Van Strien et al., 2004) with generalized additive modelling (GAM), including abiotic factors such as winter air temperature as a covariate in the model (ICES, 2008, 2011; Aunins et al., 2013). The procedure gives yearly single species indices corrected for such abiotic factors, therefore allowing for assessments of the effects of climate change in the long-term. This improvement could be considered by UNEP/MAP, which includes the TRIM analysis in the assessment of marine birds. It would be interesting to explore and test the applicability of this approach to the Mediterranean, since the required data can be retrieved from the BD reporting and the methodology is well developed and tested (Palialexis et al. 2021).

Potential methodologies for assessing the CI4

45. Breeding: Number of breeding pairs, ideally total counts but otherwise estimated using capture-mark-recapture (CMR) and population modelling methods annually or at suitable temporal scales (detailed in the species account) for specific species and in a standardised way. Annual counts of active nests.

46. Non-breeding: Standardised counts at known wintering sites (mid-winter (roost) counts for coastal wintering birds), coastal and offshore via distance sampling along transect lines and modelling.

General consideration for CI4

47. Some seabird species, especially Procellariiformes, form metapopulations with varying local population sizes and usually with non-continuous breeding distributions. Due to challenging access to nests, indirect methods such as raft counts, acoustic monitoring or extrapolation of the direct counts in a small sampling area have been used to estimate the breeding abundance in the past. Where feasible, we recommend using CMR approaches for estimating abundance rather than these indirect methods which are widely believed to be less accurate and hence produce a wider range of population abundance estimates, making trend assessments more difficult. Furthermore, many procellariiform seabird species are known to have sabbaticals which can impact both, estimates of reproductive success and adult annual survival rates, especially if monitoring is not carried out annually.

48. Some gull- and tern species such as I. audouinii and T. sandvicensis move entire colonies to different locations, for instance as an answer to disturbance. Others can have replacement clutches in case they lose the first brood e.g. as a result of flooding. Keeping part of the population colour-ringed can help to pick up such events when monitoring seabird colonies.

EO1 CI5 - Demography

49. Methodologies for setting baselines and thresholds for population demographic characteristics have not been well established although there are good practices available, and lessons learnt from the other RSC OSPAR and HELCOM.

50. Relevant population demographic characteristics for birds are mainly fecundity rates and survival rates. Species populations are in good conditions, meaning that natural levels of reproductive success (fledging success rate) and acceptable levels of annual survival of adult and immature (for species in which estimation of this parameter is feasible) birds are achieved and maintained. It is clear that both demographic parameters are impacted by a combination of various anthropogenic (e.g. bycatch, disturbance, IAS) and natural (e.g. predation, weather events) pressures. However, considering the historical data availability and challenges in estimating these parameters in seabird populations, it is suggested to choose the integrated approach of monitoring these two parameters as indicators of GES and not differentiate e.g. between various causes of mortality. However, whenever feasible, integrating data on different sources of mortality in the estimation of GES should be considered to improve the assessments.

51. GES Targets for this indicator set by UNEP/MAP are:

- Status: Populations of all taxa (here with a focus on the selected indicator species), particularly those with IUCN threatened status, are maintained long-term following the indication of population models.

52. Overall, UNEP/MAP suggests a model-based approach, with the assessment of breeding success levels and their impact on population growth rate (UNEP/MAP, 2017). The current approach uses IUCN thresholds to put growth rate into context but the threshold setting method still needs to be determined in detail.

53. On the other hand, OSPAR and HELCOM focus mainly on breeding success and failure as an indicator of population demographic characteristics. However, similar to UNEP/MAP's recommendation, assessing the impact of breeding success and failure on population growth has been suggested as an improvement to this indicator recently (ICES, 2018).

54. It is recommended adopting this improved method, as proposed by UNEP/MAP, in the Mediterranean to assess CI5. Accordingly, we recommend monitoring the population growth rate through reproductive success and annual survival. Here, the indicator will be expected long-term annual growth rate of the population, if breeding productivity and adult annual survival -as modelled from CMR data or from capture-mark-resighting data of colour ringed populations- was maintained at the mean level observed in the most recent six-year period.

55. The growth rate is defined as the factor by which the population grows per year. The value is 1 for a stable population, > 1 for a growing population and < 1 for a declining population. It should be noted that Mediterranean seabirds form metapopulations and have metapopulation dynamics where local populations are connected by dispersal processes. Apart from adult annual survival rates, it is therefore crucial to take emigration and immigration or colonisation into account (and where possible monitor it in the long term) to understand the true state of a local population and determine, if possible, source versus sink populations.

56. Adult annual survival is defined as the percentage or ratio of adult individuals of a given population which are still alive after one year. Adult annual mortality is the percentage or ratio of adult individuals of a given population which have died within one year (between two assessments one year apart). Reproductive success is defined as the ratio of fledged birds to total clutch monitored: # young birds fledged / # clutches monitored -for species laying a single egg, # clutches will be equal to the number of nests monitored.

57. OSPAR's method for population growth rate recommends calculating smoothed trends from the most recent six-year rolling mean of reproductive success and adult annual survival rates and calculating population growth rate using a simple population model. The required steps for this calculation are explained in (ICES, 2020).

58. For the majority of species and populations in the region it is most certainly not feasible to assess fecundity and survival rates annually and completely. Therefore, it is important to select temporal and spatial scales of sub-samples adequately in order to achieve representativeness of collected data. While nest monitoring is necessary for the collection of data to model overall reproductive success, capture-mark-recapture (or alternatively capture-mark-resighting with colour-ringing schemes for some species such as I. audouinii) data are necessary to model annual survival/mortality rates. To date, monitoring schemes in place and therefore demographic data available still show strong biases across the region and between the indicator species. However, collection of such data can be more straightforward and require fewer resources than for instance data collection on abundance as long as representative sites are selected for sub-sampling.

59. Alternative from other RSC: OSPAR's Marine bird breeding success/failure indicator (OSPAR, 2018) is operational in the NE Atlantic having completed assessments and agreed methods to set threshold values. The benefit of this method is that it makes use of breeding success data without the need of less available data on other demographic parameters (e.g., survival). GAMs and GMLs are utilized to estimate the values and confidence intervals per year. The metric is the annual breeding failure per species per colony, with the annual breeding success <0.1 chick fledged per pair defined as failure. Thresholds are set as follows: Failure is widespread if 5% of colonies are failing per year. Widespread failure is 'frequent' if it occurs in more than 3 years out of six. This is applicable for all species except terns where a mean percentage of colonies failing per year, over the preceding 15 years is considered. For some species, breeding success is easier to measure than abundance, but the method is mainly applicable to colony-breeders. The method has the potential to be applied to the MAP region and it could be beneficial to test it accordingly. It is recommended that the feasibility and process of testing is discussed and agreed upon with the OWG.

60. OSPAR uses a reference-based modern baseline where they take the start of the time-series data as the baseline (corresponding to 1991).

Potential methodologies for assessing the CI5

61. Breeding: Population growth rate includes both survival and reproductive success rates. Survival rates estimated using capture-mark-recapture (CMR), or capture-mark-resighting for species where colour-ringing is suitable, combined with population modelling methods annually or at suitable temporal scales (detailed in the species account) for specific species and in a standardised way. Annual monitoring of reproductive success ideally carried out with more than one visit to the colonies and on a sub-sample of representative nests.

