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Fifteenth Meeting of SPA/BD Focal Points

Videoconference, 23–25 June 2021

Report of the Fifteenth Meeting of SPA/BD Focal Points

UNEP/MAP
SPA/RAC - Tunis, 2021

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Table of contents

Report of the Fifteenth Meeting of SPA/BD Focal Points
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Introduction

1. Following the kind invitation of the Maltese Government, the Fifteenth Meeting of the Specially Protected Areas and Biological Diversity (SPA/BD) Focal Points was to be held in Malta. Because of the sanitary conditions imposed by the COVID-19 pandemic and according to the recommendation of the Coordinating Unit for the Mediterranean Action Plan, Barcelona Convention Secretariat (UNEP/MAP), all meetings scheduled up to July 2021 are to be conducted by teleconference.

2. The Fifteenth Meeting of SPA/BD Focal Points (hereinafter referred to as “the meeting”) was hosted by Malta and held by videoconference from 23 to 25 June 2021.

Participation

3. All the SPA/BD focal points were invited to attend the meeting or to designate representatives. The following Contracting Parties were represented at the meeting: Albania, Algeria, Croatia, Cyprus, Egypt, European Union, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Morocco, Montenegro, Slovenia, Spain, Syrian Arab Republic, Tunisia and Turkey.

4. The Ad Hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) was represented by its Chair and Vice-Chair.

5. The secretariats of the following United Nations bodies, conventions and agreements and intergovernmental organizations were represented as observers: the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), the Convention on Migratory Species (CMS), the Council of Europe - Bern Convention and the International Union for Conservation of Nature (IUCN).

6. The following governmental organization was also represented as observer: the European Topic Centre of Spatial Analysis and Synthesis, University of Malaga (ETC/UMA).

7. The following nongovernmental organizations were also represented as observers: the Mediterranean Association to Save the Sea Turtles (MEDASSET), the Network of Marine Protected Areas Managers in the Mediterranean, (MedPAN), the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), Notre Grand Bleu association, Oceana, and the World Wide Fund for Nature (WWF).

8. The UNEP/MAP Coordinating Unit, the Information and Communication Regional Activity Centre (INFO/RAC), the Priority Action Programme Regional Activity Centre (PAP/RAC) and the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) were represented at the meeting.

9. The Specially Protected Areas Regional Activity Centre (SPA/RAC) acted as the secretariat of the meeting.

10. The list of participants is attached as Annex I to the present report.

Agenda item 1 Opening of the meeting

11. The meeting was opened on Wednesday, 23 June 2021, at 8.30 a.m. UTC+1, by the representative of the host country and the Director of SPA/RAC.

12. Mr. Duncan BORG, Biodiversity and Water Unit Team Manager at the Environment and Resources Authority of Malta, thanked all participants for their presence and said that he looked forward to fruitful discussions.

13. Mr. Khalil ATTIA, Director of SPA/RAC, on behalf of UNEP/MAP Secretariat and SPA/RAC, welcomed the participants and thanked the Maltese authorities for hosting the meeting. He said that the biennium had been rich in terms of activities, processes and achievements at Mediterranean regional and national levels towards implementation of biodiversity and ecosystems core theme strategic outcomes within the Barcelona Convention Mid-Term Strategy 2016–2021 and in line with the Specially Protected Areas and Biological Diversity Protocol and the Barcelona Convention itself. He voiced regret that the meeting could not be held face-to-face and noted the difficulties experienced by all in the biennium since the fourteenth meeting of SPA/BD focal points.

Agenda item 2 Organizational matters

2.1. Rules of procedure

14. The internal rules adopted for meetings and conferences of the Contracting Parties to the Convention for the protection of the Mediterranean Sea against pollution and its protocols (UNEP/IG.43/6, Annex XI), as amended by the Contracting Parties (UNEP(OCA)/MED IG.1/5 and UNEP(OCA)/MED IG.3/5), applied *mutatis mutandis* to the present meeting.

2.2. Election of officers

15. The meeting unanimously elected the following officers:

Chairperson:	Mr. Duncan BORG (Malta),
Vice-Chairpersons:	Ms. Melina MARCOU (Cyprus),
	Mr. Zamir DEDEJ (Albania),
Rapporteur:	Ms. Samia BOUFARES (Tunisia).

2.3. Adoption of the agenda

16. The Secretariat introduced the provisional agenda, which had been issued as document UNEP/MED WG.502/1 Rev.1, and the annotated version in document UNEP/MED WG.502/2 Rev.2.

17. After reviewing the two documents, the meeting approved the Agenda and the proposed timetable. The Agenda of the meeting appears as Annex II to this report.

2.4. Organization of work

18. The Secretariat proposed that the meeting be held in daily sessions from 8.30 (UTC+1) to 11.30 (UTC+1) and from 12.30 (UTC+1) to 17.00 (UTC+1), subject to adjustments, as necessary.

19. The working languages of the meeting were English and French. Simultaneous interpretation was available for all the sessions.

Agenda item 3 Status of implementation of the Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD) in the Mediterranean

20. The Secretariat introduced document UNEP/MED WG.502/3, entitled “Report on the status of implementation of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol)”. The document contained an analysis of the information provided by the 11 countries that had submitted reports on implementation of the SPA/BD Protocol through the online reporting system of the Barcelona Convention and its Protocols. The reporting period covered the previous biennium, starting in January 2018 and ending in December 2019.

21. The meeting expressed appreciation for the effort made by some Contracting Parties to report on implementation of the SPA/BD Protocol but stressed that it was difficult to have an overview on the status of implementation from only a few reports.

22. The meeting called upon the Contracting Parties to submit implementation reports in a timely manner and in accordance with the reporting requirements of the Convention so that the status of and gaps in implementation of the Protocol could be better assessed.

23. The meeting noted that the online form was difficult to access and that it was difficult to provide the required data without access to data submitted previously. Receipt of a limited number of reports indicated that there was a problem. The meeting stressed that countries have obligations to report to many conventions and asked for assistance to improve and streamline reporting.

24. The meeting suggested that a workshop be organized or a working group established to analyse the difficulties encountered by Contracting Parties with the online reporting system and to propose solutions to simplify reporting and improve the form and make it user friendly.

Agenda item 4 Progress report on activities carried out to implement the Biodiversity and Ecosystems core theme since the Fourteenth meeting of SPA/BD Focal Points

25. The Director of SPA/RAC introduced the progress report contained in document UNEP/MED WG.502/4, which reflected the themes, strategic outcomes and key outputs defined in the MAP Mid-Term Strategy 2016–2021. He described in detail the main achievements and challenges met during implementation of the programme of work.

26. The meeting welcomed with appreciation the progress report presented by the Secretariat on the many varied activities undertaken since the 14th Meeting of SPA/BD Focal Points and acknowledged the work of SPA/RAC in implementing the Programme of Work, despite the difficulties due to the COVID-19 pandemic during the period.

27. Many delegations commended the support received by their countries from SPA/RAC to implement conservation measures in key biodiversity areas and requested the Centre to pursue its efforts during the next biennium towards achieving the regional objectives.

28. Representatives of partner organizations took the floor to express their satisfaction with the bonds of collaboration established between their organizations and SPA/RAC and confirmed their willingness to pursue collaborative activities with the Centre in the coming years. One representative, referring to document UNEP/MED WG.502/Inf.9, stressed the importance of the protocol it contained for the standardisation of sea turtles stranding monitoring across the Mediterranean region.

29. The meeting acknowledged the continuous commitment of the Secretariat and encouraged it to strengthen existing synergies with relevant regional partners to achieve regional objectives under the SPA/BD Protocol, in particular for activities related to conservation of endangered species and key habitats, surveying and monitoring of marine and coastal biodiversity, capacity-building and development of a coherent network of marine protected areas.

Agenda item 5 Conservation of species and habitats

5.1. Updating of the Action Plan for the conservation of cetaceans in the Mediterranean Sea

30. Referring to document UNEP/MED WG.502/5 “Draft updated Action Plan for the conservation of cetaceans in the Mediterranean Sea”, the Secretariat informed the meeting about the update process and recalled that it has been conducted in close collaboration with the ACCOBAMS Secretariat. It

underlined that the new version of the Action Plan included for the first time an implementation schedule.

31. The meeting welcomed the updated action plan, reviewed the document and endorsed the draft updated Action Plan for the conservation of cetaceans and agreed on its submission, as amended, to the MAP focal points meeting and the 22nd Meeting of the Contracting Parties (COP 22) for adoption. The document as amended by the meeting appears as Annex III to this report.

5.2. Updating of the Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea (Dark Habitats Action Plan)

32. Under this agenda item, the Secretariat introduced document UNEP/MED WG.502/6, which contained the draft updated Dark Habitats Action Plan and explained the steps in evaluating implementation, updating the plan and setting a timetable for the period 2021–2025.

33. It informed the meeting that SPA/RAC had prepared the Guidelines for the assessment of environmental impact on coralligenous and maërl assemblages (UNEP/MED WG.502/Inf.3) as provided for in the Action Plan for the conservation of the coralligenous and other calcareous bio-concretions in the Mediterranean Sea. It called the attention of participants to information document UNEP/MED WG.502/Inf.4 containing the Interpretation manual for the marine habitat types in the Mediterranean, which would shortly be sent to the Contracting Parties for national consultation.

34. It also introduced document UNEP/MED WG.502/Inf.5 on the “Project on mapping key marine habitats and assessing their vulnerability to fishing activities (MedKeyHabitats II Project)”.

35. The representatives of Contracting Parties concerned by the Medkeyhabitats II project funded by the MAVA Foundation for nature, commended the assistance provided by SPA/RAC to implement the activities in their respective countries and the importance of the products elaborated, such as national action plans, pilot studies, and distribution and vulnerability maps of marine key habitats.

36. The meeting recognized the importance of the updated action plan for the conservation of dark habitats and the associated species and noted that financial and technical assistance would be necessary to implement the provisions of the plan in several countries. It stressed the importance of multisectoral cooperation in deep-sea conservation and called for the strengthening of cooperation between SPA/RAC and its partners on the conservation and sustainable use of the high-seas and the deep-sea environment.

37. The meeting reviewed and approved the draft updated Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea (Dark Habitats Action Plan) and invited SPA/RAC to submit it, as amended, to the MAP focal points meeting and to COP 22 for adoption. The amended document appears as Annex IV to this report.

5.3. First elements to elaborate the List of Reference of Pelagic Habitat Types in the Mediterranean Sea

38. Recalling Decision IG.24/14 of the 21st Ordinary Meeting of the Contracting Parties to the Barcelona Convention (Naples, Italy, 2–5 December 2019), the Secretariat introduced document UNEP/MED WG.502/7. It stressed the need to adapt it to the indicators developed in other fora, such as those of the Convention for the Protection of the Marine Environment of the North-East Atlantic and the Baltic Marine Environment Commission, for assessing the environmental status of pelagic habitats, to be used in elaborating the 2023 Mediterranean Quality Status Report (MED QSR).

39. In considering the first elements proposed for the List of Reference of Pelagic Habitat Types in the Mediterranean Sea, the meeting (i) invited SPA/RAC to take into account, as appropriate, written comments received from the focal points on the subject in amending working document UNEP/MED WG.502/7, and (ii) endorsed the proposal of the Secretariat and agreed on its submission to the meeting of MAP focal points and to COP 22 with a recommendation to establish a multidisciplinary group of experts to elaborate the List for consideration by COP 23.

5.4. Ballast water management strategy for the Mediterranean Sea: 2022-2027

40. Making reference to the Decision IG.24/14 of COP 21 (Naples, Italy, 2–5 December 2019) relative to the Programme of Work and Budget 2020–2021, the representative of REMPEC introduced document UNEP/MED WG.502/8. He noted that the draft strategy had been prepared with SPA/RAC and presented to the Fourteenth Meeting of REMPEC focal points (videoconference, 31 May–2 June 2021). He said that the draft strategy was the result of consultations with all Contracting Parties, through the MAP focal points, in consultation with REMPEC prevention focal points and SPA/BD focal points. The draft strategy took into consideration several key developments: the entry into force of the Ballast Water Management Convention in 2017, adoption of the Integrated Monitoring and Assessment Programme (IMAP) in 2016 and adoption of the updated Action Plan concerning species introductions and invasive species in 2016.

41. The meeting welcomed the draft Ballast Water Management Strategy for the Mediterranean Sea (2022–2027) prepared by REMPEC in cooperation with SPA/RAC and reviewed by the Fourteenth Meeting of REMPEC focal points, with the view of its submission to the next meeting of MAP focal points and COP 22 for adoption.

Agenda item 6 Conservation of sites of particular ecological interest

6.1 Report by the Chair of the Ad hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) on the group's works during 2021

42. Referring to document UNEP/MED WG.502/9 "Report by the Chair and Vice-Chair of the Ad hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) on the group's works during the period 2020-2021", the Secretariat provided some background elements on the AGEM since the 14th meeting of SPA/BD focal points.

43. Referring to the same document, the Chair and Vice-Chair of AGEM presented the report on the AGEM work during the period 2020–2021. They presented the outputs that the Group had produced in the previous period and noted that some other work should be further completed.

44. The participants welcomed the report of the AGEM and acknowledged with appreciation the work of the Secretariat and the AGEM during the period 2020–2021. They highlighted the role of the AGEM in providing scientific and technical advice to the Contracting Parties and to the Secretariat with regard to advancing marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean region and recommended that the mandate of its members be extended to cover 2022–2023.

45. Given the ambitious expectations of the Contracting Parties and the Secretariat, the meeting recommended that the terms of reference of the Group be reviewed and its mandate be extended for longer than 2 years.

6.1.1 Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs

46. The Secretariat presented the "Draft Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs" in document UNEP/MED WG.502/10.

47. A discussion ensued about whether OECMs could be also included in the directory; however, the Secretariat explained that an area must be a marine and/or coastal protected area in order to be included, and that the protection be regulated either nationally or locally. Several participants emphasized the importance of binding management plans and conservation measures for each SPA.

48. The meeting proposed that the reporting format on the implementation of the Barcelona Convention and its Protocols be amended so that it could also serve for reporting to the Directory of Mediterranean SPAs and requested that SPA/RAC includes reports submitted to the Directory in the Database of Marine Protected Areas in the Mediterranean (MAPAMED).

49. The meeting endorsed the definition of SPAs and the draft Criteria and invited SPA/RAC to submit them for the consideration of the next meeting of MAP focal points and COP 22. The document appears as Annex V to this report.

6.1.2 Guidance on identifying and reporting Other effective area-based conservation measures (OECMs) in the Mediterranean marine and coastal environment

50. The Secretariat presented document UNEP/MED WG.502/11 including considerations on identifying and reporting of Other effective area-based conservation measures (OECMs) in the Mediterranean marine and coastal environment.

51. The meeting requested the Secretariat to (i) include a section on OECMs in MAPAMED, (ii) assist the Contracting Parties in identifying and reporting OECMs and (iii) provide guidance on application of the criteria of the Convention on Biological Diversity (CBD) to the Mediterranean setting, particularly to ensure that a coherent threshold of biodiversity be maintained.

6.2. Post-2020 Regional Strategy for marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean

52. The Secretariat presented the "Draft Post-2020 Regional Strategy for marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean", submitted as document UNEP/MED WG.502/12.

53. One participant asked for clarification of how the Strategy overlapped with the Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO). In response, the Secretariat explained that the two strategies are aligned.

54. The meeting initiated a prolonged discussion on the definitions of the words "strictly" and "strongly" protected with respect to MCPAs. Several speakers noted that the terms had been defined elsewhere but that their applicability to MCPAs would depend on the type of protection to which they referred. Eventually, the discussion settled on using the expression "enhanced conservation levels".

55. The meeting requested the Secretariat to develop an evaluation and monitoring framework for the Strategy, during the biennial period 2022-2023, with the technical support of AGEM.

56. The meeting reviewed and endorsed the proposed regional strategy and invited SPA/RAC to submit it to the next MAP focal points meeting and COP 22 for adoption. The amended document appears as Annex VI to the present report.

6.3. List of Specially Protected Areas of Mediterranean Importance (SPAMI List)

6.3.1. Ordinary Periodic Review of SPAMIs

57. The Secretariat introduced the report on the Ordinary Periodic Review of the areas included in the SPAMI List (UNEP/MED WG.502/13 Rev.1), which had been undertaken in 2021. It concerned the following 11 SPAMIs:
- Lara-Toxeftra Turtle Reserve (Cyprus);
- Bouches de Bonifacio Nature Reserve (France);
- Capo Caccia-Isola Piana Marine Protected Area (Italy);
- Miramare Marine Protected Area (Italy);
- Plemmirio Marine Protected Area (Italy);
- Punta Campanella Marine Protected Area (Italy);
- Tavolara-Punta Coda Cavallo Marine Protected Area (Italy);
- Torre Guaceto Marine Protected Area and Natural Reserve (Italy);
- Al-Hoceima National Park (Morocco);
- Archipelago of Cabrera National Park (Spain); and
- Maro-Cerro Gordo Cliffs (Spain).

58. The meeting commended the efforts made for the evaluation of SPAMIs during the biennium despite the challenging circumstances imposed by the COVID-19 pandemic and approved the results of the ordinary periodic review of the 11 SPAMIs.

59. The representatives of Lebanon and Tunisia informed the meeting of the corrective measures identified and launched for their SPAMIs, which had been included in a period of a provisional nature by COP 21.

60. The Secretariat informed the meeting that ordinary reviews were to be conducted of one SPAMI in 2022 and four in 2023. The SPAMI to be reviewed in 2022 is Karaburun Sazan National Marine Park in Albania, and those to be reviewed in 2023 are:
- Banc des Kabyles Marine Reserve (Algeria);
- Habibas Islands (Algeria);
- Calanques National Park (France); and
- Portofino Marine Protected Area (Italy).

6.3.2. Inclusion of areas in the SPAMI List

61. The Secretariat informed the meeting that no proposals have been received for inclusion of areas in the SPAMI List during the intersession.

62. A suggestion was made that new SPAMIs could be proposed by SPA/RAC partners, according to the same rules and frameworks as proposals by Contracting Parties. That possibility would be especially important for designation of SPAMIs in areas beyond national jurisdictions, in the high seas and deep-sea areas. The focal points recalled that an MPA must be in place before a SPAMI was proposed and that any such proposal had to be approved nationally or multilaterally by the concerned neighbouring Parties. The Secretariat emphasized the necessity of amending the SPA/BD Protocol if such a suggestion had to be implemented.

63. It was mentioned that partner organizations could however assist the Parties, as relevant, in preparing SPAMI proposals and supporting the related consultation processes.

6.3.3. Concepts to set up the SPAMI Day and SPAMI Certificate

64. The Secretariat presented the document UNEP/MED WG.502/14 “Draft Concepts to set up the Specially Protected Areas of Mediterranean Importance Day (SPAMI Day) and SPAMI Certificate”.

65. In response to a proposal that the SPAMI Day be linked to regional MPA events such as the Mediterranean MPA Forum, several participants and the Secretariat emphasized the importance of having the SPAMI Day celebration independent from any other event or celebration.

66. The meeting welcomed the proposed Concepts as submitted by the Secretariat and invited SPA/RAC to submit them to the next MAP focal points meeting and COP 22 for adoption. The draft Concepts appear in Annex VII to this report.

