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Agenda Item 4: Ecological Objective 1 (Biodiversity): Monitoring and assessing Pelagic Habitats through Phytoplankton and Zooplankton – Progress and sharing national experience

Progress update on Ecological Objective 1 (Biodiversity) Based on Phytoplankton and Zooplankton for the Assessment of Good Environmental Status (GES) of Pelagic Habitats

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SPA/RAC
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Note by the Secretariat

The Contracting Parties (CPs) to the Barcelona Convention adopted the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) through Decision IG.22/7 (COP19, Athens, Greece, 2016), within the framework of the Ecosystem Approach (EcAp). IMAP provides the common framework for monitoring and assessing the status of the Mediterranean Sea and Coast through a set of Ecological Objectives (EOs), Common Indicators (CIs), Good Environmental Status (GES) definitions and assessment criteria.

Ecological Objective 1 (EO1) aims to ensure that biological diversity is maintained or enhanced and that the quality and occurrence of habitats, as well as the distribution and abundance of species, remain in line with prevailing physiographic, hydrographic, geographic and climatic conditions.

While significant progress has been achieved in the monitoring and assessment of benthic habitats under EO1, the development of monitoring and assessment elements for pelagic habitats remained limited due to the absence of agreed regional indicators and assessment methodologies.

To address this gap, the Contracting Parties requested SPA/RAC, through Decision IG.25/13 adopted at COP22 (Antalya, Türkiye, 2021), to establish a multidisciplinary group of experts to define parameters allowing the use of phytoplankton and zooplankton for relevant IMAP biodiversity indicators and to elaborate a Reference List of Pelagic Habitat Types in the Mediterranean Sea.

The present document provides an overview of the progress achieved since COP22, including the development of the Reference List of Pelagic Habitat Types, the establishment of monitoring and assessment elements for pelagic habitats, and their integration into the updated IMAP adopted by COP24. It also presents the proposed future activities aimed at further developing operational assessment tools for pelagic habitats under Ecological Objective 1.

Progress update on Ecological Objective 1 (Biodiversity) Based on Phytoplankton and Zooplankton for the Assessment of Good Environmental Status (GES) of Pelagic Habitats

1. Introduction

1. The Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP), adopted through Decision IG.22/7 (COP19), established the regional framework for monitoring and assessing biodiversity under Ecological Objective 1 (EO1). EO1 aims to ensure that biological diversity is maintained or enhanced and that the quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing environmental conditions.

2. Although IMAP includes Common Indicators addressing habitat distribution and habitat condition, the assessment of pelagic habitats remained insufficiently developed due to the lack of agreed indicators and methodologies specifically adapted to phytoplankton and zooplankton communities. Considering the ecological importance of pelagic habitats for marine biodiversity, ecosystem functioning, food-web dynamics and ecosystem productivity, the Contracting Parties recognized the need to strengthen monitoring and assessment efforts for these habitats at regional level.

2. Development of monitoring and assessment elements for Pelagic Habitats

3. At COP22 (Antalya, Türkiye, 2021), the Contracting Parties requested SPA/RAC to establish a multidisciplinary group of experts nominated by the Contracting Parties to define parameters allowing the use of phytoplankton and zooplankton for relevant IMAP biodiversity indicators and to elaborate a Reference List of Pelagic Habitat Types in the Mediterranean Sea.

4. Following a regional call for nominations, Contracting Parties designated experts with expertise in pelagic ecology, plankton monitoring, biodiversity assessment, oceanography and marine ecosystem management. The multidisciplinary group met online on 5 April 2023 and developed a set of scientific and technical recommendations subsequently adopted by COP23 (Portorož, Slovenia, 2023) through Decision IG.26/5.

5. One of the major outcomes of the multidisciplinary group was the development of a Reference List of Pelagic Habitat Types in the Mediterranean Sea. The adopted typology is based primarily on hydrographic characteristics and chlorophyll-a concentrations within the epipelagic layer (0–200 m) and distinguishes several habitat categories ranging from reduced salinity waters and river plumes to oligotrophic oceanic waters. The Reference List adopted by COP23 provides a common regional framework that may be used by Contracting Parties to identify pelagic habitats to be monitored and assessed under IMAP while allowing adaptations to national ecological specificities and environmental conditions.

6. The multidisciplinary group identified the main pressures affecting pelagic habitats in the Mediterranean Sea, including climate change and hydroclimatic variability; Eutrophication; Non-indigenous species; Contaminants and marine litter; Overfishing; Aquaculture; Marine infrastructures and coastal developments; Ocean acidification; and Maritime traffic. These pressures may directly or indirectly affect plankton communities and ecosystem functioning, highlighting the importance of developing appropriate monitoring and assessment tools.

7. The multidisciplinary group concluded that several phytoplankton and zooplankton characteristics could serve as the basis for future pelagic habitat indicators. The priority biological parameters identified include Biomass (chlorophyll-a and carbon); Abundance; and Size structure and biovolume. In addition, several environmental parameters were identified as essential supporting information for interpreting changes in plankton communities, including temperature, salinity, dissolved oxygen, transparency, nutrient concentrations and meteorological variables.

8. The CORMON Biodiversity and Fisheries Meeting held in June 2024 acknowledged the progress achieved and concluded that additional work was required to transform the identified parameters into operational IMAP indicators. The meeting recommended the establishment of a Biodiversity Online Working Group (BOWG) on Pelagic Habitats to continue the scientific and technical development of monitoring and

assessment elements for pelagic habitats.