62. Non-breeding: Estimation of immature survival rates, ideally carried out with CMR approaches for species in which such an approach is feasible.

General consideration for CI5

63. For both, monitoring of reproductive success and annual survival rates in species, where it is not possible to assess the entire population, it is important to aim at a sufficient number of sufficiently large, representative subsamples of each population. Specifically for nocturnal, burrow nesting procellariiform seabird species, it can require relatively high effort. However, especially in these tubenose species, demographic parameters can deliver a more accurate picture of GES than the assessment of often extremely inaccurate assessments of population abundance. For this reason, Birdlife International states in their position paper on GES under MSFD for threshold criteria that population characteristics should be adopted as primary criterion instead of population abundance (Birdlife International, 2019).

64. One feature many seabird species have in common is that it can take them several years to reach maturity. This period between fledging and the first breeding attempt, in which they gain experience and prospect potential nest sites, is often characterized by reduced annual survival rates as compared to adults. Furthermore, this age class is more prone to immigration, emigration and less regularly encountered in the colonies. On the other hand, prospecting, not yet breeding birds can by times be very prominent in breeding colonies and create a bias when assessing abundance. Overall, this period in the

life cycle of seabirds is least known and monitoring and assessment methodologies should take potential biases this can create into account while at the same time trying to close knowledge gaps.

4. Definition of Spatial and Temporal Scales

65. For this work, we find the nested approach and regional division for the Mediterranean as defined in the 2011 Initial Integrated Assessment of the Mediterranean (UNEP/MAP, 2012) (Figure 1) meaningful in the context of monitoring and assessment of seabird-related common indicators. Accordingly following spatial units are used in this document:

1. Sub-regions
    a. Western Mediterranean
    b. Adriatic Sea
    c. Central Mediterranean
    d. Eastern Mediterranean
2. Sub-divisions (e.g. Ionian or Levantine)
3. National level (e.g. Turkey)
4. Sub-national level (e.g. 50 x 50 km grids, coastal sections, SPAs and mSPAs, defined colonies, etc.)

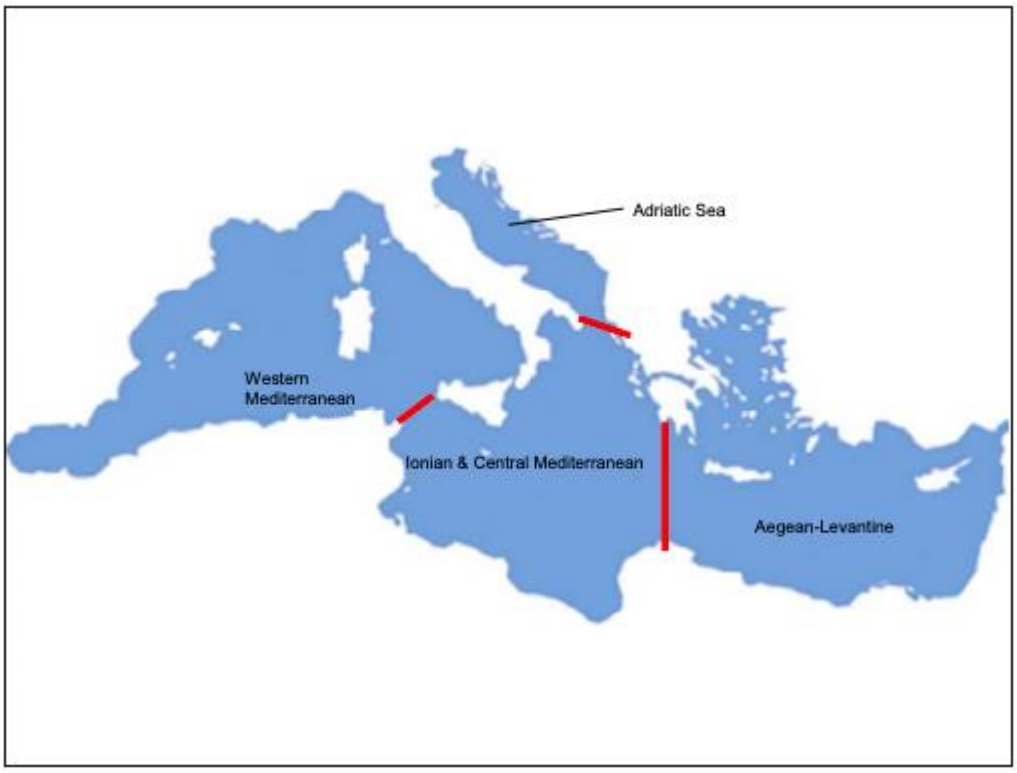

Figure 1 EcAp Sub-regions in the Mediterranean. Map taken from UNEP/MAP (2012).

66. When defining temporal scales, our focus was to enable the production of biologically meaningful data at appropriate temporal scales according to species' life history traits, as well as adopting monitoring and assessment temporal cycles that facilitate integration into existing assessment processes in the Mediterranean.

III. Indicator Species Accounts

67. All bird species suggested as indicators here form part of a sub-sample of a list of 25 endangered or threatened marine and coastal bird species in Annex II to the SPA/BD Protocol. Specific Action Plans have been proposed for all Annex II species and thus for all indicator species listed below as part of an Update of the Action Plan concerning Marine and Coastal Birds listed in Annex II to the SPA BD Protocol (UNEP(DEPI)/MED 2017). These Specific Action Plans also include proposed monitoring activities and were reviewed and consulted when compiling the indicator species accounts at hand.

68. It has to be emphasized that Contracting Parties who see the scope to add species to the list presented here ideally select them from the species list presented in Annex II to the SPA/BD Protocol.

Osprey Pandion haliaetus

- Functional group: Coastal top predator
- Population: estimated at less than 100 breeding pairs in the Mediterranean
- Distribution: Global, but in the region exclusively in the Western Mediterranean
- Countries with breeding populations in the Mediterranean: Morocco, Algeria, Spain (Balearic Islands), France (Corsica), Italy
- Conservation status: globally LC and increasing, but the present population in the Mediterranean represents about one third of the number of individuals as compared to the first half of the 20th century (Monti et al., 2018)
- Biology and life cycle: not obligate marine, but coastal population in the region, feeds exclusively on fish, open-nesting in cliffs, on trees and man-made structures, single clutch per year of 3-4 eggs, central place forager during breeding season, in the region present year-round but partial migrant.
- Main pressures: Disturbance and loss of nesting habitats due to development, direct persecution, pollutants, electrocution

Common Indicator 3: Species Distribution Range

Assessment Criteria

- Distributional pattern: % Change in occupancy in distribution range of breeding birds
- % Shift in occupancy

Baseline

Reference-based baseline:

- pristine conditions baseline with widest known range in the last 100 years
- if no reliable historic data are available, modern baseline with widest known range in last 20 years

Threshold

Not more than 10% deviation from baseline, as adopted from HBD

Scales of Assessment

Spatial: Regional and sub-regional

Temporal: Annual, with reporting every six years**,** linked to IMAP reporting cycles

Scales of Monitoring

Spatial: National, surveys covering at least all known breeding areas

Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to IMAP reporting cycles

Common Indicator 4: Population abundance of selected species

69. The assessment and monitoring of this indicator will focus on the breeding population, with the number of pairs or occupied nest sites early during the breeding period. However, the wintering population in the region will also be assessed during mid-winter counts.