6.4. Draft Guidance Document for the identification and designation of Particularly Sensitive Sea Areas in relation to SPAMIs

67. The representative of REMPEC introduced document UNEP/MED WG.502/15 “Draft Guidance Document for the identification and designation of Particularly Sensitive Sea Areas in relation to Specially Protected Areas of Mediterranean Importance”, prepared in collaboration with SPA/RAC and presented to the Fourteenth Meeting of REMPEC focal points (videoconference, 31 May–2 June 2021). He said that the guidance document was elaborated in the framework of the cooperation agreement between UNEP/MAP and the Italian Ministry for Environment, Land and Sea Protection. The draft document had been disseminated to participants at the Adriatic Region Workshop on Particularly Sensitive Sea Areas (PSSAs) and the Mediterranean Seminar on PSSAs (Tirana, Albania, 9–12 December 2019), organized by SPA/RAC in collaboration with REMPEC, to provide information on regulation of PSSAs and policy tools that could contribute to protection of sea areas subject to the environmental impact of maritime traffic.

68. Consultations had been conducted with all Contracting Parties to the Barcelona Convention, and let to the finalisation of the draft PSSA Guidance Document.

69. Participants welcomed the draft guidance document as a useful practical tool for identifying candidate PSSAs in relation to SPAMIs.

Agenda item 7: Status of implementation of the Ecosystem Approach (EcAp) Roadmap

7.1. Implementation of the second phase (2019–2021) of the Integrated Monitoring and Assessment Programme (IMAP - Biodiversity and non-indigenous species) in the framework of the EcAp Roadmap

70. The Secretariat presented document UNEP/MED WG.502/16 on implementation of the second phase (2019–2021) of the IMAP for biodiversity and non-indigenous species in the framework of the Ecosystem Approach (EcAp) Roadmap, which described national and regional progress made in implementing the IMAP. The document also provided information on the 2023 Mediterranean Quality Status Report (MED QSR), including relevant aspects of the IMAP common indicators for monitoring and assessment scales, assessment criteria and reference and thresholds values. The document includes in the appendices the proposals on the monitoring and assessment elements on the agreed IMAP Common indicators related to biodiversity cluster, already discussed within the informal online working groups and endorsed by the Meeting of the Correspondence Group on Monitoring (CORMON), Biodiversity and Fisheries (videoconference, 10–11 June 2021).

71. The Secretariat also presented information documents UNEP/MED WG.502/Inf.10 “Comparative Analysis undertaken with regard to IMAP and the European Commission GES Decision 2017/848/EU for Biodiversity” and UNEP/MED WG.502/Inf.11 “Methodological Approach for mapping the interrelations between Pressures-Impacts and the Status of Marine Ecosystem Components for

Biodiversity Cluster" and informed the meeting that these "living" documents would be continuously updated and discussed within the online working group and would be presented to the next meeting of the CORMON.

72. The participants welcomed the progress made during this second phase of the IMAP implementation and encouraged the Secretariat to continue the work with the relevant informal Online Working Groups and the CORMON.

73. The Meeting endorsed the appendixes of the document, as appearing in Annexes VIII, IX, X and XI to this report and agreed to consider their use for the purpose of the 2023 MED QSR preparation.

7.2. Status of implementation of the ODYSSEA project on Mediterranean observatories

74. The Secretariat presented information document UNEP/MED WG.502/Inf.12 on the ODYSSEA project on opportunities for supporting the IMAP through integrated marine observation systems, capacity-building and information services.

75. Several participants expressed appreciation for the support given for establishment of ocean observatories around the Mediterranean and the effective national engagement of several Parties. This European Union HORIZON 2020 project had effectively supported various IMAP indicators recording in sizeable marine areas throughout the Mediterranean with innovative technological tools.

76. The meeting took note of the document and invited the Secretariat to strengthen synergies with other data sources to ensure a successful 2023 MED QSR.

7.3. Status of implementation of the GEF Adriatic project on EcAp and MSP

77. With reference to the document UNEP/MED WG.502/Inf.15, the Secretariat presented the main outcomes of the GEF Adriatic project "Implementation of Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning" implemented in Albania and Montenegro by the MAP Coordinating Unit, SPA/RAC and PAP/RAC, which contributed to implementation of both IMAP and MSP with the view of achieving good environmental status at both national and sub-regional levels.

78. Participants welcomed the effective cooperation that had made the project possible, including capacity-building and marine field surveys, despite the restrictions imposed by the COVID-19 pandemic.

79. The representatives of Albania and Montenegro highlighted the efforts done at national level and the important results achieved through the GEF Adriatic project as well as their willingness for further support from the UNEP/MAP system to continue the implementation of the IMAP and MSP in Albania and Montenegro.

Agenda item 8: Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAP BIO)

80. Referring to document UNEP/MED WG.502/17 Rev.1 "Draft Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO)", the Secretariat presented the draft Strategic Action Programme, as revised by SAPBIO national correspondents at their 8th meeting (videoconference, 22 June 2021).

81. The meeting noted that the Draft Post-2020 SAPBIO is aligned with other relevant global and regional initiatives, and discussed the draft regarding feasibility and attainability of its goals, targets and

actions by Mediterranean countries as well as harmonization with other relevant strategies adopted in relation to the SPA/BD Protocol, such as the Post-2020 Regional Strategy for marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean.

82. In relation to reporting by Parties on their implementation of the Post-2020 SAPBIO, the meeting recommended that harmonisation and streamlining should be ensured with other relevant reporting systems to avoid more burden on the Contracting Parties as for their reporting obligations to numerous conventions and agreements.

83. The meeting reviewed the draft document, including within the framework of a working group that finalized the revision of the draft document. The meeting invited SPA/RAC to submit the Draft Post-2020 SAPBIO to the next MAP focal points meeting and COP 22 for adoption. The amended document appears as Annex XII to the present report.

Agenda item 9: Draft Programme of work of SPA/RAC for the biennium 2022–2023

84. The Director of SPA/RAC presented the draft SPA/RAC programme of work for the 2022–2023 biennium contained in document UNEP/MED WG.502/18. He emphasized that the draft Programme of Work (PoW) of SPA/RAC for the 2022–2023 biennium has been prepared following the guiding elements included in the Planning and Programming Paper for the preparation of the 2022–2023 PoW prepared by the UNEP/MAP Secretariat. Since this is the first biennium of the next MTS cycle (2022–2027), which is still under development. SPA/RAC's draft 2022-2023 PoW uses all the main elements included in the current draft of the new MTS, including key priorities, objectives and strategic outcomes.

85. The activities proposed aim at assisting Barcelona Convention Contracting Parties in the implementation of the SPA/BD Protocol. They were developed considering the priorities defined in the draft Post-2020 SAPBIO, the draft Post-2020 Regional Strategy for MCPAs) and OECMs in the Mediterranean, both under development, and the Regional Action Plans and Strategy on threatened and endangered species and key habitats.

86. The SPA/RAC's draft 2022-2023 PoW is developed mainly under four MTS Programmes, namely "Towards Healthy Mediterranean Ecosystems and Enhanced Biodiversity", "Governance", "Together for a shared vision of the Mediterranean Sea and coast" and "Towards a stronger advocacy, awareness, education and communication of the Mediterranean Sea and coast".

87. It also considers relevant current and emerging global and regional frameworks and processes, including SDGs; UN Convention on Biological Diversity and the Post-2020 global biodiversity framework, UNFCCC and Paris Agreement, UN Decade on Ecosystem Restoration (2021–2030), UN Decade of Ocean Science for Sustainable Development (2021–2030), the under development global Biodiversity Beyond National Jurisdiction binding framework (BBNJ), etc.

88. The Director emphasized the importance of continued collaboration with other MAP Components, relevant intergovernmental partners, NGOs and other regional, national and local organizations to enhance synergies and avoid duplication of activities.

89. Representative of partner organizations expressed their willingness to contribute to the implementation of the proposed programme of work for 2022–2023.

90. The meeting congratulated the Secretariat on the quality of the document and welcomed the ambitious draft programme of work of SPA/RAC for the biennium 2022–2023. It made some comments and suggestions on the programme of work, which SPA/RAC will forward to the MAP Secretariat for inclusion in the relevant draft decision to be submitted to the next MAP focal points meeting and COP 22.

Agenda item 10: Any other matters

91. No other question related to the topics of the meeting was raised by participants or by the Secretariat.

Agenda item 11: Adoption of conclusions and recommendations of the meeting

92. The meeting reviewed the conclusions and recommendations prepared by the Secretariat and endorsed them, as they appear in Annex XIV to this report. It agreed that the draft report of the meeting will be prepared by the Secretariat and circulated by e-mail to the participants for approval.

Agenda item 12: Closure of the meeting

93. After the customary exchange of courtesies, the meeting was closed on Friday 25 June 2021, at 15.00 UTC+1.

ANNEX I
ANNEXE I

List of Participants
Liste des Participants

Provisional List of Participants
Liste Provisoire des Participants

REPRESENTATIVES OF THE CONTRACTING PARTIES
REPRÉSENTANTS DES PARTIES CONTRACTANTES

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Annex II

Agenda

Agenda

Agenda item 1 **Opening of the meeting**

Agenda item 2 **Organizational matters**

2.1. Rules of procedure

2.2. Election of officers

2.3. Adoption of the agenda

2.4. Organization of work

Agenda item 3 **Status of implementation of the Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD) in the Mediterranean**

Agenda item 4 **Progress report on the activities carried out to implement the Biodiversity and Ecosystems core theme since the Fourteenth meeting of SPA/BD Focal Points**

Agenda item 5 **Conservation of Species and Habitats**

5.1. Updating of the Action Plan for the conservation of cetaceans in the Mediterranean Sea

5.2. Updating of the Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea (Dark Habitats Action Plan)

5.3. First elements to elaborate the List of Reference of Pelagic Habitat Types in the Mediterranean Sea

5.4. Ballast water management strategy for the Mediterranean Sea: 2022-2027

Agenda item 6 **Conservation of sites of particular ecological interest**

6.1. Report by the Chair and Vice-Chair of the Ad hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) on the group's works during the period 2020-2021

6.1.1. Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs

6.1.2. Considerations on identifying and reporting Other effective area-based conservation measures (OECMs) in the Mediterranean marine and coastal environment

6.2. Draft Post-2020 Regional Strategy for marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean

6.3. List of Specially Protected Areas of Mediterranean Importance (SPAMI List)

6.3.1. Ordinary Periodic Review of SPAMIs

6.3.2. Inclusion of areas in the SPAMI List

6.3.3. Concepts to set up the SPAMI Day and SPAMI Certificate

6.4. Draft Guidance Document for the identification and designation of Particularly Sensitive Sea Areas in relation to SPAMIs

Agenda item 7 **Status of implementation of the Ecosystem Approach (EcAp) Roadmap**

7.1. Implementation of the second phase (2019-2021) of the Integrated Monitoring and Assessment Programme (IMAP - Biodiversity and non-indigenous species) in the framework of the EcAp Roadmap

7.2. Status of implementation of the ODYSSEA project on Mediterranean observatories

7.3. Status of implementation of the GEF Adriatic project on EcAp and MSP

Agenda item 8 **Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO)**

Agenda item 9 **Draft Programme of work of SPA/RAC for the biennium 2022-2023**

Agenda item 10 **Any other matters**

Agenda item 11 **Adoption of conclusions and recommendations of the meeting**

Agenda item 12 **Closure of the meeting**

Annex III

Draft updated Action Plan for the conservation of cetaceans in the Mediterranean Sea

Note by the Secretariat

1. The Action Plan for the conservation of cetaceans in the Mediterranean Sea was adopted by the Contracting Parties to the Barcelona Convention in 1991. It aims at ensuring the recovery of cetacean populations in the Mediterranean. The Action Plan was prepared using the information available about the cetacean populations and the threats hanging over them as known in 1991.

2. In 2016, the Appendix "The list of Additional Points for the Implementation of the Action Plan" adopted by the Focal Points for SPAs in October 1992 has been revised for the first time, to provide new orientations for the Action Plan that are in line with the evolving regional context regarding cetacean conservation and with the new challenges and priorities as identified by the most recent scientific knowledge.

3. The revised version has been adopted by the Contracting Parties in their COP19, Decision IG.22/12, 2016

4. For the biennium 2020-2021, the Contracting Parties to Barcelona Convention requested SPA/RAC during the CoP 21 (Naples, Italy, 2-5 December 2019) to update the Action Plan for the conservation of cetaceans.

5. This update process was done in close collaboration with ACCOBAMS, given that the common obligations relating to cetaceans under the Protocol on Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) are fulfilled through the implementation of ACCOBAMS (COP 14, Slovenia 2005) and the new Memorandum of Collaboration between ACCOBAMS and SPA/RAC, signed in Monaco on October 15, 2020, defining the joint ACCOBAMS - SPA/RAC work program for the period 2020-2022

6. With regards to this update, an assessment of the implementation of the previous version has been done at national and regional levels. It has considered the SPA/RAC Progress activities achieved during the last biennium. This evaluation appears in the annex I of the present document.
7. A previous version of the draft Action plan has been shared with the SPA/BD focal points and the comments and input received have been taken in consideration to produce the present version.

8. The draft updated Action plan including the **Implementation schedule** is given in this document.

Draft updated Action Plan for the conservation of cetaceans in the Mediterranean Sea

I. Background

1. The Contracting Parties to the Barcelona Convention, within the framework of the Mediterranean Action Plan, give priority to the conservation of the marine environment and to the components of its biological diversity. This was confirmed by the adoption of the 1995 Barcelona Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) and of its annexes, among them a list of endangered or threatened species.
2. Elaborating and implementing action plans to conserve one species or group of species is an effective way of guiding, coordinating and strengthening the efforts the Mediterranean countries are making to safeguard the natural heritage of the region. Although they do not have a binding legal character, these action plans were adopted by the Contracting Parties as regional strategies setting priorities and activities to be undertaken. In particular, they call for greater solidarity between the States of the region, and for co-ordination of efforts to protect the species in question. This approach has proved to be necessary for ensuring conservation and sustainable management of the concerned species in every Mediterranean area of their distribution.
3. These Action Plans constitute mid-term regional strategies that should be updated every five years, based on an evaluation of their implementation at regional and national levels. For the biennium 2020-2021, the Contracting Parties to Barcelona Convention requested SPA/RAC during the CoP 21 (Naples, Italy, 2-5 December 2019) to update the Action Plan for the conservation of cetaceans.
4. This update process was done in close collaboration with ACCOBAMS, given that the common obligations relating to cetaceans under the Protocol on Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) are fulfilled through the implementation of ACCOBAMS (COP 14, Slovenia 2005) and the new Memorandum of Collaboration between ACCOBAMS and SPA/RAC, signed in Monaco on October 15, 2020, defining the joint ACCOBAMS - SPA/RAC work program for the period 2020-2022.

II. Introduction

5. The Mediterranean Sea, *Mare medi terraneum* (Latin for a ‘‘sea in the middle of the land’’), is the largest (2,969,000 km^2) and deepest (average 1,460 m, maximum 5,267 m) enclosed sea on Earth. It is a marine biodiversity hotspot, with approximately 17,000 marine species occurring within its basin (Coll et al, 2010). Its cetacean diversity is also remarkable: twenty-five species of cetaceans occur or have occurred at various degrees of abundance in the Mediterranean Sea. Eleven species occur regularly, with resident populations in the basin (Table 1). In addition, the North Atlantic minke whale *Balaenoptera a. acutorostrata*, the North Atlantic humpback whale *Megaptera n. novaeangliae* and the false killer whale *Pseudorca crassidens* are considered visitors, while the remaining 11 species are very rare (Table 2).

Table 1. **Cetacean species with regular occurrence and resident populations in the Mediterranean Sea and their common names in English, French and Arabic.** (Cetacean names in Arabic are usually direct translation from the English version but some Arabic countries translate the French names instead. When two options are given, the upper name refers to English and the lower to French).

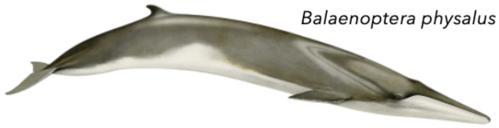
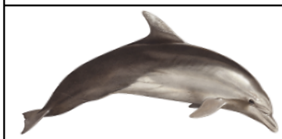
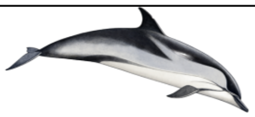
Cetacean species represented by populations regularly present in the Mediterranean			
Species	**English**	**French**	**Arabic**
 *Balaenoptera physalus*	Fin whale	Rorqual commun	الحوت الزعنفي روكال شائع
 *Physeter macrocephalus*	Sperm whale	Cachalot	حوت العنبر
 *Ziphius cavirostris*	Cuvier's beaked whale	Ziphius	حوت كوفيير المنقاري زيفيوس
 *Orcinus orca*	Orca	Orque	الحوت القاتل اوركا
 *Globicephala melas*	Long-finned pilot whales	Globicéphale noir	الحوت القائد جلوبيسيفالوس
 *Grampus griseus*	Risso's dolphin	Dauphin de Risso	دلفين ريسو جرامبوس
 *Steno bredanensis*	Rough-toothed dolphin	Sténo	الدلفين ذو الاسنان الخشنة ستينو
 *Tursiops truncatus*	Common bottlenose dolphin	Grand dauphin	الدلفين زجاجي الانف الدلفين الكبير
 *Stenella coeruleoalba*	Striped dolphin	Dauphin bleu et blanc	الدلفين المخطط الدلفين الأبيض والازرق
 *Delphinus delphis*	Common dolphin	Dauphin commun	الدلفين الشائع
 *Phocoena phocoena relicta*	Harbour porpoise	Marsouin commun	خنزير البحر

Table 2. **Cetacean species occurring, or having occurred, in the Mediterranean Sea. Regular species outlined in grey. Habitat (preferred in bold) and status are indicated only for species recognized as regular.** (Adapted from ACCOBAMS, 2021. Conserving Whales, Dolphins and Porpoises in the Mediterranean Sea, Black Sea and adjacent areas: an ACCOBAMS status report. By Giuseppe Notarbartolo di Sciara and Arda Tonay. *In preparation*.)