9. Following the recommendations of the CORMON Biodiversity and Fisheries Meeting held in June 2024 and in accordance with the SPA/RAC Programme of Work 2024–2025, a Biodiversity Working Group (BWG) on Pelagic Habitats was established to support the development of monitoring and assessment elements for pelagic habitats under EO1. Four online meetings were organized during 2025 with the participation of experts nominated by the Contracting Parties, as well as representatives of relevant regional and international organizations.

10. Throughout its work, the BWG reviewed existing monitoring and assessment approaches developed under the Marine Strategy Framework Directive (MSFD), OSPAR and HELCOM, together with the results and recommendations of the ABIOMMED project and other relevant scientific initiatives and regional assessment frameworks. Particular attention was given to methodologies and indicators that could be adapted to the specific ecological characteristics of Mediterranean pelagic habitats.

11. The Working Group also examined the scientific basis and operational applicability of phytoplankton and zooplankton indicators for the assessment of pelagic habitats and discussed the challenges associated with their implementation at national and regional levels. The overall objective of the Working Group was to identify the most appropriate monitoring and assessment approach for pelagic habitats within the framework of Ecological Objective 1 and to provide recommendations for their integration into IMAP.

12. The Working Group reviewed existing assessment frameworks and methodologies relevant to pelagic habitats, analysed phytoplankton and zooplankton indicators tested within the ABIOMMED project, examined experiences from other Regional Seas Conventions, identified key scientific and technical gaps, and developed recommendations for a regional assessment framework for pelagic habitats in the Mediterranean Sea.

13. The discussions highlighted the importance of strengthening synergies among Ecological Objective 1 (Biodiversity), Ecological Objective 4 (Marine Food Webs), Ecological Objective 5 (Eutrophication), Ecological Objective 2 (Non-Indigenous Species) and Ecological Objective 9 (Pollution). The Working Group recognized that plankton communities play a central role in marine ecosystem functioning and constitute a key ecological component linking biodiversity, food-web dynamics, nutrient enrichment, contaminants and biological invasions. Consequently, information generated under these ecological objectives should be taken into consideration when developing pelagic habitat indicators and assessment methodologies.

14. Based on the outcomes of the Biodiversity Working Group on Pelagic Habitats, a proposal was developed to support the integration of pelagic habitats into the IMAP monitoring and assessment framework under Ecological Objective 1 (EO1). The proposed approach relies on Common Indicator 2 (CI2 – Condition of the habitat's typical species and communities) and recommends the development of assessment indices based on phytoplankton and zooplankton abundance and biomass, taxonomic composition, and functional groups. Collectively, these parameters provide a scientifically robust basis for assessing the condition of pelagic habitats and their typical biological communities, while supporting the future development of Good Environmental Status (GES) definitions, targets and assessment methodologies at regional level.

15. The proposed monitoring and assessment elements were progressively reviewed and endorsed by the relevant EcAp governance bodies, namely the CORMON Biodiversity and Fisheries Meeting, the Seventeenth Meeting of SPA/BD Focal Points and the 12th EcAp Coordination Group Meeting. Following these endorsements, the proposed elements were incorporated into the updated IMAP adopted by COP24, thereby formally integrating pelagic habitats into the regional monitoring and assessment framework under Ecological Objective 1. This represents a major achievement in the implementation of the Ecosystem Approach and establishes the first regionally agreed framework for the assessment of pelagic habitats in the Mediterranean Sea, providing a foundation for the future development of operational indicators, Good Environmental Status (GES) definitions, assessment criteria and regional assessments.

3. Way Forward

16. The process initiated at COP22 has enabled a progressive transition from the conceptual definition of pelagic habitat typologies towards the development of operational monitoring and assessment elements under Ecological Objective 1 (EO1). While significant progress has been achieved, further work is required to fully operationalize the assessment of pelagic habitats and support the future establishment of Good Environmental Status (GES) definitions, targets, threshold values and assessment criteria.

17. In this context, and within the framework of the SPA/RAC Programme of Work 2026–2027, SPA/RAC, in collaboration with the Biodiversity Online Working Group on Pelagic Habitats, has developed a questionnaire to collect information on national monitoring programmes, available datasets, methodologies and research initiatives relevant to pelagic habitats. The questionnaire will be circulated to all Contracting Parties with a view to gathering comprehensive information at the regional level. The information collected through the questionnaire will provide a basis for assessing the current state of knowledge, monitoring capacities, data availability and ongoing initiatives related to pelagic habitats across the Mediterranean region. It will also contribute to identifying knowledge gaps, monitoring needs and opportunities for regional harmonization.

18. Building upon the results of the questionnaire, the recommendations of the Biodiversity Online Working Group on Pelagic Habitats, and the outcomes of relevant regional initiatives and scientific programmes, further work will be undertaken to advance indicators based on phytoplankton and zooplankton communities, including abundance, biomass, taxonomic composition and functional groups, with a view to supporting the further development and implementation of IMAP Common Indicators.

19. Particular attention will be given to strengthening synergies with EO4 (Marine Food Webs), EO5 (Eutrophication), EO2 (Non-Indigenous Species) and EO9 (Pollution), recognizing the strong ecological interactions between pelagic habitats and these Ecological Objectives and promoting coherence across the implementation of IMAP.

20. The Biodiversity Online Working Group on Pelagic Habitats will continue its work towards the development of operational indices, Guidance Factsheets (GFS), Good Environmental Status (GES) targets and threshold values, harmonized monitoring methodologies, regional assessment approaches, as well as Data Standards (DS) and Data Dictionaries (DD), in collaboration with INFO/RAC, with the aim of improving data availability, comparability and interoperability across the Mediterranean region.

21. All proposed monitoring and assessment elements will be submitted, as appropriate, to the relevant governance bodies of the Barcelona Convention for review, consideration and validation, in accordance with the established EcAp and IMAP governance process.