Assessment Criteria

Annual relative breeding bird abundance

relative abundance = annual abundance / baseline abundance

Baseline

Reference-based (modern) baseline:

- Abundance at the start of the implementation of BD (1981)
- Alternatively: highest breeding abundance estimate in the last 20 years
- Additionally: Highest abundance of wintering population in the last 20 years

Threshold

Deviation from baseline: annual relative breeding and wintering abundance > 0.7

Scales of Assessment

Spatial: Regional and sub-regional (all sub-regions, but with main focus on Western Mediterranean Sea)
Temporal: Aiming at annual assessment with reporting every six years linked to EcAp reporting cycles

Scales of Monitoring

Spatial: National or sub-national (aiming at 100% of known nesting sites)
Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

70. The assessment and monitoring of this indicator will focus on adult survival and reproductive success of the breeding population in the region. Additionally, demographic parameters will be collected on the wintering population where possible (reading of colour-ringed individuals, ageing of wintering birds during mid-winter counts).

Assessment Criteria

Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored nests
- Survival rates of adult and young from capture-mark-resighting (colour-ringing of nestlings)

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline

Model-based baseline:

- Population growth rates in the last assessment cycle

Threshold

For the species to reach GES in the region we suggest setting a population growth rate of 1.0 or higher as the Mediterranean Osprey population is still well below the numbers as compared to those from the mid-20th century (Monti, 2012; Monti et al., 2018).

Scales of Assessment

Spatial: Regional, sub-regional and national

Temporal: Annual breeding success and survival rates with reporting every 6 years linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National or sub-national

- Aiming at 100% assessment (all known nests) of reproductive success
- Representative subsample of accessible nests for colour-ringing of nestlings

Temporal:

- Annual for breeding success and survival via reading of colour rings

Kentish Plover *Charadrius alexandrinus*

- Functional group: Intertidal benthic feeders
- Population: The European population is estimated at 21,500-34,800 pairs, which equates to 43,100-69,600 mature individuals (BirdLife International, 2021), overall population in the area of the RSC unknown.
- Countries with breeding populations in the Mediterranean: Albania, Algeria, Croatia, Cyprus, Egypt, France, Greece, Iran, Iraq, Israel, Italy, Lebanon, Libya, Malta, Morocco, Slovenia, Spain, Syria, Tunisia, Turkey.
- Conservation status: Globally LC, mainly due to its large range but decreasing both globally and in the region
- Biology and life cycle: Coastal species, usually found on sand, silt or dry mud surfaces. Prefers sparsely vegetated and sandy areas when breeding. Nests on ground, solitarily or in loose semicolonial groups. Lays 3 eggs.
- Main pressures
  - disturbance and loss of coastal habitats (mainly for recreational use)
  - degradation and loss of wetland habitat

Common Indicator 3: Species Distributional Range

71. The assessment and monitoring of this indicator will focus on the breeding (i.e. breeding pairs) and wintering population (e.g. coastal sites) of the species.

Assessment Criteria
Distributional pattern: % Change in occupancy in distribution range of breeding and wintering populations
% Shift in occupancy for breeding and wintering population

Baseline
Reference-based baseline:

- For breeding and wintering population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before

Threshold
Not more than 10% deviation from baseline, as adopted from HBD

Scales of Assessment
Spatial: Sub-regional
Temporal: Every six years, linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National
Temporal: Annual

Common Indicator 4: Population abundance of selected species

72. The assessment and monitoring of this indicator will focus both on the breeding and wintering population of the species as the species is coastal and relatively easy to monitor during non-breeding season. However, it should be noted that breeding populations of the species are not resident in all Mediterranean countries and migrate to different parts of the region in winter. This should be taken into account when monitoring the wintering birds. Methods like colour-ringing of breeders would facilitate the monitoring of the movement and abundance of wintering birds.

Assessment Criteria

For breeding birds:

- Annual relative breeding bird abundance = annual abundance / baseline abundance

For non-breeding birds

- Annual relative wintering (mid-winter counts) bird abundance = annual abundance / baseline abundance

Baseline

Reference-based (modern) baseline:
Highest breeding and wintering abundance estimates in the last 20 years

Threshold

Deviation from baseline:
annual relative breeding and wintering abundance > 0.7

Scales of Assessment

Spatial: Sub-regional
Temporal: Every 6 years, linked to IMAP reporting cycle, alternatively every 3 years linked to NE-Atlantic flyway count initiative

Scales of Monitoring

Spatial:
Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP)
Non-breeding population: sub-national representative number of known sites
Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

73. The assessment and monitoring of this indicator will focus both on the breeding and the wintering populations of the species in the region.

Assessment Criteria

Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored nests
  reproductive success = # fledged chicks / # surveyed broods
- Adult survival rates from capture-mark-resight of monitored nests (colour-ringing of breeding adults)
- Immature survival rates from capture-mark-resight (via colour ringing of chicks directly after hatching)

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline

Model-based baseline:

- Population growth rates in the last 6 to 12 years where data is available

Threshold

As species is believed to be decreasing across the region, we recommend a population growth rate to be set close to 1.0 over a 6 years average as requirement to reach GES

Scales of Assessment

Spatial: Sub-regional

Temporal:

- Annual: breeding success from sub-samples
- Every six year: adult and immature survival

Scales of Monitoring

Spatial: National or sub-national

- Representative sample of nesting areas from high pressure vs protected areas
- Representative subsample of nests from these sample colonies

Temporal:

- Annual for breeding success
- every six year: adult and immature survival

Mediterranean Shag *Gulosus aristotelis desmarestii*

- Functional group: Inshore benthic feeders
- Population: The global population of the European Shag is estimated at 230,000-240,000 individuals (Wetlands International, 2021). However, the subspecies *G.a. desmarestii* which is endemic to the Mediterranean and Black Sea, has a maximum of 10,000 breeding pairs in the Mediterranean (EU List of Annex I species BD).
- Distribution: It ranges in the entire Mediterranean, nesting on parts of the coastline of most European and north African countries. Subspecies '*desmarestii*' ranges in the Central Mediterranean and Black Sea.
- Countries with breeding populations: Albania, Algeria, Croatia, Cyprus, Egypt, France, Greece, Italy, Libya, Morocco, Spain, Tunisia, and Turkey.
- Conservation status: LC, decreasing
- Biology and life cycle: coastal species with high site fidelity. Feeds on a wide range of benthic, demersal and schooling, pelagic fish. Lays three eggs. Present year-round In most of the countries in the Mediterranean.
- Main pressures
  - at land: disturbance and development at nesting sites
  - by-catch in gill-nets and fish-traps

Common Indicator 3: Species Distributional Range

74. The assessment and monitoring of this indicator will focus on the breeding (i.e. breeding colonies) and non-breeding (e.g. July counts at coastal sites, following Scridel et al. 2022) of the species. We recommend CPs to focus on harmonising and streamlining data collection processes for at sea distribution of the species within the Mediterranean to be able to define baselines and thresholds of at-sea range at a later stage but as soon as possible. As the majority of the Mediterranean population is resident, and population genomic studies indicate that Atlantic and Mediterranean populations may be different management units, making the monitoring and assessment consistent with OSPAR is not strictly necessary but would be beneficial if any data indicates exchange of individuals between Atlantic and Mediterranean populations.