	Species/subspecies	English name	Classification	Presence	Habitat	Current status (IUCN)
1	*Eubalaena glacialis*	North Atlantic right whale	Mysticeti, Balaenidae	very rare		
2	*Balaenoptera a. acutorostrata*	North Atlantic minke whale	Mysticeti, Balaenopteridae	Visitor		
3	*Balaenoptera b. borealis*	Northern Sei whale	Mysticeti, Balaenopteridae	very rare		
4	*Balaenoptera p. physalus*	North Atlantic fin whale	Mysticeti, Balaenopteridae	**Regular**	**oceanic**, slope, neritic	Vulnerable
5	*Megaptera n. novaeangliae*	North Atlantic humpback whale	Mysticeti, Balaenopteridae	Visitor		
6	*Eschrichtius robustus*	grey whale	Mysticeti, Eschrichtiidae	very rare		
7	*Physeter macrocephalus*	sperm whale	Odontoceti, Physeteridae	**Regular**	**slope**, oceanic	Endangered
8	*Kogia sima*	dwarf sperm whale	Odontoceti, Kogiidae	very rare		
9	*Hyperoodon ampullatus*	northern bottlenose whale	Odontoceti, Ziphiidae	very rare		
10	*Mesoplodon bidens*	Sowerby's beaked whale	Odontoceti, Ziphiidae	very rare		
11	*Mesoplodon densirostris*	Blainville's beaked whale	Odontoceti, Ziphiidae	very rare		
12	*Mesoplodon europaeus*	Gervais' beaked whale	Odontoceti, Ziphiidae	very rare		
13	*Ziphius cavirostris*	Cuvier's beaked whale	Odontoceti, Ziphiidae	**Regular**	**slope**, oceanic	Vulnerable
14	*Delphinus d. delphis*	common dolphin	Odontoceti, Delphinidae	**Regular**	**neritic, slope, oceanic**	Endangered
15	*Globicephala macrorhynchus*	short-finned pilot whale	Odontoceti, Delphinidae	very rare		
16	*Globicephala m. melas*	North Atlantic long-finned pilot whale	Odontoceti, Delphinidae	**Regular**	**oceanic**, slope, neritic	Endangered (proposed)
17	*Grampus griseus*	Risso's dolphin	Odontoceti, Delphinidae	**Regular**	**slope**, oceanic	Vulnerable (proposed)
18	*Orcinus orca*	Orca	Odontoceti, Delphinidae	**Regular**	**neritic, slope, oceanic**	Critically Endangered
19	*Pseudorca crassidens*	false killer whale	Odontoceti, Delphinidae	Visitor		
20	*Sousa plumbea*	Indian Ocean humpback dolphin	Odontoceti, Delphinidae	very rare		
21	*Stenella coeruleoalba*	striped dolphin	Odontoceti, Delphinidae	**Regular**	**oceanic,** slope	Least Concern (proposed)
22	*Steno bredanensis*	rough-toothed dolphin	Odontoceti, Delphinidae	**regular** in the Levantine Sea, visitor	**oceanic**, **slope**, neritic	Data Deficient (proposed)
23	*Tursiops t. truncatus*	North Atlantic bottlenose dolphin	Odontoceti, Delphinidae	**Regular**	**neritic,** oceanic	Least Concern (proposed)
24	*Phocoena p. phocoena*	North Atlantic harbour porpoise	Odontoceti, Phocoenidae	very rare		
25	*Phocoena p. relicta*	Black Sea harbour porpoise	Odontoceti, Phocoenidae	**regular** in N. Aegean Sea	**Neritic**	Endangered

6. The Mediterranean region has been inhabited by humans for millennia. Among the planet's marine environments, the Mediterranean Sea is one of the most affected by anthropogenic activities. Concentration of human populations and activities around the basin cause substantial impacts to the marine and coastal environments, threatening the structure and function of natural ecosystems and the quality and abundance of natural resources to varying degrees. The State of the Mediterranean Marine and Coastal Environment Report 2012 (UNEP/MAP, 2012) highlighted the following as the major issues requiring coordinated policy and management responses to stop the degradation of the Mediterranean ecosystems: coastal development and sprawl, chemical pollution, eutrophication, marine litter, marine noise, invasive non-indigenous species, over-exploitation, sea-floor integrity, changed hydrographic conditions, marine food webs, and biodiversity. This complex scenario of multiple pressures acting simultaneously puts certain habitats and species at high risk. As very mobile, long-lived vertebrates situated at the highest levels of the marine trophic webs and with very low reproductive rates, cetaceans are among those species at risk. Accordingly, nations bordering the Mediterranean and Black Seas created a legal instrument to ensure the survival of whales and dolphins in the area: The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), which came into force in 2001. Besides this, and in addition to national legislation, other European and international regulations are also of relevance, either directly or indirectly, to cetacean conservation (Table 3).

Table 3. European legislations, international environmental agreements and Intergovernmental organisations relevant to cetacean protection in the Mediterranean Sea.

European 	Habitats Directive (1992)	• The directive's overarching goal strives to ensure the "preservation, protection and improvement of the quality of the environment, including the conservation of natural habitats and wild fauna and flora". Cetacean species are listed in annexes II and IV. • Establishes a Community-wide network of nature protection areas known as *Natura 2000* with the aim of assuring the long-term survival of Europe's most valuable and threatened species and habitats. The responsibility for proposing sites for *Natura 2000* lies with the Member States[1].
	Pelagos Sanctuary (1999)	• France, Italy and the Principality of Monaco to create jointly coordinated initiatives to protect cetaceans and their habitats from all sources of disturbance: pollution, noise, accidental capture and injury, disruption etc.
	The Mediterranean Regulation (2006)	• Adaptation of the EU Common Fisheries Policy in the Mediterranean Sea context, by laying out the necessary measures for the sustainable exploitation of fishery resources. • Regulation of the European Parliament and of the Council for fisheries technical measures. Newest version Regulation (EU) 2019/1241.
	Marine Strategy Framework Directive (2008)	• Establishment of a framework within which Member States shall take the necessary measures to achieve or maintain *good environmental status*[2] in the marine environment by the year 2020 at the latest. • Designated to create a synergy with the Habitats Directive for marine protection.
	Barcelona Convention (1976 and 1995)	• "Convention for the protection of the marine environment and the coastal region of the Mediterranean". The Mediterranean Action Plan of the United Nations Environment Programme (UNEP/MAP) acts as its Secretariat. • Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean. • Action Plan for the conservation of Mediterranean cetaceans" (1991)
	Bonn Convention (1979)	• The Convention on the Conservation of Migratory Species of Wild Animals (CMS).
	ACCOBAMS (1996)	• The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area.
	CITES (1973)	• The Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known Washington Convention. • Forbids trade in endangered species (e.g., cetaceans).
	Bern Convention (1979)	• The Convention on the Conservation of European Wildlife and Natural Habitats, also known as Bern Convention. • Places all cetaceans regularly found in the Mediterranean in Appendix I (strictly protected fauna species).

	Convention on Biological Diversity (1992)	• Also known as CBD, although not explicitly referring to cetaceans, urges Contracting Parties to develop national programmes that will safeguard their natural heritage and biological diversity.
International 	UNCLOS (1982)	• United Nations Convention on the Law of the Sea. • It has special provisions for marine mammals (Art. 65: “States shall cooperate with a view to the conservation of marine mammals...”).
	GFCM (1949)	• The General Fisheries Commission for the Mediterranean was established under the provisions of Article XIV of the Constitution of the Food and Agriculture Organization of the United Nations (FAO). • Its main objective is to ensure the conservation and the sustainable use of living marine resources as well as the sustainable development of aquaculture in the Mediterranean and in the Black Sea.
	IWC (1946)	• The International Whaling Commission is the global body charged with the conservation of whales and the management of whaling. • Currently 88 member governments from countries all over the world. • Today's IWC works to address a wide range of conservation issues.

7.Main threats faced by cetacean species in the Mediterranean Sea are reviewed below:

II.1. Fisheries Interactions

Bycatch in fishing gear (legal/illegal, ghost nets)

8. Interactions between cetaceans and fisheries in the Mediterranean Sea are probably as old as the first human attempts to catch fish with a net (Bearzi, 2002). Direct fisheries interactions pose a serious threat to the survival of many populations and some species of marine mammals, with bycatch (incidental mortality and injury caused by fisheries from accidental entanglement) being the most acute problem (Read, 2008; Brownell et al. 2019). Various types of fishing gear can lead to cetacean bycatch, including passive and active nets, longlines, traps and discarded or lost nets and lines. More than observed bycatch rates themselves, the evidence of entanglement observed in stranded cetaceans in the past few years shows the strong impact of fisheries on Mediterranean (and Black Sea) cetacean populations (ACCOBAMS, 2019). Additionally, larynx entanglement or laryngeal strangulation has also been shown as a cause of death in dolphins depredating fishing gear. During these depredation events dolphins may swallow the net, which may get wrapped around the larynx, get lodged in the stomach or cut into laryngeal tissue (Đuras Gomerčić et al. 2009).

9. Recently, the incidental catch of cetaceans in Mediterranean fisheries has decreased with respect to earlier periods, when marine mammal bycatch, caused mainly by pelagic driftnets, was relevant (also for other groups of large marine vertebrate species). The use of these nets was banned in 2005, and since then, only a few studies have reported on the bycatch of marine mammals from other fisheries in the Mediterranean Sea.

10. Currently, the types of vessel groups with the greatest rates of interactions with marine mammals seem to be those using set gillnets and trammel nets in coastal areas

11. In terms of species bycatch composition, the recorded species of cetaceans decreased considerably once large driftnets were banned and subsequently dismissed. Currently, medium-small cetacean species, such as the striped dolphin (*Stenella coeruleoalba*), the bottlenose dolphin (*Tursiops truncatus*)

and the common dolphin (*Delphinus delphis*) are sporadically found in bycatch reports (GFCM SOMFI 2020)

12. In recent decades, the use of static nets extending to the continental slopes in all coastal fisheries has led to an increased risk of fishing gear loss and thus to unaccounted catches (i.e., ghost fishing). Fishing gear can be lost accidentally during storms, but it can also be abandoned deliberately. In the Mediterranean, despite the scarcity and inconsistency of data on derelict fishing gear, this has been recognized as an issue of major concern. The main impacts of abandoned or lost fishing gear are not only the continued catches of fish, but also of other animals such as whales and dolphins. Additional impacts include alterations of the sea-floor environment (FAO, 2019).

Overfishing and prey depletion

13. The Mediterranean Sea is one of the most intensely fished regions in the world and hosts a substantial fishing fleet comprising an estimated 76,280 fishing vessels, of which small-scale fishing vessels represent approximately 82% (FAO, 2020). The intense fishing effort is depleting fish populations and impacting many vulnerable species, including cetaceans but also sharks, Mediterranean monk seals *Monachus monachus* and sea turtles. Unsustainable fishing has contributed to dramatic ecological changes in the Mediterranean Sea (Sala, 2004), where overfishing is well documented and has had negative effects on prey availability for marine mammals, especially for small cetaceans (Piroddi et al. 2010).

Depredation by cetaceans

14. Fish depredation by dolphins appears to be recurrently perceived by Mediterranean fishers to be causing economic hardship, particularly as far as small-scale fisheries are concerned, by causing damage to fishing gear and disturbing fishing activities (Bearzi, 2002). However, dolphin depredation is not limited exclusively to small-scale fisheries and has been also reported, for instance, in purse seiners in Tunisia and Morocco (Benmessaoud et al. 2018). Ecosystem damage resulting from overfishing and habitat degradation in the Mediterranean Sea has probably exacerbated the perception that dolphins reduce fishery yields (Reeves et al. 2001). Therefore, the economic damage caused by dolphins generates conflict with fishers and, although rarely, may lead to intentional kills in retaliation, as well as to occasional demands for organized culls in some places.

II.2. Intentional Killings

15. In some Mediterranean areas, direct killings and bounties for dolphins represented the first human attempts to solve the problem of depredation and competition, a strategy that was supported by several governments and went on until the late 1960s. Nowadays, approaches to marine mammal control such as culling, or harassment are illegal in most Mediterranean countries and are no longer viewed as appropriate by most fishing organizations. Although direct killings are still occasionally enacted by individual fishers or other people, intentional killings likely do not pose a conservation problem to Mediterranean cetacean populations anymore.

II.3. Ship strikes

16. The Mediterranean Sea is subject to some of the heaviest vessel traffic in the world, with about 30 % of the world's total merchant shipping concentrated within only 0.8 % of the global ocean surface.

17. Collisions with large vessels present a major conservation issue for both fin whales (*Balaenoptera physalus*) (David et al. 2011; Panigada et al. 2006) and sperm whales (*Physeter macrocephalus*) (Di Méglio et al. 2018; Frantzis et al. 2019). Fin whales and sperm whales are listed as Vulnerable (VU) and Endangered (EN) under the IUCN Red List Criteria respectively, underlying the urgent need to reduce and mitigate any anthropogenic pressure. An analysis of stranding and collision records showed that the fin whale is the most vulnerable species to ship strikes in the North-Western Mediterranean Sea. Unusually high rates of ship collisions have been reported for this species in the region, where the

minimum mean annual fatal collision rate increased from 1 to 1.7 whales/year from the 1970s to the 1990s. It should also be noted that reported strikes greatly underestimate the true number of strikes. The highest number of collisions with fin whales occur in summer, during their feeding season when they are more often encountered, and when the traffic in ferries and passenger ships increases in the area. Collisions with fin whales tend to occur predominantly on the main passenger ship routes that cross the basin.

18. Sperm whales also are vulnerable to ship strikes, particularly on the main cargo routes that travel parallel to the Italian and French coastlines and along the Hellenic Trench, where sperm whale occurrence and naval traffic overlap substantially (Frantzis et al. 2019).

II.4. Underwater noise

19. Underwater noise from various maritime activities is recognised as a chronic, habitat-level stressor (Williams et al. 2020) and can adversely affect cetaceans in a number of ways. In the most severe cases, such as extremely high levels of acute noise (e.g., from seismic vessels or drilling projects of the offshore industry), this can result in permanent threshold shift or even tissue damage leading to stranding and death. Both acute and chronic noise - at various spatial and temporal scales - can affect cetaceans through a range of mechanisms, including temporary threshold shifts, spatial displacement and habitat exclusion, masking of sounds relevant to communication and foraging, disturbance and elevated stress levels, and modifications of short-term and possibly long-term behaviour (Southall et al. 2007; Weilgart 2007; Clark et al. 2009; Williams et al. 2020). These may lead to impacts on feeding and energetic balance, as well as on reproduction, potentially leading to population-level consequences. In addition to vessel traffic of all types and purposes (cargo, transport, fishing, tourism, whale watching, research), noisy activities can arise from geophysical exploration, military activities (sonar and explosions), dredging and coastal and offshore development (e.g., offshore windfarms). Potentially, the noise emitted by vessels may also affect the ability of cetaceans to avoid collisions with vessels.

II.5. Disturbance from boat traffic

20. There has been a great expansion of recreational boat traffic and shipping in the Mediterranean Sea in recent decades. The relatively closed nature of the Mediterranean Sea, its densely populated coastlines and prominent presence of tourism likely make cetaceans in this basin particularly susceptible to the impacts of recreational boat traffic and the associated acoustic disturbance. A number of studies demonstrated behavioural changes (including acoustic behaviour) in response to recreational boat traffic in some species (Papale et al. 2011), as well as temporary avoidance of areas with high vessel density of recreational boat traffic (La Manna et al. 2010; Gonzalvo et al. 2014), although a certain degree of tolerance has been also reported (La Manna et al. 2013). In addition to its potential to disrupt foraging, socializing or resting behaviour, as well as increase stress levels (see also 4-Underwater noise), boat traffic may also lead to serious injuries or death from boat strikes, as described above.

II.6. Cetacean-watching (including swimming-with)

21. Invasive approaches of boats (e.g., from cetacean-watching activities or even non-careful research activities) can disturb cetaceans through direct physical presence and/or via emitted noise and may interrupt important behaviours, such as feeding and reproduction (Jahoda et al. 2003). Long-term vessel presence can also exclude animals from preferred habitat (see also 4-Underwater noise).

22. Unregulated cetacean-watching activities, which may grow very fast in some areas, may have detrimental population-level effects, which need to be mitigated and prevented.

23. Close and invasive approaches, such as those related to swim-with operations, should be prohibited in accordance with guidance from ACCOBAMS, the Pelagos Sanctuary Agreement and the IWC, as they may lead to severe disturbance to the animals.

24. It is noteworthy to consider also that Unmanned Aerial Vehicles (UAVs), or drones, have recently emerged as a relatively affordable and accessible method for studying, photographing and filming cetaceans. For many cetacean watching operators this relatively new, rapidly evolving and increasingly affordable technology is seen as a good opportunity to obtain spectacular images and footage for promoting their business.

II.7. Chemical pollutants

25. Effects of chemical pollutants on cetaceans are varied and can be both direct and indirect. They include immunosuppression (Tanabe et al. 1994), endocrine disruption (Tanabe et al. 1994 ; Vos et al. 2003 ; Schwacke et al. 2012), reproductive impairment (Schwacke et al. 2002) and developmental abnormalities (Tanabe et al. 1994 ; Vos et al. 2003). Pollutants may directly impact abundance through reduced reproduction or survival (Hall et al. 2006; Hall et al. 2017), while indirect effects include impacts on the abundance or quality of cetacean prey. Although organochlorine contamination has generally decreased in several areas, levels in several Mediterranean cetaceans remain alarmingly high (Jepson et al. 2016; Marsili et al. 2018; Genov et al. 2019). Currently, Polychlorinated Biphenyls (PCBs) are likely the greatest contaminant threat to cetaceans (Jepson et al. 2016). Within the Mediterranean Sea, PCB concentrations in bottlenose dolphins, a species widespread across the basin, generally decline from north to south, and from west to east (Genov et al. 2019), in line with a general gradient of human activities in this basin. The Mediterranean Sea may also be particularly vulnerable to contamination by mercury, due to its semi-enclosed nature, as well as the relatively high presence of this heavy metal from both natural and anthropogenic sources (Andre et al. 1991).

II.8. Marine debris (macro/micro)

26. Plastic pollution has become one of the biggest environmental concerns of the Anthropocene, as it represents a major threat to both wildlife and human health. The Mediterranean Sea is one of the most plastic polluted environments. This acute marine pollution might threaten entire ecosystems through its impact on marine fauna (entanglement, ingestion, contamination), eventually impacting the tourism industry and the well-being of Mediterranean populations (Lambert at el., 2020).

27. Different cetacean species may be threatened by marine debris to varying degrees (Baulch & Perry 2014), with deep-diving odontocetes apparently particularly vulnerable to ingestion of plastic macro debris (Simmonds 2012; de Stephanis et al. 2013). Baleen whales such as the Mediterranean fin whale may be especially vulnerable to the ingestion of microplastics due to their feeding mechanisms. The interaction between free-ranging fin whales and microplastics in the Mediterranean Sea and elsewhere has only recently started to be investigated. Fossi et al. (2012) found considerable quantities of microplastics and plastic additives in surface water samples of and adjacent to the Pelagos Sanctuary. More recent studies suggest that debris, including micro-plastics and chemical additives (e.g., phthalates), tend to accumulate in pelagic areas in the Mediterranean (Fossi et al. 2016, 2017), indicating a potential overlap between debris accumulation areas and fin whale feeding grounds. Exposure to microplastics (direct ingestion and consumption of contaminated prey) poses a major threat to the health of fin whales in the Mediterranean Sea. Microplastics have also been found in a number of odontocete species, but the scale of impacts is still poorly understood (Nelms et al. 2019).

II.9. Habitat loss and degradation

28. Habitat degradation can be defined as ‘those processes of anthropogenic origin that make habitats less suitable or less available to marine mammals’ (IWC, 2006). It is often difficult to separate physical degradation of certain activities (i.e., physical damage to the habitat such as coastal development or bottom trawling) from other factors associated with those activities (e.g., high levels of noise resulting from coastal development or trophic web effects). Either way, directly or indirectly human development activities (both coastal and pelagic) in key cetacean habitats can have serious adverse impacts.

29. Reduced habitat quality and loss of critical habitat can be caused by coastal and offshore development, marine engineering, port and dam construction, opening and closing of waterways, and

exploitation of marine resources (e.g., resulting in sea floor modifications, changes in water quality, eutrophication and harmful algal blooms). The resulting disruption of cetacean behaviour might compromise an individual's energy balance and, consequently, population vital rates (e.g., survival and reproduction). Moreover, when this disruption affects most individuals in a population, it can translate into changes in population dynamics. It has been reported, for instance, that higher intensities of dredging related to a harbour expansion project caused bottlenose dolphins to spend less time in the harbour, despite high baseline levels of disturbance and the importance of the area as a foraging patch (Pirotta et al. 2013).

II.10. Climate change

30. Climate change is now widely recognized as a global issue (IPCC, 2007), which has also been documented in the Mediterranean Sea. Boero and colleagues (2008) reviewed water temperature and salinity levels over the last decades, reporting higher levels throughout the entire Mediterranean Sea, attributable to climate change. The effects of climate change over the Mediterranean Sea have been the subject of several studies (Gambaiani et al. 2009; Lejeusne et al. 2009), with predicted changes in prey availability and distribution over the water column and increases in the presence of alien (exotic) species, due to the 'tropicalization' of the entire area (Bianchi, 2007).