Assessment Criteria

Distributional pattern: % Change in occupancy in distribution range of breeding and non-breeding populations
% Shift in occupancy for breeding and non-breeding population

Baseline

Reference-based baseline:

- For breeding and non-breeding population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before

Threshold

Not more than 10% deviation from baseline, as adopted from HBD. However, this 10% threshold is set preliminarily and might need to be re-evaluated as the species is known to show strong fluctuations in range and abundance in some areas of its range. Alternatively, a 10% deviation of averages between assessment cycles could be used as threshold.

Scales of Assessment

Spatial: Regional and sub-regional
Temporal: Every six years, linked to EcAp reporting cycles

Scales of Monitoring

Spatial: National
Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycle

Common Indicator 4: Population abundance

75. The assessment and monitoring of this indicator will focus both on the breeding and wintering population of the species as the species is coastal and relatively easy to monitor during non-breeding season. As the breeding season for European Shags start in mid-winter in the region, regular mid-winter counts might not be informative for the wintering population of the species. We recommend monitoring the non-breeding populations in late summer (July-August) when they show maxima in the region. For the non-breeding population, we suggest aiming for synchronised mid-winter coastal (roost) counts at the sub-regional scale as it proved effective in the Adriatic region (Scridel, et al., 2022).

Assessment Criteria

For breeding birds:

- Annual relative breeding bird abundance = annual abundance / baseline abundance or average breeding bird abundance in 6-years monitoring cycle when annual monitoring is not feasible due to the high number of nesting sites.

For non-breeding birds

- Annual relative non-breeding bird abundance = annual abundance / baseline abundance

Baseline

Reference-based (modern) baseline:
Highest breeding and non-breeding abundance estimates in the last 20 years

Threshold

Deviation from baseline:
annual relative breeding and non-breeding abundance > 0.7

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Every six-years, linked to the EcAp reporting cycles

Scales of Monitoring
Spatial:
Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population, according to suggestions by UNEP/MAP (2017))
Non-breeding population: sub-national: relevant, representative sites during non-breeding season counts
Temporal: Annual or averages in 6-year monitoring cycles can be used when annual monitoring of the species is not feasible due to the high number of nesting sites.

Common Indicator 5: Population Demographic Characteristics

76. The assessment and monitoring of this indicator will focus both on the breeding and the wintering populations of the species in the region.

Assessment Criteria
Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored nests:
  reproductive success = # fledged youngs / # surveyed broods

77. It should be noted that this species is sensitive to disturbance during early-breeding season, which may result in abandoning the nests. As an alternative to several visits during the breeding season for reproductive success monitoring, post-fledgling counts before dispersal can be used. In this case breeding (a)synchrony within and between colonies should be taken into account.

- Adult survival rates from capture-mark-resight of monitored nests (colour-ringing of breeding adults)
- Immature survival rates from capture-mark-resighting (via colour ringing of chicks), additionally by ratio adult vs first winter at roosts (mid-winter counts).

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline
Model-based baseline:

- Population growth rates in the last assessment cycle

Threshold
Population growth rate of at least 1.0 (at least stable population growth is aimed at due to small population size of the subspecies in the Mediterranean)

Scales of Assessment
Spatial: Regional and sub-regional
Temporal:

- Every six year: adult and immature survival and annual reproductive success throughout the reporting cycle

Scales of Monitoring
Spatial: National or sub-national

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies

- Relevant, representative sites for non-breeding season counts

Temporal:
- Annual

Audouin's Gull *Ichthyaetus audouinii*

- Functional group: Offshore surface-feeders
- Population: global population estimated 33,000-46,000 mature individuals
- Distribution: Regional near endemic, with approximately 90% of population breeding in the Mediterranean
- Countries with breeding populations: Spain, (Portugal), France, Morocco, Algeria, Tunisia, Italy, Croatia, Greece, Cyprus, Turkey
- Conservation status: VU, decreasing
- Biology and life cycle: widely marine, forages mainly on fish including fisheries discards; lays 3-4 eggs per season; nest in colonies on rocky cliffs, offshore islands and islets, saltmarshes, and sandy peninsulas; in the Mediterranean year-round but tends to winter more along the southern Mediterranean coast and part of the population leaves into the Atlantic to winter along the NW- W-African coast (mainly young birds)
- Main pressures
  - In colonies on land: mammalian predators (eggs and chicks) in the colonies, disturbance
  - At sea: food depletion by overfishing and EU-wide ban on discards, by-catch in long-line fisheries, potentially pollution

Common Indicator 3: Species Distributional Range

Assessment Criteria
- Distributional pattern: % change in occupancy in distribution range of breeding birds
- % Shift in occupancy

Baseline
Maximum range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1981)

Threshold
Not more than 10% deviation from baseline, as adopted from HBD

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Every six years**,** linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National, surveys covering all known (major) breeding colonies per country
Temporal: Annual if feasible, alternatively 1 to 2 times within a 6years reporting cycle. Due to known shifts in occupancy annual monitoring is highly recommended.

Common Indicator 4: Population abundance of selected species

78. The assessment and monitoring of this indicator will focus both on the breeding and non-breeding population of the species.

Assessment Criteria
For breeding birds in colonies:
- Annual relative breeding bird abundance = annual abundance / baseline abundance

For non-breeding birds during coastal mid-winter roost counts for countries in which the species winters in relevant numbers and passage counts at bottlenecks during post-breeding/ post fledging migration (Gibraltar Strait)

- Annual relative non-breeding bird abundance = annual abundance / baseline abundance

Baseline
Reference-based (modern) baseline:
Highest breeding and non-breeding abundance estimates in the last 20 years

Threshold
Deviation from baseline:
annual relative breeding and non-breeding abundance > 0.7

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Annual with reporting every six-years linked to EcAp reporting cycles

Scales of Monitoring
Spatial:
Breeding population: National or sub-national, all (larger) colonies
Non-breeding population: sub-national, all known roost sites during mid-winter, bottleneck during outbound migration
Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

79. According to Genovart et al., (2018) the population dynamics of the species is mainly driven by immature survival and fertility.

Assessment Criteria
Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored colonies or subsamples
  reproductive success = # fledged youngs / # surveyed broods
- Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies
- Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline
Model-based growth rate.

Threshold
As the species is near endemic in the region, listed as VU and declining, the threshold for growth rate for the species to reach GES should be set at 1.0 or higher.

Scales of Assessment
Spatial: Sub-regional
Temporal:

- Annual: breeding success, immature and adult survival rates with reporting every six years linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National or sub-national

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies
- All important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals
- bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration

Temporal:

- Annual for breeding success, adult and immature survival

Slender-billed Gull *Chroicocephalus genei*

- Functional group: Inshore surface-feeders
- Population: the global population is estimated at 310,000-380,000 individuals (Wetlands International, 2021)
- Distribution: the species has a wide breeding distribution range with scattered localities, from Western Africa, the Mediterranean and Black Sea, Asia Minor and the Middle East to north-west India.
- Countries in the region with breeding populations: Spain, France, Tunisia, Italy, Greece, Turkey
- Conservation status: LC, with an overall unknown trend; European population is estimated to be decreasing by less than 25% in three generations
- Biology and life cycle: not strictly marine, forages mainly on fish, crustaceans and insects; lays 3-4 eggs per season; nests in colonies in estuaries, marshes, river valleys and beaches; partial migrant, in the Mediterranean year-round, occurs during the non-breeding period across the region in coastal areas.
- Main pressures
  - Loss of nesting habitats
  - Disturbance in the colonies
  - Water pollution
  - Predation by mammals and other gull species
  - Competition with other gull species

Common Indicator 3: Species Distributional Range

Assessment Criteria

- Distributional pattern: % change in occupancy in distribution range of breeding birds
- % Shift in occupancy

Baseline
Average range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1980)

Threshold
Not more than 10% deviation from baseline, as adopted from HBD

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Every six years**,** linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National, surveys covering all known (major) breeding colonies per country
Temporal: Annual if feasible, alternatively 1 to 2 times within a 6-year reporting cycle

Common Indicator 4: Population abundance of selected species

80. The assessment and monitoring of this indicator will focus both on the breeding and non-breeding population of the species.

Assessment Criteria

For breeding birds in colonies:

- Annual relative breeding bird abundance = annual abundance / baseline abundance

For non-breeding birds during coastal mid-winter roost counts and at roosting areas during post-breeding

- Annual relative non-breeding bird abundance = annual abundance / baseline abundance

Baseline

Reference-based (modern) baseline:

Average breeding and non-breeding abundance estimates in the last 20 years

Threshold

Deviation from baseline:

Annual relative breeding and non-breeding abundance > 0.7

Scales of Assessment

Spatial: Regional and sub-regional

Temporal: Annual with reporting every six-years linked to EcAp reporting cycles

Scales of Monitoring

Spatial:

Breeding population: National or sub-national, all (larger) colonies

Non-breeding population: sub-national, all known roost sites during mid-winter

Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

Assessment Criteria

Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored colonies or subsamples
  reproductive success = # fledged young / # surveyed broods
- Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies
- Ratio of first winter versus adult birds from mid-winter roost counts for cross-assessment of reproductive output

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline

Model-based growth rate.

Threshold

The species has a wide distribution range and is listed as LC, however for precautionary reasons, the threshold for growth rate for the species to reach GES should be set at 1.

Scales of Assessment

Spatial: Sub-regional

Temporal:

- Annual: breeding success, immature and adult survival rates with reporting every six years linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National or sub-national

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies
- All important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals

Temporal:

- Annual for breeding success, adult and immature survival

Lesser-crested Tern *Thalasseus bengalensis emigratus*

- Functional group: Inshore surface-feeders
- Population: global population of the species estimated at 225,000 birds, but subspecies *emigratus* numbered some 4,000 birds in 1993 (HBW), or a maximum of less than 2,300 pairs in 2009 (Hamza et al., 2011)
- Distribution: subspecies endemic to the sub-region
- Country with breeding population: Libya
- Conservation status: globally assessed as LC and stable (BLI), but subspecies/ Mediterranean population extremely vulnerable due to small population size and restricted distribution range in very few colonies.
- Biology and life cycle: marine, forages mainly on small fish in coastal waters; lays 3 eggs per season; nest in colonies on sandy islands and islets close to the coast or coastal lagoons; in the Mediterranean year-round, but partially migratory, wintering along the S and SW Mediterranean coast, but also along the W-African coast in the Atlantic.
- Main pressures
  - In colonies on land: anthropogenic disturbance and habitat alterations, predation of eggs and chicks by gulls and mammals
  - At sea: overfishing, potentially pollution

81. A detailed monitoring plan for the Libyan population is available (UNEP/MAP, 2012). Due to security issues, there has not been any update on any population parameters since 2012.

Common Indicator 3: Species Distributional Range

Assessment Criteria

- Distributional pattern: % change in occupancy in distribution range of breeding birds
- % Shift in occupancy

Baseline
Maximum range of breeding colonies as measured in the last 20 years

Threshold
82. Not more than 10% deviation from baseline, as adopted from HBD is recommended as a start but due to conservation status and narrow range of the species, a lower threshold should be considered. However, as the species is known to move the entire colony between different years, this point requires further discussion, ideally based on insights from the most recent monitoring data on the species.

Scales of Assessment
Spatial: sub-regional
Temporal: Every six years**,** linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National, surveys covering all known breeding colonies and suitable nest-sites in Libya
Temporal: Annual

Common Indicator 4: Population abundance

83. The assessment and monitoring of this indicator will focus both on the breeding and non-breeding population of the species.

Assessment Criteria
For breeding birds in colonies:

- Annual relative breeding bird abundance = annual abundance / baseline abundance

For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait)

- Annual relative non-breeding bird abundance = annual abundance / baseline abundance

Baseline
Reference-based (modern) baseline:
Highest breeding and non-breeding abundance estimates in the last 20 years

Threshold
Deviation from baseline:
annual relative breeding and non-breeding abundance > 0.7

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Annual with reporting every six-years linked to EcAp reporting cycles

Scales of Monitoring
Spatial:
Breeding population: National or sub-national, all (larger) colonies
Non-breeding population: sub-national, all known roost sites during mid-winter, bottleneck during outbound migration
Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

Assessment Criteria
Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored colonies or subsamples
  reproductive success = #fledged youngs / # surveyed broods
- Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies
- Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output if feasible

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline
Model-based growth rate.

Threshold

84. As the relevant subspecies is endemic to the region, with overall small population size and very restricted breeding range, it is recommended to set the threshold for growth rate for the species to reach GES at 1.0 or higher, at least for a 6-year average.

Scales of Assessment

Spatial: Sub-regional, national (Libya)

Temporal:

- Annual: breeding success, immature and adult survival rates with reporting every six years linked to EcAp reporting cycles

Scales of Monitoring

Spatial: National or sub-national

- All colonies
- Representative subsample of nests/ chicks from these sample colonies
- All mid-winter aggregations per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals
- bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration

Temporal:

Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance

Sandwich Tern *Thalasseus sandvicensis*

- Functional group: Inshore surface feeders
- Population: The European population is estimated at 79,900-148,000 pairs, which equates to 160,000-295,000 mature individuals (BirdLife International 2021). The population of the Mediterranean and Black Sea is estimated at 20,270 – 65,670 bp.
- Distribution: Almost exclusively coastal during breeding season.
- Countries with native populations: Albania, Algeria, Croatia, Cyprus, Egypt, France, Greece, Iran, Iraq, Israel, Italy, Lebanon, Libya, Malta, Morocco, Slovenia, Spain, Syria, Tunisia, Turkey
- Conservation status: Globally LC with stable trend. The EU population is fluctuating.
- Biology and life cycle: Breeds in relatively denser colonies in comparison to other tern species, and in coastal areas with available feeding grounds closeby. Main prey consists predominantly of surface-dwelling marine fish 9-15 cm long. Lays 2 eggs but clutch size varies between years and locations. Due to its larger size in comparison to other terns, Sandwich Terns can make longer foraging trips from their colonies, habitually fly 30 km or more (Cabot and Nisbet, 2013).
- Main pressures: highly vulnerable to anthropogenic disturbance in colonies

Common Indicator 3: Species Distributional Range

85. The assessment and monitoring of this indicator will focus both on the breeding and the wintering populations of the species in the region

86. The Sandwich Tern is considered as very flexible with respect to breeding site selection and easily abandon a site when encountered disturbance/predators early in the season (Cabot and Nisbet, 2013) and therefore we recommend adopting a trans-boundary approach in monitoring the range and abundance of the species, and producing comparable data with other RGCs, covering the entire range in Europe as much as possible to better interpret the changes in range and abundance.