31. As an example, the potential effects of global climate change or ocean acidification on Mediterranean fin whales, largely dependent for feeding on euphausiids such as *Meganyctyphanes norvegica* (Notarbartolo di Sciara et al. 2003), as well as possibly susceptible to an increase in water temperature and salinity (Gambaiani et al. 2009), may strongly influence the entire population, leaving no space to move to northern latitudes.

32. The effects of climate change on Mediterranean cetaceans are currently unknown but cannot be neglected and need further investigation. Impacts may occur because of changes in prey availability, increased intra- and inter-specific competition, potentially increased incidence of pathogens, oceanographic changes or interaction of climate change and fishery pressure (Gambaiani et al. 2009).

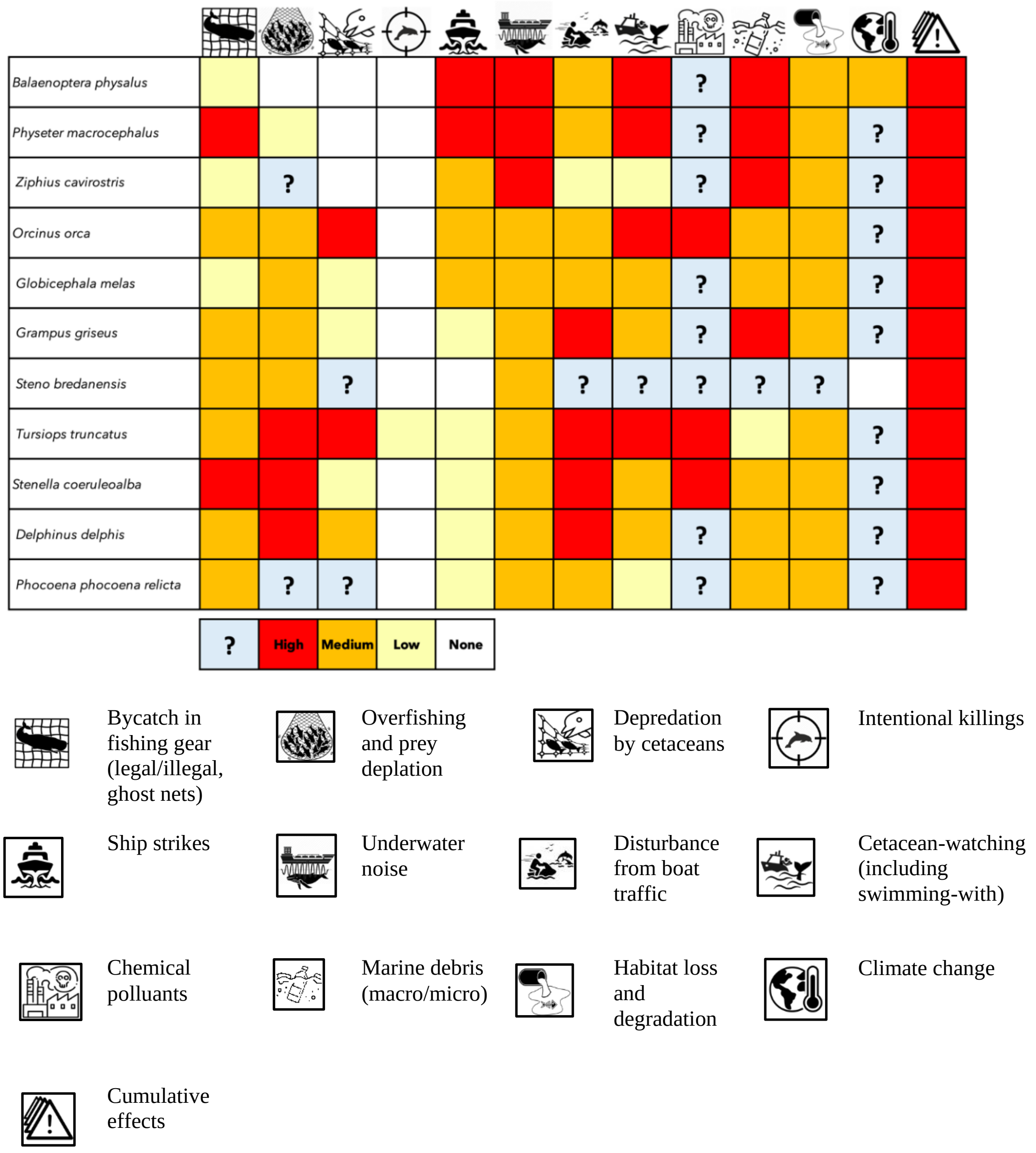
II.11. Cumulative effects

33. The above sections discuss threats individually. However, it is clear that some or all of them may interact temporally and/or spatially.

34. Cumulative effects can be considered as changes in reproduction and/or survivorship that negatively affect population dynamics and status, because of repeated exposure to the same stressor(s) over time, or the combined effects of multiple stressors. Developing robust ways to evaluate this is a complex problem (Stelzenmüller et al. 2018). Perhaps the best-developed framework to date is the Population Consequences of Disturbance (PCoD) model (Booth et al. 2020), which has been extended to consider the Population Consequences of Multiple Stressors (PCoMS) (National Academies of Sciences, Engineering, and Medicine 2017). This approach moves through the effects of stressors on individuals' behaviour and physiology, which is converted to effects on vital rates and then on to population trends and sustainability. However, the approach is extremely data demanding and requires quantitative temporal and spatial information on the target species (distribution, demographics and physiology), their prey and environment, human activities and models linking these - this complexity also contains inherent large levels of predictive uncertainty.

Table 4. Threats faced by cetaceans with a regular occurrence and resident populations in the Mediterranean Sea.

(The attempt to rank threats affecting these 11 cetacean species should be considered as a purely indicative exercise. For instance, some of these threats may be locally high in a given area but considered medium or low at regional level. Moreover, the sparce use of "?" indicating lack of knowledge does not imply that the rest of “ranked” cells have to be considered as definitive, but as stated above, purely indicative based on available evidence).



III. Objective of this Action Plan

35.The main Objective of this Action Plan is to provide a conservation framework and guidance, in line with decisions adopted by international bodies such as ACCOBAMS, the Pelagos Sanctuary Agreement and the International Whaling Commission (IWC), to be used to improve the conservation status of cetacean populations within the Mediterranean Sea.

IV. Methodology

36.According to the IUCN Red List, several cetacean populations in the Mediterranean Sea are Endangered or Threatened. Consequently, measures to enhance their protection and conservation should be considered as priority actions within this Action Plan by all Parties to the Barcelona Convention when defining the best strategies to implement it with the assistance of ACCOBAMS and SPA/RAC.

37.Ongoing efforts at the Mediterranean scale, such as the ACCOBAMS Survey Initiative (ASI), have allowed the collection of robust baseline data on presence, distribution, abundance and density of several cetacean species. On the other hand, many important aspects of cetacean biology, behaviour, range and habitats in the Mediterranean are still poorly known.

38.In drafting this action plan, references to the ongoing programme of work by ACCOBAMS and by the IWC have been taken into careful consideration. As an example, Conservation and Management Plans should be drafted and implemented for most cetacean species in the Mediterranean Sea, in order to properly manage human activities that may have detrimental effects on cetacean populations.

39.The Action Plan considers the UNEP/MAP Decision IG22/7 on the Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP), that aimed at enabling a quantitative, integrated analysis of the state of the marine and coastal environment. IMAP covers three clusters i) pollution and marine litter, ii) biodiversity and non-indigenous species and iii) hydrography. These backbones of the IMAP are the 11 Ecological Objectives and their agreed common indicators, targets and Good Environmental Status (GES) definition. At their 19th Ordinary Meeting (COP 19, Athens, Greece, 9-12 February 2016), the Contracting Parties to Barcelona Convention, when adopting IMAP, stated that species of cetaceans regularly present in the Mediterranean Sea should all be considered when developing the national monitoring and assessment activities. Accordingly, the Contracting Parties should make every effort to identify a minimum of two species (if present) to be included in their national monitoring programme, based on the specificity of their marine environment and biodiversity, and taking account that these species should belong to at least two different functional groups, where possible (Baleen whales/Deep-diving toothed whales/Shallow-diving toothed whales). Moreover, as far as possible, the choice of monitored species should be coordinated at sub-regional scale to ensure coherence with cetacean population distribution in the Mediterranean Sea.

40.Cetaceans are included in two Ecological Objectives of IMAP (EO1 and EO11). EO1 focus on common Indicators 3, 4 and 5 for distribution, abundance, and demography respectively. Most of the actions proposed are expected to provide robust data and inputs relevant for the establishment of a primary, region-wide Standardized Integrated Monitoring and Assessment Programme. Monitoring and assessment of cetacean distribution, abundance and demography at national, sub-regional and regional levels will be used to improve knowledge on the Mediterranean marine environment through the development every cycle of six year a regional assessment product (2023 Mediterranean Quality Status Report (2023 MEDQSR),).

41.While the different actions have not necessarily been specifically designed according to the EcAp/IMAP process, they are aligned with EcAp/IMAP goals and requirements. The data arising from the implementation of each single action will provide key inputs to address the different indicators targeting cetaceans.

V. Regional Coordinating Structure and Implementation

42. The coordinating body is composed by SPA/RAC in collaboration with ACCOBAMS with occasional support/advice from its Scientific Committee, which will be helping by:

- providing support to in the implementation of the AP, its review and update every five years;
- providing recommendations and advice on issues related to cetacean conservation;
- providing support on the creation and maintenance of a forum for cetacean conservation experts, where relevant information and experience is shared, exchanges are facilitated, challenges are discussed, cooperative initiatives are enhanced, transparency and openness of procedures are safeguarded (e.g., NETCCOBAMS);
- Regularly reporting to the National Focal Points for SPAs about the implementation of the present Action Plan;
- ensuring that the Mediterranean region is involved in the pertinent international and/or regional initiatives in relation with cetacean monitoring and conservation.

43. Implementing the present Action Plan is the responsibility of the national authorities of the Contracting Parties. At each of their meetings, the National Focal Points for SPAs shall assess how far the Action Plan is being implemented on the basis of national reports on the subject and a report made by SPA/RAC on implementation at regional level.

44. In the light of this assessment, the Meeting of National Focal Points for SPAs will suggest recommendations to be submitted to the Contracting Parties. If necessary, the Meeting of Focal Points will also suggest adjustments to the schedule that appears in the Appendix to the Action Plan.

VI. Participation in the Implementation

45. Implementing the present Action Plan is the province of the national authorities of the Contracting Parties. The concerned international organisations and/or NGOs, laboratories and any organisation or body are invited to join in the work necessary for implementing the Action Plan. At their ordinary meetings, the Contracting Parties may, at the suggestion of the meeting of National Focal Points for SPAs, grant the status of «Action Plan Associate» to any organization or laboratory which so requests, and which carries out, or supports (financially or otherwise) the carrying out of concrete actions (conservation, research, etc.) likely to facilitate the implementation of the present Action Plan, taking into account the priorities contained therein.

VII. National Action Plan

46. To ensure more efficiency in the measures envisaged in the implementation of this Action Plan, Contracting Parties are invited to establish National Action Plans for the conservation of cetaceans.

47. Each National Action Plan, taking into account the concerned country’s specific features, should address the current factors causing loss or decline of cetacean population and their habitats, suggest appropriate subjects for legislation, give priority to the protection and management of marine areas, the regulation of fishing practices and ensure continued research and monitoring of populations and habitats as well as the training and refresher courses for specialists and the awareness-raising and education for the general public, actors and decision-makers.

VIII. Priority Actions

48. The actions outlined in this Plan are grouped into four categories: Education and Awareness, Capacity Building, Research and Monitoring, and Management.

49. In all the actions presented below, there is a section referred to as *Actors* and one as *Evaluation*. In the former, various bodies that may be responsible for the execution and implementation of each action are proposed; this is not meant to be an exclusive or comprehensive list and other actors can be included in a case-by-case basis, depending on the country/region of implementation of the action and its needs (e.g Pelagos Secretariat). Ultimate evaluation of all the actions proposed within this AP is to be carried out by SPA/RAC and ACCOBAMS, as stated above, with support and advice from the ACCOBAMS SC.

50. There are several actions in this Action Plan, and we acknowledge it would be difficult to implement all of them and evaluate their objectives within the next five years. A priority ranking is provided for each action and it is suggested that during the next meeting of the Contracting Parties, these actions are carefully evaluated, their feasibility is considered, and agreement is reached on identifying the actions to be urgently implemented, according to national and international conservation and management priorities.

VIII.1. Education and awareness

VIII.1. INCREASE PUBLIC AWARENESS	
Objective	**Priority** (Low, Medium, High)
To develop a strategy for the timely production of a series of resources to inform citizens of the status and the importance of conservation of Mediterranean cetaceans	Medium
Description	
Aim of this action is to develop a strategy and a series of actions to produce a variety of targeted, accurate, public awareness resources that will inform the general public on the status of Mediterranean cetaceans and on how citizens can assist in conservation efforts, including what they should do if they encounter living or dead individuals. This action refers to a variety of categories of stakeholders for each range state: coast guard, mariners (and their trade associations where applicable), fishers (and their trade associations where applicable), cetacean watching operators, NGOs, research institutes, schools, etc. Outreach should include the use of mass media such as newspapers, radio and television; the internet and social media; public lectures and symposiums; education programmes for teachers and students of all ages; and dissemination of information in written and spoken form in cetacean-watching and other tourism operations. Dedicated smartphone applications could also be developed, or those already existing may be adapted, as necessary.	
Actors	**Evaluation**
Parties to the Barcelona Convention, Ministry of Environment (or equivalent for each country), Ministry of Fisheries, Ministry of Education (or equivalent for each country), NGOs.	SPA/RAC and ACCOBAMS

VIII.2. Capacity building

VIII.2.1. INCREASE AND STRENGTHEN CAPACITY AT THE MEDITERRANEAN LEVEL	
Objective	**Priority** (Low, Medium, High)
To ensure that individuals and relevant management bodies have the motivation, skills and resources needed to implement this plan	High
Description	
The degree of knowledge and expertise throughout the region is unevenly distributed. The transfer of necessary skills is a key step in the process of successfully implementing this AP. Training effort should be diverse and target different aspects of the conservation process, by providing the knowledge needed to conduct adequate research, monitoring and assessment activities on cetacean species and their ecosystems, but also by giving tools to effectively translate the newly acquired information on cetacean distribution and conservation needs into legislative, regulatory and management actions, that will lead to direct conservation benefits. This strategy is to be tailored for each Contracting Party and target groups may vary between countries - while some may be in need of very specific capacity building actions (i.e., training), other may be in a position to play an active role in exchanging of best practices by providing sub-regional training opportunities. Training packages for different approaches to cetacean research (e.g., line-transect surveys, photo-identification, stranding management and sampling protocols, data analysis, etc.) and conservation tools, with the aim of unifying teaching methods, will be designed in synergy with the ongoing activities developed within the EcAp/IMAP process.	
Actors	**Evaluation**
Parties to the Barcelona Convention, the Pelagos Sanctuary Agreement, research institutes, Universities, MedPAN and NGOs	SPA/RAC and ACCOBAMS

VIII.2.2. INCREASE THE CAPACITY OF AND DEVELOP STRANDING NETWORKS THROUGHOUT THE REGION	
Objective	**Priority** (Low, Medium, High)
Set up a pilot project on remote training and advice for stranding networks	Medium
Description	

The Covid-19 pandemic crisis has demonstrated the great potential of remote training and advisory services. This innovative approach can be applied to cetacean stranding capacity building, by setting up an online programme based on video tutorials and presentations. While some aspects of training may be carried out remotely, other aspects may be implemented through in-person teaching. These courses can be followed by dedicated personnel going through a final test, which should give access to a formal accreditation (open badge) issued by teaching entities (i.e., universities) and recognized by ACCOBAMS. The course should be tailored depending on resources and skills present in each country. Practical training should be provided for veterinarians and/or biologists by preparing a train-the-trainer program. Training subjects covered by the program will include information on stranding response and management, carcass disposal, data collection and basic post-mortem evaluation, as well as specific instructions on the collection and preservation of samples, related to both life history and histopathology. After compilation of the training, follow-up advice will be provided to support first interventions in stranding events and in more complex cases by using remote support platforms such as WhatsApp, Zoom, etc.

Actors	**Evaluation**
Universities, Research institutes, veterinary professionals, NGOs, already existing and well-established Stranding Networks, SPA/RAC and ACCOBAMS	SPA/RAC and ACCOBAMS

VIII.2.3. INCREASE CAPACITY ON AND DISSEMINATE CETACEAN MONITORING TECHNIQUES	
Objective	**Priority** (Low, Medium, High)
Capacity building on cetacean monitoring techniques, to be complemented with a pilot initiative to facilitate remote training and advice for less experienced researchers	Medium
Description	
Effective national and regional monitoring programmes in line with the EcAp/IMAP process and in synergy with the Marine Strategy Framework Directive (MSFD) are fundamental in setting conservation targets and ensure they are being met. Increasing national and regional capacity for implementing such programmes is therefore of utmost importance. Because institutional and individual capacity in the region is highly uneven and variable, training activities are vital in ensuring wider implementation capabilities and therefore data representativeness. Depending on the specific needs, the methods in question (e.g., boat-based visual surveys, aerial surveys, photo-identification, passive acoustic monitoring) and the level of experience by the trainees, training may be organised in-person, remotely, or as a combination of the two. **Increasing capacity is needed at the level of data collection, data analysis and data publishing.**	
Actors	**Evaluation**

MPA management unit(s), IMAP national committee(s), Universities, research institutes running long-term cetacean monitoring programmes and projects, NGOs	SPA/RAC and ACCOBAMS

VIII.2.4. INCREASE CAPACITY ON AND IMPROVE MONITORING OF THREATS AFFECTING CETACEANS	
Objective	**Priority** (Low, Medium, High)
Capacity building on monitoring threats, to facilitate training and advice for less experienced researchers	Medium
Description	
Alongside monitoring of cetacean populations, it is imperative to monitor the threats affecting them. This action is consistent with Action 2.3 and may build into it. As already postulated in Action 2.3, the monitoring capacity is highly uneven across the Mediterranean region and there are clear benefits to carry out capacity building activities to ensure a better data representativeness and region-wide ability to monitor the status of cetacean populations. As with Action 2.3, training activities may be organised through both in-person and remote learning, depending on the specific methodology, threats (e.g., fisheries bycatch, underwater noise, chemical pollutants, etc.) and individual needs in different countries or regions.	
Actors	**Evaluation**
Universities, research institutes running long-term cetacean monitoring projects, National IMAP Committee(s)[1], NGOs	SPA/RAC and ACCOBAMS

VIII.3. Research and Monitoring

VIII.3.1. CETACEAN BYCATCH – IMPLEMENTATION OF LESSONS LEARNT BY MEDBYCATCH PROJECT THROUGHOUT THE MEDITERRANEAN	
Objective	**Priority** (Low, Medium, High)

Implementing lessons learnt from the MedBycatch project throughout the Mediterranean	High
Description	
The scope of the on-going MAVA funded MedBycatch Project is to monitor and mitigate incidental catches of vulnerable species (Marine Mammals, Sharks, rays, seabirds, marine turtles, corals and sponges) and reduce fishing impacts and pressures on marine habitats and species. Phase 1 (Sept. 2017 - Jun. 2020), involving Morocco, Tunisia and Turkey generated several outputs, among them a protocol on Monitoring the incidental catch of vulnerable species in Mediterranean and Black Sea Fisheries: Methodology of data collection, an Identification guide of vulnerable species incidentally caught in Mediterranean fisheries, creation of a Pan-Mediterranean multi-taxa database containing data on bycatch of vulnerable species in the region, and a Review on Incidental Catches of Vulnerable Species in the Mediterranean and the Black Seas as well as national bycatch reports. Phase 2 (Jun. 2020 - Oct. 2022) has expanded the geographical scope of the project, including Croatia and Italy. Phase 2 is primarily focusing on testing mitigation measures and on informing and influencing policy developments related to the bycatch of vulnerable species at national and regional levels. It is of key importance to capitalize the efforts done so far (and on-going) in the context of the MedBycatch project and promoting its approach, deliverables and results to encourage replication across the Mediterranean, establishing a baseline for bycatch in the region and identifying existing gaps.	
Actors	**Evaluation**
Parties to the Barcelona Convention, National IMAP Committee(s), Ministries of Fisheries and Environment (or equivalent for each country), GFCM, partners of the MedBycatch project directly (or indirectly) involved in cetacean conservation	SPA/RAC and ACCOBAMS

VIII.3.2. INVOLVING FISHERS ACROSS THE MEDITERRANEAN SEA ON CETACEAN CONSERVATION	
Objective	**Priority** (Low, Medium, High)
Gather fishers' local ecological knowledge in order to improve information on cetacean conservation status and threats, and increase their marine conservation awareness	Medium
Description	

Fishers' local ecological knowledge (LEK), accumulated over the course of their fishing careers, can be invaluable in helping marine researchers and resource managers obtain critical information to improve management of fish stocks and rebuild and conserve marine ecosystems. Well-designed and carefully conducted interviews with fishers will allow insights into past abundance of fish and changes in ecosystem status and quality, dolphin–fisheries interactions, as well as whale and dolphin population trends and status, and to identify the main conservation management actions needed. In addition, this initiative will contribute to increasing the marine conservation awareness of fishers by inviting them to reflect on issues that, in many cases, have been largely ignored by their community, and to directly contribute to effective ecosystem-based management measures. The LEK protocol used in the context of the MedBycatch project (see above), as well as the experience gained in this field through similar initiatives within the Mediterranean are to be taken into consideration when designing future questionnaires addressed to fishers. Fishers of different ages and from different generations should be ideally included in this exercise, to account for the phenomenon of shifting environmental baselines[2]. Before conducting private interviews, informative talks will be given at the local fishers' cooperatives to call for the collaboration of their members. This action should not be focused exclusively on small-scale fishers, but also on those working in industrial fishing fleets.