Assessment Criteria
Distributional pattern: % change in occupancy in distribution range of breeding and wintering birds
% Shift in occupancy

Baseline
Maximum range of breeding colonies and wintering locations as measured in the last 20 years,

Threshold
10% deviation from baseline

Scales of Assessment
Spatial: Sub-regional
Temporal: Every six years

Scales of Monitoring
Spatial: National
Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles

Common Indicator 4: Population abundance of selected species
Breeding and wintering populations

Assessment Criteria
Relative abundance for breeding and wintering birds

Baseline
Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years

Threshold
Annual relative abundance > 0.7

Scales of Assessment
Sub-regional
Annual where feasible, with reporting every six-years linked to EcAp reporting cycles

Scales of Monitoring
Sub-national:
Breeding: high- and low-pressure areas > sample of nests
Wintering: selection of high- and low-pressure areas or all known areas
Temporal: annual

Common Indicator 5: Population Demographic Characteristics
Breeding population only

Assessment Criteria
Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored colonies or subsamples
    - reproductive success = # fledged young / # surveyed broods
- Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies
- Ratio of first winter versus adult birds from counts at mid-winter roosts for cross-assessment of reproductive output if feasible

Indicator: expected long-term annual growth rate of the population, if breeding productivity and adult annual survival was maintained at the mean level observed in the most recent six-year period.

Baseline
Model-based growth rate.

Threshold
Population growth rate of at least 1.0

Scales of Assessment
Spatial: Regional, Sub-regional
Temporal:

- Annual: breeding success, immature and adult survival rates with reporting every six years linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National or sub-national
Temporal:
Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance

Mediterranean Storm-petrel *Hydrobates pelagicus melitensis*

- Functional group: Offshore surface or pelagic feeder
- Population: Mediterranean subspecies is estimated at less than 16,000 breeding pairs and at 10,476 - 14,296 breeding pairs in European countries of the Mediterranean. Large proportion of the population is restricted to a few archipelagos with Malta holding 50% and Italy holding 30% of the population.
- Distribution: Western Palearctic species with regional endemic subspecies. Large breeding colonies are distributed in the central and western Mediterranean, but surveys are lacking along the North African coast, Eastern Mediterranean and Adriatic.
- Countries with confirmed breeding: France, Greece, Italy, Malta, Spain
- Conservation status: LC, decreasing
- Biology and life cycle: Breeds on rocky islands and islets, among boulders. Lays a single egg. Highly mobile, but also highly philopatric.
- Main pressures
  - In colonies on land: predation by mammals and Yellow-legged gulls, development and disturbance incl. light pollution
  - At sea: potentially pollution

Common Indicator 3: Species Distributional Range

87. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies at this stage. We recommend CPs to focus on harmonising and streamlining data collection processes for at sea distribution of the species to be able to define baselines and thresholds of at-sea range at a later stage but as soon as possible.

Assessment Criteria

- Distributional pattern: % change in occupancy in distribution range of breeding birds
- % Shift in occupancy

Baseline
Reference-based baseline:

- Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before

Threshold
Not more than 10% deviation from baseline, as adopted from HBD

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Due to vulnerability of the species every 3 years, equivalent to 2 times per EcAp reporting cycles

Scales of Monitoring
Spatial: National
Temporal: Annual where feasible and depending on scale, alternatively two to three times within six years, linked to EcAp reporting cycles

Common Indicator 4: Population abundance

88. The assessment and monitoring of this indicator will mainly focus on the breeding population of the species i.e. breeding colonies and breeding pairs (or mature adult individuals), as it is very challenging to reliably quantify and monitor the abundance of the non-breeding population. However, even monitoring breeding populations is not very easy in some places due to inaccessible nesting sites. Some relatively easier but unreliable methods such as estimating abundance from call-playback surveys (Soanes et al., 2012) during the incubation phase (throughout the day) can be applied inside of breeding colonies where CMR is not feasible. We recommend using CMR in assessing the abundance of this species and therefore abundance estimates carried out in different temporal cycles (e.g. every 3 years instead of on an annual basis) than the other species.

Assessment Criteria
Annual relative breeding bird abundance

- relative abundance = annual abundance / baseline abundance

Baseline
Reference-based (modern) baseline:

- Highest breeding abundance estimate in the last 20 years

Threshold
Deviation from baseline: Relative annual abundance > 0.8

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Every six years, linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017))
Temporal: every 3 to 6 years

Common Indicator 5: Population Demographic Characteristics

89. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies, as population dynamics of the species are driven mainly by adult survival and reproductive success (Sanz-Aguilar et al., 2009). Additionally, it is very challenging to reliably

quantify and monitor the demographic characteristics of the non-breeding population. However, even monitoring the breeding population of this species is challenging, especially monitoring the nests for reproductive success. We therefore recommend focusing the effort on long-term CMR studies to quantify the survival.

Assessment Criteria
Population growth rate

- Adult survival rates from capture-mark-recapture of monitored colonies

Baseline
Model-based baseline:

- Average population growth rates if available in the last 6 to 12 years

Threshold
Average growth rate of at least 1.0

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Aiming at annual monitoring and assessment with reporting every six years

Scales of Monitoring
Spatial: National or sub-national, representative subsamples

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies

Temporal: Annual

Scopoli's Shearwater *Calonectris diomedea*

- Functional group: Offshore surface or pelagic feeder
- Population: estimated at 285,000-446,000 mature individuals (BirdLife International 2021)
- Distribution: Regional endemic (breeding), wide range within the region, main distribution towards the western and central Mediterranean
- Countries with breeding populations: Confirmed breeding in Algeria, Croatia, France, Greece, Italy, Malta, Spain, and Tunisia. Breeding is suspected in Turkey
- Conservation status: LC, decreasing
- Biology and life cycle: obligate marine species, main prey squid and fish, partially fisheries discards, max. 1 egg per season, nest in burrows, cave or crevice, nocturnal in colonies, highly mobile, but also highly philopatric, large range during foraging, species spends non-breeding period (Nov-March) mainly in the Atlantic, i.e. some pressures on the species are active outside the region
- Main pressures
  - In colonies on land: IAS such as *R. rattus*, development and disturbance incl. light pollution
  - At sea: by-catch mainly in long-line fisheries, potentially pollution

Common Indicator 3: Species Distributional Range

90. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies at this stage. We recommend CPs to focus on harmonising and streamlining data collection processes for at sea distribution of the species to be able to define baselines and thresholds of at-sea range at a later stage but as soon as possible.

Assessment Criteria
Distributional pattern: % Change in occupancy in distribution range of breeding birds

% Shift in occupancy

Baseline
Reference-based baseline:
Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before

Threshold
Not more than 10% deviation from baseline in six years (i.e. each assessment cycle), as adopted from HBD

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Every six years**,** linked to the EcAp reporting cycles

Scales of Monitoring
Spatial: National, surveys covering at least all known breeding areas
Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to the EcAp reporting cycle

Common Indicator 4: Population abundance

91. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies and breeding pairs (or mature adult individuals), as it is very challenging to reliably quantify and monitor the abundance of the non-breeding population. Scopoli's Shearwaters tend to raft closer to the colonies and seem loyal to their rafting sites in comparison to other shearwaters in the region and therefore raft counts can be used as a supporting method for population abundance monitoring where monitoring in certain nesting sites is not feasible. A time window of the raft counts a few days post-hatching is believed to provide best results. Furthermore, connectivity of rafts with certain colonies should be confirmed via telemetry (gps-tagging in colonies). However, raft counts are not recommended as a primary method as the behaviour might vary in different regions in the Mediterranean.

Assessment Criteria
Annual relative breeding bird abundance

- relative abundance = annual abundance / baseline abundance

Baseline
Reference-based (modern) baseline:

- Abundance at the start of the implementation of BD (1980): needs to be discussed
- Highest breeding abundance estimate in the last 20 years

Threshold
Deviation from baseline: annual relative breeding abundance > 0.8. As the range between higher and lower population estimates is wide, deviation from baseline would need to be given for both estimates.

Scales of Assessment
Spatial: Regional or sub-regional
Temporal: Aiming at annual monitoring and assessment with reporting every six years linked to EcAp reporting cycle

Scales of Monitoring
Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017))
Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

92. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies, as population dynamics of the species is believed to be driven mainly by adult survival and reproductive success. Additionally, it is very challenging to reliably quantify and monitor the demographic characteristics of the non-breeding population.

93. Besides reproductive success, monitoring adult survival for this species (and other shearwaters) is important as loss of adults due to high adult mortality would be masked by recruitment processes (e.g. immigration) and therefore would produce a stable trend for a certain population (Sanz-Aguilar et al., 2016).

Assessment Criteria
Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success of monitored nests
- Adult survival rates from capture-mark-recapture of monitored nests

Baseline
Model-based approach:

- Population growth rates over one assessment and reporting cycle

Threshold
Population growth rate of at least 1.0

Scales of Assessment
Spatial: Regional
Temporal: Annual

Scales of Monitoring
Spatial:
National or sub-national

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies

Temporal: Annual

Yelkouan Shearwater *Puffinus yelkouan*

- Functional group: Offshore (surface or pelagic) feeders
- Population: 15,337-30,519 pairs, roughly equating to 46,000-92,000 individuals (Derhé, 2012)
- Distribution: Region endemic (or near-endemic, if still breeding in the Black Sea) with strongholds towards the central and eastern Mediterranean. In the western (Balearic Islands) it is replaced by the sibling taxon *P. mauretanicus*, with which it may form a stable hybrid population on Menorca.
- Countries with breeding populations confirmed in the recent past: France, Italy, Malta, Algeria, Tunisia, Croatia, Albania, Greece. Breeding was confirmed in the past also in Bulgaria and is suspected to breed in Turkey.
- Conservation status: VU, decreasing

- Biology and life cycle: obligate marine species, prey fish, squid, crustaceans; lays max. 1 egg per season, nest in burrows, cave or crevice, nocturnal in colonies, highly mobile, but also highly philopatric, large range during foraging, in the Mediterranean year-round but part of the breeding population moves eastwards and spends non-breeding period (July-November) in the Black Sea, i.e. some pressures on the species are active outside the region
- Main pressures
  - In colonies on land: IAS such as *R. rattus*, development and disturbance incl. light pollution
  - At sea: by-catch mainly in long-line fisheries, potentially pollution

Common Indicator 3: Species Distributional Range

94. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies at this stage. We recommend CPs to focus on harmonising and streamlining data collection processes for at sea distribution of the species to be able to define baselines and thresholds of at-sea range at a later stage but as soon as possible.

Assessment Criteria
Distributional pattern: % change in occupancy in distribution range of breeding birds
% Shift in occupancy

Baseline
Reference-based baseline:

- Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before

Threshold
Not more than 10% deviation from baseline, as adopted from HBD

Scales of Assessment
Spatial: Regional and sub-regional
Temporal: Every six years, linked to EcAp reporting cycles

Scales of Monitoring
Spatial: National
Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycle

Common Indicator 4: Population abundance

95. The assessment and monitoring of this indicator will mainly focus on the breeding population of the species i.e. breeding colonies and breeding pairs (or mature adult individuals), as it is very challenging to reliably quantify and monitor the abundance of the non-breeding population. However, we strongly recommend complementing the breeding abundance monitoring with synchronised monitoring at known passage bottlenecks, e.g. the Bosporus and Dardanelles (Turkey), Lesvos (Greece) during an agreed time period during the high seasons. This monitoring data can be evaluated as a 'surveillance indicator' without being quantitatively assessed against a threshold value. Land-based passage counts in the evening, ideally combined with telemetry, can be used in the same manner in suitable breeding locations as a supporting method in monitoring abundance at nesting sites.

96. Accessibility can be a challenge for some nesting sites of the species. For such sites raft counts, land-based evening counts or call counts at night can be considered as an alternative method. Rafting

locations of different colonies can be confirmed from available tracking data as well. However, we strongly recommend using the CMR approach in colonies wherever possible and don't recommend using the above as the primary method for abundance estimation in the majority of the breeding sites at the national scale.

Assessment Criteria

Annual relative breeding bird abundance

- relative abundance = annual abundance / baseline abundance

Baseline

Reference-based (modern) baseline:

- Highest breeding abundance estimate in the last 20 years

Threshold

Deviation from baseline:

- annual relative breeding abundance > 0.9 (higher due to the conservation status of the species)

Scales of Assessment

Spatial: Regional and sub-regional
Temporal: Every six years, linked to EcAp reporting cycles

Scales of Monitoring

Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP)
Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

97. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies, as population dynamics of the species are driven mainly by adult survival and reproductive success (Oppel et al., 2011). Additionally, it is very challenging to reliably quantify and monitor the demographic characteristics of the non-breeding population.

Assessment Criteria

Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success = # young birds fledged / # nests monitored
- Adult survival rates from capture-mark-recapture of monitored nests

Baseline

Model-based approach:

- Population growth rates over one assessment and reporting cycle

Threshold

Population growth rate of at least 1.0

Scales of Assessment

Spatial: Regional and sub-regional
Temporal: Annual

Scales of Monitoring

Spatial: National or sub-national

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies

Temporal: Annual

Balearic Shearwater *Puffinus mauretanicus*

- Functional group: Offshore surface or pelagic feeder
- Population: estimated at 19,000 - 25,000) mature individuals (BirdLife International 2021), 2,000-2,400 breeding pairs (Oro et al., 2004) or 7,200 breeding pairs (Genovart et al., 2016)
- Distribution: Sub-Regional endemic (breeding), exclusively in the Western Mediterranean
- Countries with breeding populations: Entire breeding population restricted to the Balearic Islands, Spain
- Conservation status: CR, rapidly declining
- Biology and life cycle: obligate marine, main prey small pelagic fish, partially fisheries discards, max. 1 egg per season, nest in burrows, cave or crevice, nocturnal in colonies, highly mobile, but also highly philopatric, large range during foraging, species spends non-breeding period (August to December) mainly in the Atlantic, i.e. some pressures on the species are active outside the region
- Main pressures
    - In colonies on land: predation by mammals, development and disturbance incl. light pollution
    - At sea: by-catch, potentially pollution

Common Indicator 3: Species Distributional Range

98. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies and the at-sea distribution, which is relatively well known (Arcos, 2011). However, we recommend COP and relevant COP of OSPAR to focus on harmonising and streamlining data collection processes for at sea distribution of the species to be able to monitor and assess potential changes in distributional range adequately.