Actors	**Evaluation**
Parties to the Barcelona Convention, GFCM, Ministries of Fisheries (or equivalent for each country), Ministry of Environment (or equivalent for each country), NGOs	SPA/RAC and ACCOBAMS

VIII.3.3. STANDARIZATION OF CETACEAN STRANDING PROTOCOLS ACROSS MEDITERRANEAN COUNTRIES	
Objective	**Priority** (Low, Medium, High)
Promote and implement standardized cetacean stranding protocols throughout the Mediterranean	High
Description	
At the Joint ACCOBAMS/ASCOBANS Workshop on standardization of best practices on cetacean post-mortem investigation and tissue sampling, a common approach was adopted. This was followed by the resolution 7.14 on *best practices in monitoring and management of cetacean stranding* being released at the 7th Meeting of the Parties to ACCOBAMS, held in Istanbul, Turkey, in November 2019[3].	

[2] The phenomenon of shifting environmental baselines was described by Daniel Pauly (1995) noting that each generation subconsciously views as 'natural' the way the environment appeared in their youth. As one generation replaces another, perceptions of what is natural can change dramatically among local communities and lead to the loss of memory on past ecosystem status.
[3] ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.14
https://accobams.org/wp-content/uploads/2019/12/Res.7.14_-Best-Practices-Strandings.pdf
ACCOBAMS-MOP7/2019/Doc 33 - *Best Practice on Cetacean Postmortem Investigation and Tissue Sampling*
https://accobams.org/wp-content/uploads/2019/04/MOP7.Doc33_Best-practices-on-cetacean-post-mortem-investigation.pdf

This should now be shared across the entire Region, including focusing on the collection of data on marine litter ingestion. Three sub-actions are envisaged: a. Promotion and distribution of the documents to the different stranding networks in the region. Common data sets will be collected annually to have an updated overall view of cetacean interaction with fishing activities and marine litter. b. To stress the relevance of a common basic sampling. A common set of tissue samples should be collected and stored for further analyses. These data sets will be dependent on stranding networks skills and resources (see 2.2). Part of these samples will be stored in centralized common tissue banks identified by ACCOBAMS that will store and share samples with all the Mediterranean countries where required. A dialogue with CITES will be established as necessary to facilitate sharing tissue samples, including with IWC. c. Set-up of veterinary laboratories for those stranding networks not having one national laboratory for ancillary analyses (necropsy, histopathology, microbiology). Through the cooperation with the World Animal Health Organization Marine Mammal Health (OIE) reference centre, based in Torino, laboratories will be identified, training will be provided and contacts with already existing and well-established stranding networks will be facilitated. d. All resulting data is to be shared with the Mediterranean database on cetacean strandings (MEDACES) This action is complementary to 2.2 (Capacity building). A centralized tissue bank system should be identified according to the ISO standards foreseen by the OIE and the Environmental Tissue Bank standards.	
Actors	**Evaluation**
Parties to the Barcelona Convention, Ministry of Environment (or equivalent for each country), Coastguards, NGOs, National Stranding Networks	SPA/RAC and ACCOBAMS

VIII.3.4. WEB-BASED EXCHANGE OF SCIENTIFIC INFORMATION	
Objective	**Priority** (Low, Medium, High)
Contribute to a harmonized web-based platform such as NETCCOBAMS by which scientific information (e.g., photo-ID catalogues, tissue sample database, sighting record registry) can be maintained in a centralized location and freely exchanged among interested parties	High
Description	
Integration of information on Mediterranean cetaceans from all areas where they are observed is of substantial value in understanding patterns of habitat use and the links between geographic areas, as well as in determining migration routes and wintering location(s) for some species, such as fin and sperm whales. Having a centralized data repository where all interested parties (including the public) would be able to share and exchange information on Mediterranean cetaceans - in accordance with an agreed data availability protocol - would benefit conservation measures at a broader (i.e., range-wide) geo-spatial scale.	

Actors	Evaluation
Parties to the Barcelona Convention, Ministry of Education (or equivalent for each country), Ministry of Environment (or equivalent for each country), Research Institutes, NGOs,	SPA/RAC and ACCOBAMS

VIII.3.5. DEVELOP AND CARRY OUT EFFECTIVE LONG-TERM MONITORING AT THE ENTIRE MEDITERRANEAN BASIN SCALE TO ESTIMATE ABUNDANCE AND TRENDS	
Objective	**Priority** (Low, Medium, High)
To obtain robust and unbiased population estimates and distributional information on Mediterranean cetaceans throughout the Basin at regular intervals (suggested 6 years following the IMAP requirements)	High
Description	
Promote suitable monitoring programme for the entire Mediterranean region to enable abundance trends, potential distributional changes to be identified and demography of population, in order to inform timely mitigation actions. Robust baseline information on parameters following the agreed EcAp/IMAP agreed common indicators (i.e distribution, abundance and demography) are necessary to inform conservation actions and to implement and evaluate the efficacy of any measures currently in place. The European Habitat Directive, the Marine Strategy Framework Directive, and the IMAP/Ecosystem Approach not only require the monitoring of the Good Environmental Status (GES) of species and habitats of community interest, but also require reporting on this status every 6 years. A synoptic survey, applying line transect distance sampling methodologies, to be carried out in a short period of time across the whole Mediterranean Sea, combining visual survey methods (boat- and aerial-based surveys) and passive acoustic monitoring (PAM). The main aim in both aerial and vessel-based surveys is to estimate density and abundance and assess potential trends over time. Standardized and agreed protocols should be used for the monitoring actions, following the guidelines endorsed by the Contracting Parties during the EcAp Coordination Group Meeting and benefits from the ACCOBAMS Survey Initiative (ASI, 2018) experience. Use existing ongoing programs to integrate abundance estimates and trend estimates. Consider the possibility to perform photo-ID and biopsy and eDNA sampling during large scale surveys to: (1) sample data poor areas, (2) monitor changes in hormones levels, stable isotopes, contaminants in areas of interest as identified by previous surveys. Power analysis should be used to design the specific monitoring framework to detect a trend of a given magnitude and to detect specific rates of population change.	

Actors	Evaluation
Parties to the Barcelona Convention, National IMAP committee(s), MPA management unit(s), Ministry of Environment (or equivalent for each country), Universities, Research Institutes, NGOs	SPA/RAC and ACCOBAMS

VIII.3.6. DEVELOP AND CARRY OUT EFFECTIVE ANNUAL LONG-TERM MONITORING OF CETACEAN DISTRIBUTION, ABUNDANCE AND TRENDS NATIONALLY AND SUB-REGIONALLY	
Objective	**Priority** (Low, Medium, High)
Ensure that annual/seasonal monitoring of distribution, abundance and density is regularly conducted nationally and at relevant sub-regional units, corresponding to the main distribution areas of Mediterranean cetaceans	High
Description	
Continued monitoring of the Mediterranean cetacean populations and regular updates on population status are essential for meeting conservation objectives; among these, the Barcelona Convention, through the EcAp/IMAP, requests Parties to implement common indicators on a variety of species topics (e.g., distribution, abundance and demography) and prepare periodic regional assessment report (Quality Status Reports), to be presented at regular intervals of six years. In addition, the European Commission, through the implementation of the MSFD, asks its members to systematically report on their monitoring programs, developed at national level. Photo-identification is a widely used technique in cetacean research that can provide information on population demography, estimates of abundance and population parameters such as survival and reproductive rates. Long time series of photo-identified cetaceans of several species are available in different areas, providing opportunities for detecting changes in abundance over time. Similarly, biopsy sampling can be used to obtain information on population genetic structure, contaminant levels, and abundance through genetic mark-recapture analysis. Monitoring at the regional level may require data collection throughout the year, to better understand seasonal patterns in distribution, whereas monitoring at the basin level would mainly address inter-annual changes (3.5.). Mark-recapture models should be applied to photo-identification data (and genetic data where practicable) to estimate abundance for specific areas that populations or part of populations occupy during one or more seasons of the year. Collating information collected by different research groups in these areas is also recommended. Line-transect surveys based on distance-sampling methodology may be appropriate for some species, countries or regions. The use of platforms of opportunity, such as fisheries surveys and/or passenger ferries should also be considered in some cases, while acknowledging their limitations.	
Actors	**Evaluation**

Parties to the Barcelona Convention, national IMAP committee(s), MPA management unit(s), Ministry of Environment (or equivalent for each country), Universities, Research Institutes, NGOs	SPA/RAC and ACCOBAMS

VIII.3.7. MONITOR THREATS AT THE NATIONAL AND BASIN LEVEL	
Objective	**Priority** (Low, Medium, High)
To periodically assess the status and trends of threats, and the emergence of potential new threats	High
Description	
Status and trends of threats to cetaceans, including ship strikes, bycatch in fishing gear and other negative interaction with fisheries, underwater noise, micro- and macro litter ingestion, chemical contaminant exposure, physical disturbance and climate change, as well as their cumulative effects in the entire Mediterranean Sea, is key information needed to assess the efficiency of existing and future mitigation measures, and the needs for adaptation of any mitigation strategies. Existing national fishing fleet monitoring programs should be leveraged to obtain information on and monitor cetacean bycatch. Trend maps will inform on the evolution of known threats in previously identified risk areas compared to previous assessments, the identification of new risk areas and the emergence of new threats. The needed know-how to conduct this monitoring is not uniformly distributed among the region; therefore, this action is to be conducted in coordination with 2.4., which aims at providing capacity on monitoring threats to cetaceans where necessary.	
Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee(s), MPA management unit(s), Ministry of Environment (or equivalent for each country) in collaboration with neighbouring countries (whenever possible), Universities, Research Institutes, NGOs	SPA/RAC and ACCOBAMS

VIII.4. Management

VIII.4.1. WIDER ADOPTION AND IMPLEMENTATION OF STANDARDIZED MEASURES TO MITIGATE ADVERSE IMPACT OF CETACEAN WATCHING ACTIVITIES	
Objective	**Priority** (Low, Medium, High)
Efficient management of cetacean watching activities and the implementation of relevant standardized codes of conduct (IWC, ACCOBAMS, CMS)	Medium

Description	
Harassment risk begins when a vessel is deliberately closer than the minimum distance identified in common rules (Code of Conduct) for commercial cetacean watching or when the vessel stays for a period longer than prescribed. This is especially true for swim-with cetacean activities. Moreover, direct interactions between swimmers and animals may introduce risks of animal violent behaviour and transmission of diseases. Additionally, individuals that are regularly approached (even in respect of the code of conduct) can experience substantial stress, which may lead to medium or long-term population-level impacts. It is therefore necessary to minimize the risk of cetacean-watching activities having negative impacts on cetaceans, by the implementation of effective management strategies including the adoption and implementation of standardized codes of conduct (IWC, ACCOBAMS, CMS). The ACCOBAMS “High Quality Whale-Watching®” Certificate aims at encouraging the implementation of good practices and sustainable know-how by whale-watching operators involved in initiatives fostering quality and environmental responsibility; its implementation throughout the basin must be promoted and implemented, ideally, by all Parties. There have been several attempts to evaluate the potential impact of UAVs on cetaceans. At present, there is very little evidence that UAVs disrupt the behaviour of baleen whales. To date, the behavioural responses of dolphins when approached by a UAV remain poorly investigated and most studies have focused on bottlenose dolphins. The available evidence suggests that when small UAVs are flown at an altitude of 10–30 m above bottlenose dolphins, short-term behavioural responses occur. These responses may vary depending on group size and behaviour. Guidelines and well-defined protocols should be developed, promoted among the industry and properly implemented to minimize any potential adverse effects (See Raoult et al. 2020 for a review on using drones on marine animal research).	
Actors	**Evaluation**
Parties to the Barcelona Convention, Ministry of Environment (or equivalent for each country), Ministry of Tourism (or equivalent for each country), Research Institutes, NGOs, MAP managers	SPA/RAC and ACCOBAMS

VIII.4.2. MITIGATE SHIP STRIKES WITH LARGE WHALES	
Objective	**Priority** (Low, Medium, High)
Reduce ship strike risk for fin and sperm whales throughout the Mediterranean Basin	High
Description	

Measures that separate whales from vessels (or at least minimise co-occurrence) in space and time to the extent possible (e.g., routing schemes, Traffic Separation Schemes TSS) are the most effective in reducing this threat. In the absence of routing options, reducing speed has been identified as the most effective way of reducing ship strike risk. Emphasis should be placed on the collection and reporting of data to the IWC Global Ship Strikes Database which will both: (1) facilitate a proper evaluation, prioritisation and monitoring of ship strikes as a threat to various populations and areas (e.g., the Mediterranean Sea); and (2) assist in the development of specific mitigation measures. One of the key actions is to identify high-risk areas for ship strikes (a high-risk area is defined as the convergence of either areas of high-volume shipping and whales, or high numbers of whales and shipping, reflected in the ACCOBAMS work on Cetacean Critical Habitat, CCH). Important Marine Mammal Areas (IMMAs) represent a systematic and biocentric approach to identifying important habitats and can be helpful in identifying potential high-risk areas for ship strikes. In particular, if an IMMA contains a species or population vulnerable to ship strikes, and is transited by significant shipping, the area can be "flagged" for further investigation and potential mitigation. The following steps should be undertaken as part of a process to identify High Risk Areas for Ship Strikes based on IMMAs and in relation to CCH: (1) Traffic information (e.g., vessel type, size, speed, flag, etc.): plotting major ship routes to determine overlap with IMMAs that host significant populations of species threatened by or vulnerable to ship strikes; (2) Species information (e.g., relative or absolute abundance, status, behaviour/seasonality/key lifecycle use in and within IMMAs); and (3) Management and Mitigation. Further develop the process for the designation of International Maritime Organization (IMO) measures, such as a TSS in the Hellenic Trench and a Particularly Sensitive Sea Areas (PSSA) at a scale that includes the North West Mediterranean Sea, Slope and Canyon IMMA, as well as the Spanish corridor, to take into account whale population movement and distribution. Zoning within the area with ship strike mitigation tools such as speed reduction and routing measures could be proposed as part of Associated Protective Measures within the PSSA. Co-operation with IMO, other IGOs, national authorities, the shipping industry, port authorities and the whale watching industry is essential if effective mitigation is to occur.	
Actors	**Evaluation**
IMO, IWC, REMPEC, European Community Shipowners' Associations (ECSA), relevant Ministries per country, research institutes, NGOs	SPA/RAC and ACCOBAMS

VIII.4.3. DEVELOP CONSERVATION MANAGEMENT PLANS (CMPs) FOR MEDITERRANEAN CETACEANS	
Objective	**Priority** (Low, Medium, High)
Develop a series of CMPs to manage human activities that affect cetaceans in the Mediterranean Sea in order to maintain a	High

favourable conservation status throughout their historical range, based on the best available scientific knowledge	
Description	
It is not possible to 'manage' cetaceans in the Mediterranean Sea themselves, but it is possible to manage human activities that adversely affect the cetaceans and/or their habitat. Thus, by their nature, the management actions associated with CMPs require a degree of control and limitation on human activities. In pursuing this goal, the needs and interests of stakeholders need to be considered to the extent possible, whilst recognising that favourable conservation status is the highest priority. Moreover, scientific uncertainty must be considered while setting priorities and determining appropriate actions, but uncertainty alone should not preclude conservation action. Ideally, all management actions are based on adequate scientific data. However, there are occasions when the potential conservation consequences of waiting for confirmatory scientific evidence are sufficiently serious that it is justified to take action immediately whilst continuing to study the problem. This means following the 'precautionary principle'.	
Actors	**Evaluation**
Parties to the Barcelona Convention, IWC, research institutes, NGOs	SPA/RAC and ACCOBAMS

VIII.4.4. ENHANCE EFFORT ON SPECIALLY PROTECTED AREAS OF MEDITERRANEAN IMPORTANCE (SPAMIs) WITH IMPORTANT MARINE MAMMAL AREAS (IMMAs) AND CETACEAN CRITICAL HABITATS (CCH)	
Objective	**Priority** (Low, Medium, High)
Continue with the ongoing effort to monitor existing SPAMIs and designate new ones, assess potential new candidate IMMAs and Areas of Interest and move forward with the overlap with anthropogenic stressors, to identify CCH in the Mediterranean Sea	Medium
Description	
There are 2 SPAMIs specifically designated for the protection of marine mammals in the Mediterranean Sea: the Pelagos Sanctuary and the Spanish Migration Corridor. Efforts to continue monitoring these areas, by implementing their management plan, as well as proposing new potential SPAMIs in the Basin should be considered as a priority. The Mediterranean Sea also features 19 IMMAs designated as important habitats for cetaceans. In addition to these, 5 candidate IMMAs relevant to cetacean conservation have been identified, along with 23 AoIs. The re-evaluation period for IMMAs is envisaged every 10 years. The next evaluation for the Mediterranean, following a first workshop organised in 2016, is scheduled for 2026, coinciding with the	

last phase of this 5-year AP. Furthermore, where possible, efforts should be made to designate some of the existing IMMAs as Marine Protected Areas. SPAMIs and IMMAs provide the initial biocentric process (through the spatial definition of the animals' most important habitats) to be followed by use of the CCH, in which the spatial distribution of threats is identified. Management advice is then based upon an integration of the two approaches and the prioritization of mitigation approaches on a case-specific basis. In addition, other highly relevant initiatives include the post-2020 Regional Strategy for Marine Protected Areas (MPAs) and Other Effective Area-based Conservation Measures (OECMs) in the Mediterranean Sea, coordinated by SPA/RAC. This multidisciplinary effort will assist in providing Countries with advice on targeted and effective conservation measures (where appropriate on a seasonal basis) including: ▪ designation of new (or the extension of existing) MPAs with appropriate focused management actions, ▪ zoning within existing MPAs, ▪ corridors between MPAs, ▪ threat-specific mitigation measures for application throughout the region (shipping or noise directives, e.g., through IMO) during marine spatial planning processes.

Actors	**Evaluation**
IUCN Marine Mammal Protected Areas Task Force, Parties to the Barcelona Convention.	SPA/RAC and ACCOBAMS

VIII.4.5. REDUCE THE INTRODUCTION OF ANTHROPOGENIC SOUND INTO THE MARINE ENVIRONMENT AND MITIGATE ACTIVITIES LIKELY TO PRODUCE UNDERWATER NOISE	
Objective	**Priority** (Low, Medium, High)
Reduce the input of man-made sound into the marine environment, especially from sources and at levels likely to negatively impact cetaceans, as well as provide mitigation measures for noise-producing activities	High

Description
Cetaceans rely on sound to communicate, navigate and locate prey. Man-made underwater noise is a significant threat to these animals. Efforts should be made to reduce the underwater noise pollution, in order to prevent adverse effects on cetaceans. For activities and development likely to produce high intensity impulse sounds (e.g., seismic surveys for oil and gas exploration, pile driving and the use of sonar) and long-term chronic noise (e.g., planning of ports and shipping routes or other sound-producing activities), appropriate Environmental Impact Assessments should be carried out before such activities are allowed to take place. Appropriate mitigation measures should be put in place to prevent detrimental effects of underwater noise on cetaceans. Within the EcAp/IMAP process, Contracting Parties to the Barcelona Convention are required to monitor and assess the candidate common indicators related to energy including underwater noise (i.e. common indicator 26: Proportion of days and geographical distribution where loud, low, and midfrequency

impulsive sounds exceed levels that are likely to entail significant impact on marine animals, and common indicator 27: Levels of continuous low frequency sounds with the use of models as appropriate). It is also important to monitor underwater noise levels nationally and regionally and build on initiatives such as the "Overview of the Noise Hotspots in the ACCOBAMS area", the EU funded QuietMed I & II projects, the Quit Sea Project and the Mediterranean Strategy on Underwater Noise Monitoring for establishing the methodological basis for a future implementation of a basin-wide monitoring programme on underwater noise.	
Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, MPA management unit(s), Relevant Ministries for each Government, IWC, CMS	SPA/RAC and ACCOBAMS

VIII.4.6. REDUCE THE INPUT OF CHEMICAL CONTAMINANTS	
Objective	**Priority** (Low, Medium, High)
Reduce the input of chemical contaminants into the marine environment and limit the mobilization of contaminants in marine sediments	High
Description	
Chemical pollutants impact cetacean species in a number of ways. While some pollutants in the Mediterranean Sea have declined or are declining, organochlorine levels, particularly PCBs, are found at high concentrations in several Mediterranean cetacean species. Pollutants and their impact in marine organisms are included in the EcAp/IMAP Ecological Objective 9 and its Common Indicator 19 and the Descriptor 8 of the Marine Strategy Framework Directive (MSFD) At the Mediterranean policy level, PCB concentration in relation to established toxicity thresholds should be used to assess "Favourable Conservation Status" of cetaceans. Chemical pollutants need to be included in impact assessments of other activities likely to affect cetaceans, due to cumulative and synergistic effects. Greater compliance with the Stockholm Convention is needed in order to significantly reduce PCB contamination of the marine and terrestrial environment by 2028. Measures include the safe disposal or destruction of large stocks of PCBs and PCB-containing equipment, limiting the dredging of PCB-laden rivers and estuaries, reducing PCB leakage from old landfills, limiting PCB mobilization in marine sediments, and regulating the demolition of PCB-containing precast buildings.	
Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, Relevant Ministries for each Government, MED POL, IWC, REMPEC	SPA/RAC and ACCOBAMS

VIII.4.7. REDUCE THE AMOUNT OF MARINE DEBRIS AND MICROPLASTICS ACROSS THE MEDITERRANEAN BASIN	
Objective	**Priority** (Low, Medium, High)
Reduce the input of marine debris and micro/nano plastics into the marine environment and ensure appropriate removal where possible	High
Description	
Different cetacean species are threatened by marine debris to varying degrees, with deep-diving odontocetes likely most vulnerable to ingestion of macro debris and fin whales especially vulnerable to the ingestion of micro/nano plastics. Macro- and microplastics enter the marine environment either directly from improper waste disposal, improperly managed landfills, improperly treated water waste management or result from the degradation of larger items breaking down into smaller particles. Marine litter monitoring of IMAP is based on the Regional Plan on Marine Litter management (Decision IG.20/10) and on the following agreed candidate indicator 24 “Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles (EO10)”. Mitigation measures in relation to marine plastic pollution should focus on 1) preventing the leakage of new micro- and macro-plastic material into the environment and 2) instigating the removal of macro-plastics from the marine environment. The Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 was established to reduce the impact of plastic on the environment (including marine ecosystems) by promoting the establishment of a circular economy. Considering that single-use plastics and fishing-related items represent the vast majority of marine litter, these products should be the main target of mitigation measures. The transition to a circular economy framework will involve the phasing out of single-use plastics, extended producer responsibilities, and recycling schemes. The Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol should be implemented.	
Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, Relevant Ministries for each Government, MedPOL, IWC, REMPEC	SPA/RAC and ACCOBAMS

VIII.4.8. MANAGEMENT OF FISHERIES TO MITIGATE CETACEAN BYCATCH	
Objective	**Priority** (Low, Medium, High)

Recognising mitigating cetacean bycatch as intrinsic to successful fisheries management	High
Description	
Despite being considered as the greatest threat to cetaceans globally, bycatch is frequently perceived as a separate fisheries management issue. Nevertheless, to achieve effective reduction of cetacean bycatch rates, technical mitigation measures specially designed, promoted and imposed for cetaceans, must be coupled with other intrinsic improvements in fisheries management globally. For instance, the most generally effective mitigation measure of cetacean bycatch is reduction in fishing effort; such strategy is to be seriously considered, starting to incorporate it in future fisheries management initiatives, starting by fisheries with the largest documented impact, which may vary considerably among or even within countries. According to the ACCOBAMS/ASCOBANS bycatch mitigation measures, the following are proposed: 16.Encourage Parties, Research Institutes, and Private Sector bodies supported by funding bodies, in collaboration with fishers throughout the process, to develop or improve mitigation measures with new technology and/or materials, alternative gears, the shifting of fishing effort etc. 17. The success of particular mitigation measures depends upon a variety of elements including the particular cetacean population, specifics of the gear and its deployment, as well as local conditions. The Working Group should keep a watching brief of case studies relevant to the Agreement Areas that describe which measures have or have not worked. This should be undertaken in liaison with other bodies (e. g. ICES, WGBYC, FAO, IWC, HELCOM, OSPAR) so that actions complement one another rather than duplicate effort. 18. There is a need to improve the involvement of fishers from the start, including transfer of knowledge, in adopting good practices and to contribute prevention and monitoring of bycatches and careful release of entangled animals. Better outreach would help to inform and reduce bycatch and entanglement. Parties should consider the provision of incentives where appropriate. 19. The Working Group should develop guidelines to policymakers, authorities, and the scientific community on how to best incentivise and engage fishers in prevention, mitigation and monitoring programmes. 20. Where the current mitigation measures (e. g. pingers) don't solve the problem, spatio-temporal closures may be the only immediately available solution, although care is needed that this does not simply move the problem elsewhere. Consideration should be given to moving away from métiers of concern, in which case national authorities should consider some means of compensation to help cover fishers' income loss, where appropriate. The precautionary principle should be adopted. Insufficient technology development should not be considered as a reason to postpone decision-making. 21. The need to move towards an internationally standardised approach for dealing with potential interventions (or lack thereof) of free-swimming, chronically entangled cetaceans should be considered. Expansion of the IWC Global Whale Entanglement Response Network across the regions should be encouraged, including dedicated training of entanglement responders. 22. The humane release of live bycaught and entangled animals according to best practices should be encouraged to help ensure their survival (e.g. Guidelines for the Safe and Humane Handling and Release of Bycaught Small Cetaceans from Fishing Gear - CMS Technical Series No.43, FAO/ACCOBAMS Good Practice Guide for the Handling of Cetaceans caught incidentally in Mediterranean Fisheries, IWC Guidelines for entanglement responders) and fishers should be encouraged to report releases of bycaught individuals.	

23. Countries should be encouraged to establish Marine Protected Areas (MPAs) and Other Effective area-based Conservation Measures (OECMs) where appropriate, and to develop and implement management plans to reduce cetacean bycatch. 24. Methods to monitor the performance of mitigation measures (such as pingers) as well as compliance in their usage by fisheries in real world conditions should be improved and become standard.	
Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, GFCM, Ministries of Fisheries (or equivalent for each country), Ministry of Environment (or equivalent for each country), IWC	SPA/RAC and ACCOBAMS

VIII.5 Implementation schedule

Actions		Time	Who
VIII.1. EDUCATION AND AWARENESS	VIII.1.1. Increase public awareness	Continuously	Contracting Parties ; SPA/RAC; ACCOBAMS
VIII.2. CAPACITY BUILDING	VIII.2.1. Increase and strengthen capacity at the Mediterranean level	Continuously and as needed	SPA/RAC; ACCOBAMS; CPs
	VIII.2.2. Increase the capacity of and develop stranding networks throughout the region		SPA/RAC; ACCOBAMS; CPs
	VIII.2.3. Increase capacity on and disseminate cetacean monitoring techniques		SPA/RAC; ACCOBAMS; CPs
	VIII.2.4. Increase capacity on and improve monitoring of threats affecting cetaceans		SPA/RAC; ACCOBAMS; CPs
VIII.3. RESEARCH AND MONITORING	VIII.3.1. Cetacean bycatch – implementation of lessons learnt by med bycatch project throughout the Mediterranean	As soon as possible and continuously	SPA/RAC; ACCOBAMS; GFCM
	VIII.3.2. Involving fishers across the Mediterranean Sea on cetacean conservation		Contracting Parties
	VIII.3.3. Standarization of cetacean stranding protocols across Mediterranean countries		SPA/RAC; ACCOBAMS;

	VIII.3.4. Web-based exchange of scientific information		Contracting Parties; ACCOBAMS
	VIII.3.5. Develop and carry out effective long-term monitoring at the entire Mediterranean basin scale to estimate abundance and trends		SPA/RAC; ACCOBAMS; CPs
	VIII.3.6. Develop and carry out effective annual long-term monitoring of cetacean distribution, abundance and trends nationally and sub-regionally		SPA/RAC; ACCOBAMS; CPs
	VIII.3.7. Monitor threats at the national and basin level		CPs; SPA/RAC; ACCOBAMS;
VIII.4. MANAGEMENT	VIII.4.1. Wider adoption and implementation of standardized measures to mitigate adverse impact of cetacean watching activities	As soon as possible and continuously	CPs; ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.2 mitigate ship strikes with large whales		CPs; ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.3. Develop conservation management plans (CMPs) for Mediterranean cetaceans		ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.4. Enhance effort on specially protected areas of Mediterranean importance (SPAMIs) with important marine mammal areas (IMMAs) and cetacean critical habitats (CCH)		ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.5. Reduce the introduction of anthropogenic sound into the marine environment and mitigate activities likely to produce underwater noise		CPs, ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.6. Reduce the input of chemical contaminants		CPs, ACCOBAMS; SPA/RAC; Pelagos secretariat, MEDPOL
	VIII.4.7. Reduce the amount of marine debris and microplastics across the Mediterranean basin		CPs, ACCOBAMS; SPA/RAC; Pelagos

			secretariat, MEDPOL
	VIII.4.8. Management of fisheries to mitigate cetacean bycatch.		CPs, ACCOBAMS; SPA/RAC; GFCM, Pelagos secretariat

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Appendix I : Status of the implementation of the Action Plan for the conservation of cetacean in the Mediterranean Sea

Acronyms and abbreviations:

SPA/RAC: Specially Protected Areas Regional Activity Centre

ACCOBAMS: The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area

ASCOBANS: Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas.

GFCM: General Fisheries Commission for the Mediterranean

EcAp: The Ecosystem Approach for management

IMAP: Integrated Monitoring and Assessment Programme

GES: Good Environmental Status

IUCN: International Union for Conservation of Nature

ASI: ACCOBAMS Survey Initiative

MEDASSET: Mediterranean Association to Save the Sea Turtles

JBWG: Joint Bycatch Working Group between ACCOBAMS, ASCOBANS and CMS

CMS: The Convention on Migratory Species (CMS), also known as the Bonn Convention

EO: Ecological Objectives under the IMAP Criteria

CI: Common Indicator under the Ecosystem Approach

REMPEC: The Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea

MSFD: Marine Strategy Framework Directive

***UNDP*:** United Nations Development Programme

ISPRA: The Italian National Institute for Environmental Protection and Research

CCH: Cetaceans Critical Habitat

IMMAs: Important Marine Mammal Area

AoI: Area of interest

Table of contents :

1. INTRODUCTION :

In the Mediterranean Sea, there are 21 species of cetaceans dwelling in the basin, a proportion of these are referred to as "OCASIONAL SPECIES" in which their presence is either spatially (such as the rough-toothed dolphin) or temporally (such as the Orca of the Strait of Gibraltar) limited in the basin. The other proportion is referred to as "REGULAR SPECIES" containing 8 species that are frequently present in the Mediterranean. These later group combine the following species: the fin whale (*Balaenoptera physalus*), the sperm whale (Physeter macrocephalus), Cuvier's beaked whale (*Ziphius cavirostris*), long-finned pilot whale (*Globicephala melas*), Risso's dolphin (*Grampus griseus*), common bottlenose dolphin (*Tursiops truncates*), striped dolphin (*Stenella coeruleoalba*) and the short-beaked common dolphin (*Delphinus delphis*).

Based on the scientific evidence available, most of cetaceans' populations in the basin are under pressure from different anthropogenic activities. Therefore, in 1991, the Contracting Parties of the Barcelona Convention adopted the Action Plan for the conservation of cetaceans in the Mediterranean Sea. The objectives of this action plan are to ensure; a). The protection and conservation of cetacean habitats in particular feeding, breeding and calving grounds, and b) protection, conservation and the recovery of cetacean populations present in the Mediterranean Sea area. Therefore, all cetacean species are now included in Annex II (*list of endangered or threatened species*) of the SPA/BD Protocol of the Barcelona Convention and also included in different degrees of vulnerability in the IUCN Red List.

In 2001, the ACCOBAMS Agreement inter into force and with it, a more binding legal framework was set to further strengthen the conservation effort of cetaceans. The Contracting Parties to the Barcelona Convention followed on that during their 14th Ordinary Meeting and invited the Mediterranean countries to join the Agreement which harmonised their goals and framework. They also invited the Mediterranean countries to recognize that common obligations relating to cetaceans under the SPA and Biodiversity Protocol are fulfilled through the implementation of ACCOBAMS goals and agenda. Similar to ACCOBAMS, the General Fisheries Commission (GFCM) has also joined the conservation effort for cetaceans in 2002 when they adopted Recommendation on the mitigation of incidental catches of cetaceans in the GFCM area (Recommendation GFCM/36/2012/2).

2. OBJECTIVE :

The Action Plan for the conservation of cetaceans in the Mediterranean Sea was adopted by the Contracting Parties to the Barcelona Convention in 1991. It aims at ensuring the recovery of cetacean populations in the Mediterranean. The Action Plan was prepared using the information available about the cetacean populations and the threats hanging over them as known in 1991.

In 2016, the Appendix "The list of Additional Points for the Implementation of the Action Plan" adopted by the Focal Points for SPAs in October 1992 has been revised for the first time, in order to provide new orientations for the Action Plan that are in line with the evolving regional context regarding cetacean conservation and with the new challenges and priorities as identified by the most recent scientific knowledge.

Seven priorities were highlighted in the revised Appendix as important for the conservation of cetaceans. The main aim of this report is to summarise the information gathered for each country to update the status of the different priorities at the national level.

The updated priorities are :

- ***Prohibition of deliberate taking;*** *measures and actions to ensure that cetaceans are covered, at national level, by appropriate regulations and legislation to elimination deliberate killing and for the mitigation of the adverse impacts from their interactions with human activities.*

- ***Prevention and elimination of pollution;*** *especially regarding the implementation of a basin-wide strategy for underwater noise monitoring in the Mediterranean under the Ecological Objective 11 of the EcAp process, the development of acoustic mapping to build a comprehensive picture of the spatial and temporal distribution of anthropogenic noise sources, in particular for the noise hotspot areas identified in the Mediterranean by ACCOBAMS, and, to Promote awareness of the anthropogenic noise impacts on cetaceans, targeting in particular decision makers, key players in the industry organisations and the stockholders in the shipping sectors.*

- ***Elimination of incidental catches in fishing gear;*** *mainly through assessing cetacean bycatch, depredation and through the adoption of appropriate mitigation measures.*

- ***Protection of feeding, breeding, and calving grounds;*** *Establish a list of marine conservation areas under the country's jurisdiction identified as of special importance for cetaceans. Also, to Ensure, through regulation or other appropriate approaches, that whale-watching activity is environmentally sound and sustainably conducted.*

- **Monitoring, research and data collection and dissemination with regard to biology, behaviour, range and habitats of cetaceans;** *mainly regarding the implantation of the comprehensive survey of abundance and distribution of cetaceans carried out by ACCOBAMS (ACCOBAMS Survey initiative).*

3. REPORTS OF TH CONTRACTING PARTIES REGARDING THE IMPLEMINTATION OF THE ACTION PLAN.

ALBANIA

Appropriate regulations measures regarding deliberate killing and Appropriate regulations measures regarding whale watching:

Although no direct regulations were developed by the Albanian state, there were some regulations that are relevant for cetaceans' conservation such as the legislation to regulate marine traffic especially in marine sensitive areas. Also, some regulations prohibiting live capture of cetaceans. Other relevant legislation:

- Order of Minister of the Environment, Forests and Water Administration "On the approval of the Red list of Albanian flora and fauna" no. 1280, of 20.11.2013

- Law no. 9867 of 31.1.2008 "On the rules and procedures on international trade of 31.1.2008 Ministry of Environment endangered species of wild fauna and flora".

- Law no. 10006, of 23.10.2008 "On wild fauna protection" 23.10.2008.

- Law no.81/2017, of 4.5.2017 "On protected Areas", amended in 2008 06.06.2002.

- Law no.9587 of 20.7.2006 "On biodiversity 20.7.2006 Ministry of Environment protection", amended in 2014.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ACCOBAMS Areal Survey for the Adriatic Sea (including Albania) took place during Summer 2018 and was completed.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No monitoring of bycatch is taking place in Albania, stranding and bycatchs sometime reported by fishers on voluntary bases.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise and, establishing conservation areas which are important to cetaceans:

Albania has not developed any recognisable monitoring programme for noise pollution.