Assessment Criteria

- Distributional pattern: % change in occupancy in distribution range of breeding birds
- Distributional pattern: % change in at-sea distribution (50% KDE), modelled from representative number of tracked individuals and/or transect line counts
- % Shift in occupancy

Baseline

Reference-based ‘modern’ baseline:

Due to unfavourable conservation status (CR): maximum ranges (at sea and regarding breeding colonies) e.g. since start of the implementation of BD (1980)

Threshold

- No negative deviation in range size between assessment cycles due to precarious conservation status.
- Maximum 10% in range shift between assessment cycles

Scales of Assessment

Spatial: Sub-regional (Balearic Islands for breeding, Western Mediterranean Sea (mainly) for at-sea distribution during breeding (relevant OSPAR sub-region during non-breeding)

Temporal: Every six years, linked to EcAp reporting cycles

Scales of Monitoring

For breeding range: Balearic Islands, covering at least all known breeding areas

Temporal: Annual

Common Indicator 4: Population abundance of selected species

99. The assessment and monitoring of this indicator will mainly focus on the breeding population of the species i.e. breeding colonies and breeding pairs (or mature adult individuals), as it is very challenging to reliably quantify and monitor the abundance of the non-breeding population. However, we strongly recommend complementing the breeding abundance monitoring with a continuation of land-based counts at known passage bottlenecks during migration (Gibraltar Strait).

Assessment Criteria

Annual

- relative breeding bird abundance = annual abundance / baseline abundance
- count net maxima of individuals passing bottleneck on migration

Baseline

Reference-based (modern) baseline:

Highest breeding abundance estimate in the last 20 years

Threshold

Deviation from baseline:

annual relative breeding abundance 1.0 or larger due to unfavourable conservation status of the species (CR)

Scales of Assessment

Spatial: Regional (Western Mediterranean Sea)

Temporal: Aiming at annual monitoring and assessment with reporting every six years linked to EcAp reporting cycles

Scales of Monitoring

Spatial: Sub-national (ideally 100% but at least 90% of the population)

Temporal: Annual

Common Indicator 5: Population Demographic Characteristics

100. The assessment and monitoring of this indicator will focus on the breeding population of the species i.e. breeding colonies, as population dynamics of the species are driven mainly by adult survival (assessed via CMR on the nest) and reproductive success (Oro et al., 2004). Additionally, it is very challenging to reliably quantify and monitor the demographic characteristics of the non-breeding population.

Assessment Criteria

Population growth rate (the impact of reproductive success and annual survival on population growth)

- Reproductive success = # young birds fledged / # nests monitored
- Adult survival rates from capture-mark-recapture of monitored nests

Baseline

Model-based approach:

- Population growth rates over one assessment and reporting cycle

Thresholds

Due to the precarious conservation status, the species can only achieve GES if the growth rate reaches a value of 1.0 or higher. For a shearwater species, annual survival rates of adults would need to be >0.9

to consider the population to be sustainable (e.g. Oppel et al., 2011), while reproductive success would need to be >0.75 to allow for a recovery or positive growth of the population (Louzao et al., 2006).

Scales of Assessment

Spatial: sub-regional
Temporal: Annual with reporting every six years, linked to EcAp reporting cycles

Scales of Monitoring

Spatial:
Sub-national

- Representative sample of colonies from high pressure vs protected areas
- Representative subsample of nests from these sample colonies

Temporal: Annual

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Annex I: Assessment Processes in the Mediterranean and under other regional seas conventions

There are several assessment processes in the Mediterranean and other regional seas Convention, with which IMAP would benefit from creating synergies.

MSFD (Marine Strategy Framework Directive, relevant for EU Contracting Parties to Barcelona Convention)

The implementation of the EU Marine Strategy framework Directive (MSFD, 2008) by the EU countries in the region presents great opportunities and needs for the application of the EcAp throughout the Mediterranean region ensuring that the MSFD and EcAp mutually strengthen and build on each other, with the common ultimate aim to achieve GES of the Mediterranean Sea.
The MSFD calls to regional cooperation meaning "cooperation and coordination of activities between Member States and, whenever possible, third countries sharing the same marine region or subregion, for the purpose of developing and implementing marine strategies" […] "thereby facilitating achievement of good environmental status in the marine region or subregion concerned".
MSFD requires assessment and revision of marine strategies every 6 years.
MSFD **Descriptor 1 Biodiversity** assesses the following five indicators with three corresponding to IMAP EO1 common indicators:

- **D1C1** – The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long-term viability is ensured
- **D1C2 –** The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured. **Corresponds to CI4.**
- **D1C3 –** 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. **Corresponds to CI5.**
- **D1C4 –** The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions. Member States shall establish threshold values for each species through regional or subregional cooperation. **Corresponds to CI3.**
- **D1C5 –** The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.

EU Birds Directive (and Habitats Directive)

Article 12 of the Birds Directive (BD) requires monitoring of the status and trends of bird species breeding in the EU with reporting due every six years. Under this Directive, national breeding bird population size (min., max., or range) and trends: short-term (12 years) and long-term (since 1980) and National breeding distribution map and size and breeding distribution trends (short-term and long-term), plotted on a 10x10km² grid (for smaller member states either 5x5km² or 1x1km²) are being monitored at the national level. Adopting compatible assessment methodologies for relevant IMAP CIs is important to fully utilise the data obtained through these programmes and to increase the efficiency in monitoring and assessment.

Other Regional seas conventions

The OSPAR Convention aims to achieve GES in the NE Atlantic and covers two indicators for seabirds;

- Abundance of breeding and non-breeding birds
- Breeding success and failure

OSPAR CEMP Guidelines Common Indicator: Marine Bird Abundance (B1) gives an example of a potential approach for GES assessments based on abundance numbers, including how to set baselines and threshold values (OSPAR Commission, 2016).

The HELCOM Baltic Sea Plan aims to restore the good ecological status of the Baltic Sea. To achieve this goal, the plan assesses the following indicators:

- Abundance of waterbirds in the wintering season
- Abundance of waterbirds in the breeding season
- Number of drowned mammals and waterbirds in fishing gear

- Marine bird health (White-tail eagle productivity)

Conclusions on other assessment processes in the Mediterranean

Drawing on the experience and best practices available from the existing processes, it is recommended to make use of them to the maximum extent with the aim of streamlining the processes and creating synergies between these different processes and reduce redundancies for the countries' effort in monitoring and assessment of the Mediterranean marine environment.