BOSNIA AND HERZEGOVINA

Appropriate regulations measures regarding deliberate killing Appropriate regulations measures regarding whale watching:

No information was fond on regulations or legislation specific for the conservation of cetaceans.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Bosnia and Herzegovina is not a signing Party for ACCOBAMS

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No information was fond on relevant assessment

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise, and Establishing conservation areas which are important to cetaceans:

No information was fond on noise pollution monitoring both on the national level, public awareness, or the creation of relevant conservation areas.

CROATIA

Appropriate regulations measures regarding deliberate killing, Appropriate regulations measures regarding whale watching:

In Croatia, Cetaceans enjoy strict protection in all waters under national jurisdiction through the Nature Protection Act (OG No. 80/13, 15/18, 14/19) and the Ordinance on Strictly Protected Species (OG No. 144/13, 73/16). Furthermore, cetaceans are protection within the territory of the Protected Areas according to Nature protection Act (such as the case in the National parks of Mljet, Brijuni, Kornati, Lastovo archipelago and Telašćica). According to Regulation on Ecological Network (OG No. 124/13, 105/15), there are 6 Sites of Community Importance (SCIs) for Bottlenose dolphins, these are: 1). Cres-Lošinj; 2). Aquatorium of J.Molat-Dugi-Kornat-Murter-Pašman-Ugljan-Rivanj-Sestrunj-Molat; 3). Lastovo and Mljet channel, 4). National park Kornati, 5). Aquatorium of the island of Vis, 6). Aquatorium of western Istria.

Regarding whale watching, it is not regulated as specific activity at national level. All rules according to Nature Protection Act apply to it as any other activity influencing wild (strictly protected) species. There is a considerable challenge of fast growth of non-regulated whale-watching tours performed by local commercial operators as a tourist attraction. Currently, there is one company (Blue World Ltd) that is known to organize dolphin-watching tours on dolphin-friendly and environmentally conscious manner. Codes of conduct how to behave in the presence of dolphins have been prepared and educational programmes/campaigns for boat operators are planned.

Implementation of the ACOOBAMS Survey Initiative (ASI):

In 2016, Croatia joined the ACCOBAMS Survey Initiative project (ASI). With the support of the ACCOBAMS secretariat, during the summer 2018, the survey of abundance and distribution of cetaceans was carried out in the Croatian part of the Adriatic Sea as a part of survey blocks 16 and 17 of the Adriatic Sea. Additionally, there will be another survey implemented through the project "Establishment of the system of monitoring conservation status species and habitats" as well as through the LIFE project.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

At the national level, sporadic data on bycatch is collected through the National Stranding Network. Starting 2019, fishing sector has the obligation to record and to report bycatch of endangered species, including cetaceans. At national level, the mitigation measures for reducing bycatch and depredation have not yet been implemented, only sporadically, mostly project based. There is a need for further capacity building in inspection sector and supervision services in each MPA and SCIs. Also, there is a need for education of fishermen how to handle incidentally caught species as well as certain education and clear instructions for reporting by caught animals. Only limited cooperation has started on this issue between fishing and nature protection sector.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

In 2014 for the purpose of the implementation of MSFD Government of the Republic of Croatia adopted Monitoring System for the Assessment of the status of the Adriatic Sea (OG No. 153/2014) and underwater noise is one of the descriptors that should be monitored. Implementation of monitoring started in 2016. Additionally, few projects are starting that will cover underwater noise research and analysis, basin wide.

Also, at the same year, and for the purpose of the implementation of MSFD Government of the Republic of Croatia adopted Monitoring System for the Assessment of the status of the Adriatic Sea (OG No. 153/2014) and underwater noise is one of the descriptors that will be monitored. Implementation of monitoring started in 2016. Additionally, few projects are starting that will cover underwater noise research and analysis, basin wide.

Establishing conservation areas which are important to cetaceans:

As mentioned previously, the National parks of Mljet, Brijuni, Kornati, Lastovo archipelago and Telašćica) are inhabited by cetaceans' species and are protected as part of the NPs framework. There are also the 6 Sites of Community Importance (SCIs) for Bottlenose dolphins which are: 1). Cres-Lošinj; 2). Aquatorium of J.Molat-Dugi-Kornat-Murter-Pašman-Ugljan-Rivanj-Sestrunj-Molat; 3). Lastovo and Mljet channel, 4). National park Kornati, 5). Aquatorium of the island of Vis, 6). Aquatorium of western Istria.

CYPRUS

Appropriate regulations measures regarding deliberate killing and Appropriate regulations measures regarding whale watching:

There are some national legislations regarding the conservation of megafauna species including cetaceans, birds, and sea turtles. But nothing specific for deliberate killing or whale watching. These regulations are:

- Law 153(1) 2003 refers to the Habitats Directive of the EU

- Law 152(1) 2003 refers to the Birds Directive of the EU

- Fisheries Law (CAP 135)

- Fisheries regulations (273/90 and amendments)

- Maritime Traffic Act, Law 35(III) 2007, Law 140(I) 2005, Law 51, 1979 on dumping

- Both the Fisheries Legislation and the Habitats Directive (the Cyprus law implementing this) have provisions that related to the conservation of cetaceans.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ACCOBAMS Survey of the Cypriot waters took place during the summer of 2018.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No information was provided regarding the assessment if bycatch

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No information was provided regarding any noise monitoring framework or activity

Establishing conservation areas which are important to cetaceans:

No information was provided

EGYPT

Appropriate regulations measures regarding deliberate killing and Appropriate regulations measures regarding whale watching:

There are some legislations regarding conservation and biodiversity in general, that include all marine mammals'. These are:

- Law 102 of 1983 for Nature Protectorates & Biodiversity (NCS/ EEAA).

- Law 4 of 1994 for the Protection of the Environment which is amended by Law 9/2009, & its executive regulation (EEAA).

- Law 124 of 1983 regulating fisheries, forced by General Authority for Fish Resources Development (GAFRD).

Finally, there are no whale watching activities taking place in Egypt.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Due to constraints on requiring the necessary sailing permits for the survey boat, the ASI survey took place in late Summer of 2019 covering most of the Egyptian Mediterranean coast.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

Mo assessment was made regarding the bycatch of cetaceans in Egypt.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No framework or monitoring programme for noise on the national or regional levels.

Establishing conservation areas which are important to cetaceans:

Along the Mediterranean coast of Egypt, there is only one Marine Protected Area which is El-Salloum MPA. While cetaceans (especially costal odontocetes) can be found within the MPA, it was established based on other conservation criteria for habitat and other species such as sea turtles and the monk seal.

FRANCE

Appropriate regulations measures regarding deliberate killing:

- Law n° 2016-1087 of 08/08/2016 for the conservation of biodiversity, nature, and landscapes: Following the entry into force in July 2017 of Decree 217-300 implementing the obligation to equip a position-sharing device aimed at avoiding collisions with cetaceans in the Pelagos sanctuary.

- Law n° 2006-436 on national parks, natural marine parks and regional natural parks and Law n° 1976-629 on the Protection of Nature.

- Order 07/01/2011 about the list of marine mammals protected on the national territory and the methods of their protection (Ministry of the Environment).

- 2005- Modifications of the decree of July 27, 1995 on protecting marine mammals allowing the compliance of the species protection texts with the community regulation of application of CITES.

Appropriate regulations measures regarding whale watching:

- France is working on setting up measures to supervise the approach of cetaceans at the national level, in particular with a draft regulation relating to the approach distance of cetaceans, in order to achieve an activity of whale-watching more sustainable and respectful of animal welfare.

- Also, France is already implementing and supporting the ACCOBAMS's High Quality Whale Watching (HQWW) label in the Mediterranean.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The survey took place by both by boat (in the Pelagos sanctuary) and airplanes to cover the national Mediterranean waters of France.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

There is a national working group "accidental catches of small cetaceans ", jointly chaired by the Directorate of Maritime Fisheries and Aquaculture (Ministry of Agriculture and Food) and the Directorate of Water and Biodiversity (Ministry of Ecological and Solidarity Transition) was set up in 2017. This working group also associating relevant organizations and agencies such as the French Agency for Biodiversity, the Pelagis Observatory, and others. Together, they aim at improving knowledge on the interaction between cetaceans and fisheries, reduce the bycatch via mitigation measures and raise awareness among fishing communities. Regarding legislation, there is article 4 of the decree of 2011 for the protection of marine mammals.

Also, two management plans were implemented for the pelagic trawling fleet which was identified as a main contributor to accidental capture. These plans have been proposed and approved by representatives of professional fishing to mitigate the issue of bycatch for cetaceans.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

The "**Underwater Noise Monitoring Programme"** is part of the Strategic Framework Directive on the marine environment. It started in 2017 to monitor the potential impacts of underwater noise aminating from human activities on the marine environment. It is coordinated by the Hydrographic and Oceanographic Service of the Navy (SHOM) and it is subdivided into 4 sub-programs:

- The continuous noise: covering maritime traffic and other types of traffic (recreational or artisanal fishing, pleasure craft).

- Pulsive noise: the objective of this sub-program is to create a national register of pulsive noise.

- Ambient noise: this sub-program concerns the creation of an in-situ acoustic observatory with a network of hydrophones (MAMBO device) and a database of opportunity measurements.

Also, under the programme "**Define Recommendations to Limit Impacts of Anthropogenic Acoustic Emissions**", France has undertaken to develop a guide of recommendations to Limit Impacts of Anthropogenic Acoustic Emissions. This guide includes:

- an overview of the activities and the different types of emissions they produce.

- a presentation of the impacts on marine fauna according to the types of noise.

- the inventory and analysis of the various mitigation measures available.

Establishing conservation areas which are important to cetaceans:

The Pelagos Sanctuary which was created in February 2002 based on agreement between France, Italy, and Monaco to create a Sanctuary for Mediterranean Marine Mammals in in the Corso-Liguro-Provençal Basin. The Sanctuary encamps a marine area of 87,500 sq. km subject to an agreement and management by the three countries. the sanctuary is also qualified as a Specially Protected Areas of Mediterranean Importance (SPAMI).

GREECE

Appropriate regulations measures regarding deliberate killing:

On the national level, there are several laws and legislations for the conservation of cetaceans in general, these are:

- JMD 115276/44 O.J. 8/B of 31/01/2011: Buying and selling of species of native flora and wild fauna being in danger of extinction, (Ministry for the Environment, Energy and Climate Change).

- Law 3937/11 of 31/03/2011, "Conservation of biodiversity and other provisions", (Ministry for the Environment, Energy and Climate Change).

- P.D. 67/1981 of 30/01/1981, for the protection of native flora and wild fauna and definition of a procedure for coordination and control of research on them, and corrections of18/02/1981, on P.D. 67/1981 (Ministry of Rural Development and Food).

- Law 2055/92 of 30/06/1992 of Ratification of CITES Convention (Ministry of Rural Development and Food).

- J.M.D. of 26/10/2006 on Trade of species of wild fauna and native flora (Ministry of Rural Development and Food).

- 28/12/1998 J.M.D. 33318/3028/1998 Determination of measures and procedures for the conservation of natural habitats and of wild fauna and flora (Ministry for the Environment, Energy and Climate Change).

Appropriate regulations measures regarding whale watching:

Apart from the previous, rather general, legislations, no other text was found regarding the regulation of whale watching activities.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The Survey took place in the Greek waters during the summer of 2018 and was completed in the same period.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No information was provided on the any assessment on cetaceans' bycatch in Greece.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

Through the EU funded QuietMED project (Joint programme on noise - D11), which aims to improve the level of coherence and the comparability of the implementation of the Second Cycle of MSFD as regards noise monitoring and mitigation D11. This was achieved through enhancing cooperation among MS, the Barcelona Convention and other third non-EU countries.

Also, the Project "PERSEUS" to implement the principles and objectives put forward in the MSFD regarding D11 and to promote them across the Southern European region.

Establishing conservation areas which are important to cetaceans:

The Gulf of Corinth IMMA: it is a small, semi-enclosed embayment with unique topographic variations, including continental shelf areas, steep bottom relief, and deep waters. It offers a suitable habitat for Vulnerable Mediterranean striped dolphins (*Stenella coeruleoalba*) and Endangered common dolphins (*Delphinus delphis*).

Also, The Hellenic Trench IMMA: it is a long bathymetric feature in southern Greece consisting of a continuous steep continental seaward slope, often bounding offshore linear trenches, troughs and basins, which reach 5 km in depth. The area is the core habitat for the eastern basin distribution of the Endangered Mediterranean sperm whale subpopulation. This eastern Mediterranean distribution includes some 200-250 animals. Additionally, the Hellenic Trench features a sub-area which is the largest among five high-density areas of Mediterranean occurrence for Vulnerable Cuvier's beaked whales that have suffered repeated mass stranding events in the area.

ISRAEL

Appropriate regulations measures regarding deliberate killing:

All marine mammals are fully protected in the national legislation, and they may not be harmed or disturbed in any way. Some examples of the legislation are:

- Wildlife Protection Law - 1955
- National Parks, Nature Reserves, National Sites and Memorial Sites Law – 1998
- Protection of the Coastal Environment Law - 2004

Appropriate regulations measures regarding whale watching:

Legislation toward the regulation of whale watching activities is under development in Israel.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Aerial survey took place during the summer of 2018 to cover the Israeli national waters.

Assessment of cetacean's bycatch, depredation, and the adoption of mitigation measures:

Cetacean bycatch, through fisher reports/victim transfer and/or strandings judged to be bycatch victims, are monitored and recorded by IMMRAC (Israeli Marine Mammal Research & Assistance Center) since 1993. All these data and then reported to the Israel Nature and Parks Authority (INPA) on an annual basis and stored in INPA databases.

Implementation of noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

There are several regulations instituted by the Ministry of Energy regarding minimizing the introduction of noise during oil and gas prospecting activities in Israeli national and economic waters (EEZ). Also, there are areas defined where such actions are altogether prohibited. Environmental impact assessments performed through directives from the Ministry of Environmental Protection prior to activities with an underwater noise component, such as port and coastal construction, always include assessment of potential adverse noise impacts on cetaceans.

Establishing conservation areas which are important to cetaceans:

In Israel, there are several Marine Reserves that hold small odontocete species such as the bottlenose dolphin and the common dolphin. These include :

- Rosh Hanikra Marine Reserve.
- Yam Dor Habonim Marine Reserve.
- Avtach Marine Reserve

In addition, the coastal shelf waters of the Israeli Mediterranean coast have been recognized as an IMMA (Important Marine Mammal Area) in 2017 by IUCN's Marine Mammal Protective Areas Task Force, on account of the above-mentioned two dolphin species.

ITALY

Appropriate regulations measures regarding deliberate killing, and measures regarding whale watching:

There are several regulations that govern both the conservation of cetaceans and also whale watching activities, these can be summarised as following:

- Decreti Ministero della Marina Mercantile 21.05.1980, 3.05.89: "Disciplina della cattura di cetacei, testuggine e storioni".

- Law157 of 11/02/1992 - Norme per la protezione della fauna selvatica omeoterma e per il prelievo venatorio (Corpo forestale dello Stato, guardia).

- Adoption of the EU Council Directive on the conservation of natural habitats and of wild fauna and flora 92/43/CEE on 21/05/1992 (Ministry in charge of Environment).

- Law n.391 of 11/10/2001 Ratifica ed esecuzione dell'Accordo relativo alla creazione nel Mediterraneo di un santuario per i mammiferi marini (Ministry in charge of Environment).

- Regolamento DM 469 de 06/12/2001 recante disposizioni in materia di mantenimento in cattività di esemplari appartenenti alla specie Tursiops truncatus, in applicazione dell'articolo 17, comma 6 della legge 23/03/2001, n. 93 (Autorità di gestione CITES tramite).

- Decree of Ministry dell'Ambiente e della turala del Territorio e del mare 3 settembre 2002 "Linee Guida per la Gestione dei siti natura 2000 in attuazione della direttiva 92/43/CEE Ministero dell'Ambiente e della Tutela del territorio e del mare.

- European Council Regulation n. 812/2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98 of 26/04/2004 Ministry of Agriculture, Food and forest policy.

- Law 41/82 (Fishery rationalisation and development plan) and following amendments, introduced the possibility to carry out, activities of "pesca-turismo" (fishery-tourism), under specific circumstances. This measure was introduced as a way to encourage alternatives to small-fishery activities and mitigate the human-impact on the environment.

- Law 61/2006 (Official Gazette no 52 of the 03-03-2006), establishing the Ecological Protection Zone.

- Law n. 394 of 06/12/1991 Protected areas.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ACCOBAMS Survey Initiative was conducted successfully in Summer of 2018. Results are now pending for analysis.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

This is carried out for cetaceans and other marine top predators via reinforcement synchronous submission of catch, bycatch and discard data to both scientific and management bodies, and annually to the General Fisheries Commission for the Mediterranean (GFCM)-Timeline: every year from 2014 to 2019.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No information was provided regarding any strategy or framework for monitoring and regulating noise pollution.

Establishing conservation areas which are important to cetaceans:

The Pelagos Sanctuary which was created in February 2002 based on agreement between France, Italy, and Monaco to create a Sanctuary for Mediterranean Marine Mammals in in the Corso-Liguro-Provençal Basin. The Sanctuary is a marine area of 87,500 km^2 subject to an agreement and management by the three countries. the sanctuary is also qualified as a Specially Protected Areas of Mediterranean Importance (SPAMI).

Also, the Waters around Iscia and Ventotene which was qualified as an IMMA. This is mainly due to the presence of vulnerable species such as the fin whale and common dolphin among other topographical and bathymetric features of the sea floor in that area.

LEBANON

Appropriate regulations measures regarding deliberate killing:

Based on the ratification of the ACCOBAMS Agreement, three national legislations were subsequently issues in Lebanon:

- Ministerial decision Nº 69/2004 of July 2nd 2004: "Establishment of a permanent inter- ministerial committee to implement the ACCOBAMS agreement." 5

- Decision Nº 524 of the General Secretary of Ministers Council of May 10th2005: "Designation of the National Centre for Marine Sciences - CNRS as the focal point of the ACCOBAMS agreement"

- Ministerial decision No1154, 2013, "General conditions to protect marine mammals (whales, dolphins and monk seal)".

Also, An Action Plan for the Conservation of Cetaceans in Lebanon was elaborated in 2009 by the National Center for Marine sciences-CNRS, the document contains some recommendations that can be converted into legislative text.

Appropriate regulations measures regarding whale watching:

No whale watching activities is taking place in the country.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ACCOBAMS Survey Initiative took place in the Lebanese water during the summer of 2018 in collaboration with the CNRS.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

The Lebanese Ministry of Agriculture had banned the use of dynamite fishing and trawling nets. The relevant legislation imposed minimum mesh size and regulated scuba-diving.

Moreover, fishing using firearms is not practiced in Lebanon. On the other hand, the Ministry of Agriculture has finalized a new draft framework law on fisheries and aquaculture and has submitted it to the Parliament for approval. This draft law also stresses on the conservation of marine endangered species and on banning the use of firearms and dynamite. 2- The Ministry of Agriculture issued the ministerial decision number 125/1 dated 23/9/1999 that prohibits the fishing of cetaceans, monk seals and marine turtles, and this decision is still applicable.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

Within the “Integrated Monitoring and Assessment programme (IMAP)” executed at regional level by the Specially Protected Areas Regional Activity Centre (SPA/RAC), a national monitoring programme for different Common Indicators in Lebanon was prepared in 2017 by SPA/RAC in close coordination with the Ministry of Environment.

Establishing conservation areas which are important to cetaceans:

No information regarding conservation areas for cetaceans was provided.

LIBYA

Appropriate regulations measures regarding deliberate killing and whale watching:

There is a general legislation regarding the protection and conservation of marine ecosystem and organisms. Apart from that, there is no specific legislation for cetaceans.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Survey took place in Summer 2018 covering the majority of the Libyan waters excluding the gulf of Sirte region and the far western area.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No assessment of cetaceans' bycatch took place in Libya.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No strategy framework for noise monitoring or assessment in Libya.

Establishing conservation areas which are important to cetaceans:

Farwa Lagoon MPA which contain costal species of odontocetes namely bottlenose and common dolphin.

Aim Gazallah MPA which also contain a resident bottlenose population with some sightings of Common dolphins.

The marine part of Al-Kouf national Park which also contain costal Odontoceti species, namely bottlenose and common dolphins.

MALTA

Appropriate regulations measures regarding deliberate killing:

Protection has been afforded through the Marine Mammals Protection Regulations (Subsidiary Legislation 549.35) and the Flora, Fauna and Natural Habitats Protection Regulations (Subsidiary Legislation 549.44), as amended. Cetaceans are also covered through the Trade in Species of Fauna and Flora Regulations (Subsidiary Legislation 549.38), also being afforded protection through relevant obligations of the EU acquis and international treaties.

Appropriate regulations measures regarding whale watching:

Whale watching activities are carried out in an environmentally sound and sustainable manner. This is ensured through permits granted by ERA through the Environment Protection Act (Cap. 549), with the obligation that this activity follows the whale-watching guidelines produced by ACCOBAMS.

Implementation of the ACCOOBAMS Survey Initiative (ASI):

The survey took place during the summer of 2018 covering the Maltese waters.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

By-catch data on cetaceans and other species groups is collected as part of the requirements of fisheries policy and used for assessment of the level of pressure and status assessment under environmental policy. Such data on by-catch is collected during scientific observer trips and through logbook completion by fishers in order to estimate the level of fishing and the impact of fishing activities on cetaceans. Malta is nevertheless seeking the continuous improvement of the data collection processes with respect to incidental by-catch to ensure that the data collected reflects the real scenario with respect to incidental bycatch of marine mammals.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

Under the EU co-founded QuietMed project, activities focused on regional cooperation, the identification and testing of methodologies and best practices (with Malta being one of the pilot project sites) and the creation of a joint register of impulsive underwater noise; Malta has reported its data on the ACCOBAMS Register on Noise in the following link: http://80.73.144.60/CTN_Geoportal/login/?next=/CTN_Geoportal/upload/upload_noise/.The mentioned data was also assessed as part of the assessment of environmental status (https://era.org.mt/wp-content/uploads/2020/06/MSFD-Art.-17-Update-Malta_FINAL.pdf).

Public awareness on this matter was raised with relevant entities and as part of more generic awareness and outreach campaigns as part of the EU co-funded LIFE MIGRATE project

Establishing conservation areas which are important to cetaceans:

Through the EU LIFE MIGRATE co-funded project, which was on-going during the reporting interim, three proposed sites of Community Interest (pSCIs) were declared under the EU Habitats Directive in 2016 due to their potential importance for cetaceans and turtles, with the areas chosen also had a high incidence of cetacean presence. The same sites have also been declared as MPAs under the Environment Protection Act (Cap. 549).

MONACO

Appropriate regulations measures regarding deliberate killing:

No information was provided regarding any relevant legislation

Appropriate regulations measures regarding whale watching:

No details were communicated apart from being part of The Habitats Directive of the European Commission. A point to add is that Monaco funded the development and translation of the CMS/CBI guidelines related to Whale Watching.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ASI survey (both with airplanes and research vessels) took place in Monaco during the summer of 2018.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

From a legal point of view, this aspect is covered by the application of Sovereign Ordinance No. 3.131 relating to the exploitation of living resources. This is also covered as part of the Pelagos Sanctuary framework and The Habitats Directive.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

This is done through the EU Marine Directive 2008/56/CE (MSFD) and Descriptor 11 (underwater noise and its impacts on the marine Biota.

Also, projects (such as QuiteMED) are addressing the identification of noise thresholds, provide guidelines on methodologies and policy.

Establishing conservation areas which are important to cetaceans:

Monaco has cooperated with neighbouring countries to set up the cetaceans' Pelagos sanctuary, of which Monaco is the custodian.

MONTENEGRO

Appropriate regulations measures regarding deliberate killing:

Several laws related to cetaceans' conservation and prohibiting direct capture or killing includes:

- The Law on Nature Protection ("Official Gazette of Montenegro", no. 54/16) is major legislative act for the protection of Species,

- Articles 89-90 refer to the establishment of the list of strictly protected and protected wild species of plants, animals, and fungi for which the Law prescribes specific management measures and procedures including cetaceans.

- Decree on protection of rare, declining, endemic and endangered plant and animal species ("Off. Gazette of MNE", no. 76/06) is act which put species under protection at national level cetaceans' species are protected by the Decree.

- The Law on Environment ("OG of MNE", 52/16) is the umbrella law in the area of environment and it lays down the principles of environmental protection and sustainable development, entities, environmental protection instruments and measures, access to information, public participation, access to justice in environmental matters, environmental financing and other issues relevant for the environment.

- Law on National Parks (Official Gazette of Montenegro, no. 28/14) prescribes rules within national parks, management measures, protection measures, control of activities,

- Law on Marine Fishery and Mariculture (Official Gazette of Montenegro, no. 56/09 and 47/15) prescribe measures in relation to fishery rules and procedures.

- COMAND ON HUNTING OF AGE CLASSES OF FISH AND OTHER MARINE ORGANISMS (Official Gazette of Montenegro, no. 56/09) forbids hunting of all marine mammals.

Appropriate regulations measures regarding whale watching:

- The Law on Nature Protection ("Official Gazette of Montenegro", no. 54/16) is major legislative act for the protection of Species.

- Articles 89-90 refer to the establishment of the list of strictly protected and protected wild species of plants, animals and fungi for which the Law prescribes specific management measures and procedures including cetaceans. In the Article 91 Protection and conservation of protected wild species of plants, animals and fungi are prescribed as follows: It is prohibited to pick, collect, use and destruct protected wild species of plants, to disturb, catch, shoot and injure protected species of wild animals, to reduce number of populations of protected wild species of plants, animals and fungi (removing and killing), to destruct or to endanger their habitats or to change their living conditions. Whale watching and other commercial tourism activities should be in line with the Law on Nature Protection provisions but since now those activities have not been recorder in Montenegro.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Fieldwork of the ACCOBAMS Survey Imitative took place in summer of 2018 to cover the entire Adriatic Sea including Montenegro.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

Starting April 2017, Montenegro is implementing the National Marine Data Collection Program which is a fully compliant with DCF (Data Collection Framework - the European Commission Program and the DCRF (Data Collection Reference Framework- GFCM program). This monitoring also gathers information on accidental catches of marine mammals and has not recorded any incidental catches of marine mammals in Montenegrin fisheries. The program is implemented by the Institute of Marine Biology through observers on vessels that record and catch the whole catch in the hull flies, swimmers, stagnants and longliners (demersal trawl nets, purse seines, gillnets and trammel nets and longlines).

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

In regard to noise pollution monitoring and mitigation, no information was provided for the state of Monaco. Having said that, Workshop titled “Mitigating the impact of underwater noise on marine biodiversity with specific focus on seismic surveys in the southeastern European waters of the Mediterranean Sea” was organised by OceanCare in cooperation with NRDC and co-sponsored by Deutsche Bundesstiftung Umwelt and took place on the 22nd and 23rd of November 2017 in Split in Croatia. Decision makers, key players in the industry organisations and the stockholders in the shipping sectors from Montenegro participated at the workshop which was an opportunity to raise awareness on anthropocentric noise impacts on cetaceans.

Establishing conservation areas which are important to cetaceans:

Kotorsko Risanski Zaliv is proclaimed as UNESCO site and cetaceans are present in the Bay sporadically

MOROCCO

Appropriate regulations measures regarding deliberate killing:

For cetacean conservation and protection, two pieces of legislation are relevant, these are:

- Law n° 19-07 (2010) which is amending and supplementing the Law n° 1-73-255 of 23 November 1973. Both laws are regulations maritime fishing vessels and prohibits fishing vessels from keeping on board or using drifting gillnets, the main bycatch cause for cetaceans in the region.

- Decree n° 2-10-341 of 7 Joumada I, 1432 (April 11, 2011) taken for the application of law n° 19-07 amending and supplementing Law n° 1-73-255 of 27 chaoual 1393 (23 November 1973) forming a regulation on fisheries.

Appropriate regulations measures regarding whale watching:

No whale watching activity is taking place in the country.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The survey took place during summer 2018 and was completed by covering most of the Moroccan Mediterranean coast.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

A scientific monitoring programme for the interactions between bottlenose dolphins and Mediterranean purse seiners is under development by the INRH. This program is to understand the behaviour of this species toward this particular fishing gear, therefore limiting the negative impact of predation by this cetacean on fishing gear.

In this context, Morocco has allocated a budget of 2.5 million dirham (roughly 230,000€) for the manufacture and testing of a reinforced seine that can withstand predation by the Bottlenose Dolphin.

Another project that is taking place in Morocco is "**Understanding Mediterranean multi-taxa' bycatch 'of vulnerable species and testing mitigation- a collaborative approach**" known as the MedBycatch Project. The project is looking at identifying hotspots of bycatch issue relevant to all marine top predators including cetaceans, quantify it using a standard methodology, develop and test mitigation measures.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No activities on noise pollution were implemented in Morocco.

Establishing conservation areas which are important to cetaceans:

The Alboran Sea, Strait of Gibraltar and Gulf of Cádiz are all qualified as IMMAs for serval species of cetaceans including the only Mediterranean habitat for the killer whale.

SLOVENIA

Appropriate regulations measures regarding deliberate killing and whale watching:

There are several laws and legislative text that are related to protection of cetaceans, not specifically from direct killing though. Very little is done regarding whale watching regulation and law. These are:

- Act of 24/09/ 19xx Ratifying the Convention on the Conservation of Migratory Species of Wild Animals (Ministry in charge of Environment).

- Act of 21.12.19xx, Ratifying the Convention on International Trade in Endangered Species of Wild Fauna and Flora, Amendment to the Convention and Amendments I, II, III, and IV to the Convention (Ministry in charge of Environment).

- Act of 15.06.19xx, on Ratification of the Convention on the Conservation of European Wildlife and Natural Habitats (Ministry in charge of Environment).

- Act of 25.10.20 Ratifying the Protocol on Special Protected Areas and Mediterranean Biodiversity (Ministry in charge of Environment).

- Act of 16.05.19xx, Ratifying the Convention on Biological Diversity (Ministry in charge of Environment).

- Act of 23.06.20xx, ratifying the International Convention for the Regulation of Whaling and the Protocol to the International Convention for the Regulation of Whaling, signed at Washington under date December 2, 1946 (Ministry in charge of Environment).

- Act of 29.09.20xx, Ratifying the Agreement on the International Dolphin Conservation Program (Ministry of Agriculture, Forest).

- Act of 04/03/2016 Ratifying the Amendments to the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (Parliament).

- Nature conservation Act 23/15 amended 46/14.

- Decree on important ecological areas 33/13 amended 99/13.

- Decree determining Special Protection Areas (Natura 2000) 8/12 amended 33/13, 3345/13 and 3/14.

- Transfer of European Union Council Directives and regulations Enacting on 12/02/1982 the Council Regulation (EEC) No 348/81 of 20 January 1981 on common rules for imports of whales or other cetacean products (Ministry in charge of Environment).

- Enacting on 22/07/1992 the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Ministry in charge of Environment).

- Enacting on 03/03/1997 the Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein (Ministry in charge of Environment).

- Enacting on 09/04/1999 the Council Directive.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Survey took place in Summer of 2018 covering the entire Adriatic Sea.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No information was given regarding assessments on cetaceans' bycatch in Slovenia.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

Slovenia is participating in the project QuietMed and QuietMed2. There is underwater noise recorder at one site, to establish continuous underwater sound level noise. Other relevant activities are taking place as part of these two regional projects.

Establishing conservation areas which are important to cetaceans:

According to the Database on marine protected areas MAPAMED, there are 13 marine conservation sites in which cetaceans are present (mostly costal bottlenose dolphins). These are:

- Strunjan Landscape Park, 1990.

- Cape Madona, Natural Monument,1990.

- Debeli Rtic, Natural Monument, 1991

- Skocjanski Zatok Nature Reserve, coastal lagoon, 1998

- Kanal Sv. Jerneja, N2000-SCI, 2004

- Sečoveljske Soline, Ramsar site, 1993

- Sečoveljske Soline in Estuary Dragonje, N2000-SCI and SPA, 2004

- Žusterna RastiščePozejdonke, N2000-SCI, 2004

- Piranski klif, N2000 SAC, 2004

- Škocjanskizatok, N2000-SAC, 2004

- Ankaran-Sv Nikolaj, N2000-SAC, 2004

- Debeli Rtic, N2000-SAC, 2004

- Med Izolo in Strunjanom-klif, N2000-SCI, 2012

- Med Strunjanom in Fieso, N2000-SCI, 2013

SPAIN

Appropriate regulations measures regarding deliberate killing, harassing and whale watching:

There are several regulation and legislative text that protect cetacean species and prohibit killing or harassing of cetaceans, these are:

- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. All cetacean species are included in, and protected by, the Royal Decree. Article 10 of the Royal Decree 1997/1995 provides that, all species included in Annex IV (i.e., all species of cetaceans) should be granted the measures of protection set forth in the Law 4/1989 and in the Royal Decree 439/1990.

- Royal Decree 1997/1995 of 07/12/1995, concerning the conservation of natural habitats and of the wild Fauna and Flora. (National and Regional Governments).

- Law 42/2007 of 13/12/2007on Natural Heritage and Biodiversity (National and Regional Governments).

- Law 33/2015 of 22/09/2015 amending Law 42/2007 of 13/12/2007 on Natural Heritage and Biodiversity (National Government).

- Royal Decree 139/2011 of 04/02/2011for the development of the List of Wildlife Species under a Special Protection Regime and the Spanish Catalogue of Threatened Species (National and Regional Governments).

- Law 21/2013 of 11/12/2013, on Environmental Assessment (National Government).

- Royal Decree 1727/2007 of 21/12/2007, for the conservation of cetaceans (National Governments).

- Order APM / 427/2017, of 4/5/2017, that approves the protection measures, and the Conservation Plan of the Killer Whale of the Strait and Gulf of Cádiz.

- Law 41/2010 of 29/12/2010, on the protection of the marine environment (National and Regional Governments.

- Law 31/2003 of 27/10/2003, on the conservation of wild fauna in zoological parks (National Government).

Implementation of the ACOOBAMS Survey Initiative (ASI):

Survey took place in the Spanish waters (mainly the Mediterranean) during the summer of 2018.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

The Tramuntana dolphins Project (https://www.submon.org/project/tramuntana-dolphins/) involves the assessment of interaction between fisheries and bottlenose dolphin in the area of the Creus Canyon and the Western Underwater Canyons System of the Gulf of León.

The pilot project “Killer whale and fisheries interactions in the Strait of Gibraltar area” which aims at investigating the issue of depredation and interaction between Tuna fisheries and the killer whale population of the Strait of Gibraltar.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

Spain was/is part of both QUITEMED and QUITEMED 2 Projects that address the issue of noise and its impact on marine organizations. Spain contain one of the western main site of monitoring noise emissions (Cabrera of the Balearic Islands) in which constant monitoring is taking place.

The project also touches on developing noise indicators, building database on noise pollution and promote mitigation actions.

Establishing conservation areas which are important to cetaceans:

According to the Database on marine protected areas MAPAMED there are 190 conservation sites in Spain. The marine coverage represents 30,459.03 km^2 or 11.66% of waters under national jurisdiction. Some of these sites are:

- MPA Corredor de Migración de Cetáceos del Mediterráneo.

- MPA/SAC ES90ATL01 El Cachucho.

- Marine Reserve for Fisheries Cabo de Gata-Níjar.

- Marine Reserve for Fisheries Cabo de Palos-Islas Hormigas.

- Marine Reserve for Fisheries Cala Ratjada-Levante de Mallorca.

- Marine Reserve for Fisheries Isla de Alborán.

- Marine Reserve for Fisheries Isla de la Graciosa e Islotes del Norte de Lanzarote.

- Marine Reserve for Fisheries Isla de la Palma.

- Marine Reserve for Fisheries Isla de Tabarca.

- Marine Reserve for Fisheries Islas Columbretes.

- Marine Reserve for Fisheries Masía Blanca.

- Marine Reserve for Fisheries Punta de la Restinga - Mar de las Calmas.

- SAC ES7010016 Área Marina de la Isleta.

- SAC ES5310108 Àrea marina del cap Martinet.

SYRIA

Appropriate regulations measures regarding deliberate killing:

In 2013, the "Action Plan for the conservation of cetaceans in Syria" was under preparation. Until now there is no National Conservation Plan, but there are some indirect measures introduced to protect cetaceans such as:

- Measures related to the reduction of pollution.

- Measures introduced to strengthen the national capacities.

- Measures introduced to create and maintain a network of specially protected areas to protect Marine biodiversity including cetaceans and their habitats.

Appropriate regulations measures regarding whale watching:

No whale watching activity is taking place in Syria.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ASI survey was delayed in Syria and only took place in Summer of 2019.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

No assessment of cetaceans bycatch was elaborated in Syria.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No measure, monitoring or activities were implemented in Syria regarding noise pollution.

Establishing conservation areas which are important to cetaceans:

No information was provided regarding conservation areas that may be important to cetaceans.

TUNISIA

Appropriate regulations measures regarding deliberate killing:

no direct national legislation to regulate deliberate killing of cetaceans in Tunisia. however, there are general legislations and laws regarding the conservation of nature and endangered species. these are present as:

- Loi 94-13 sur l'exercice de la pêche de 1994, ministère de l'Agriculture, des Ressources Hydrauliques et de la Pêche – MARHP).

- Arrêté règlementant l'exercice de la pêche en Tunisie du 28/11/1995 (MARHP).

- Loi 2009-17 du 16 mars 2009 relative au régime de repos biologique dans le secteur de la pêche et à son financement (MARHP).

- Loi 2009-49 relative aux aires marines et côtières protégées (ministère de l'Environnement).

- Loi 2001-68 du 11 juillet 2001 ratifiant ACCOBAMS.

- Décret 2005-1991 de 2005, sur les Etudes d'Impact sur l'Environnement.

- Loi n° 94-13 amendé par les lois 97-34, 99-74, 2009-17, 2009-59 et 2010-21 sur les activités de pêche et d'aquaculture.

Appropriate regulations measures regarding whale watching:

No whale watching activities are taking place in Tunisia.

Implementation of the ACOOBAMS Survey Initiative (ASI):

The ASI survey (both with airplanes and research vessels) took place in Tunisia during the summer of 2018.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

Although no direct assessment of cetaceans' bycatch was carried out, the issue is addressed by several projects operating in Tunisia. The total results of these projects could give an overall assessment of the interaction with fisheries, especially in relation to the bottlenose dolphin (*Tursiops truncatus*). The projects are:

- ACCOBAMS-GFCM Project on mitigating interactions between endangered marine species and fishing activities.

- Understanding Mediterranean multi-taxa 'bycatch' of vulnerable species and testing mitigation- a collaborative approach.

- the Depredation Project.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No measure, monitoring or activities were implemented in Tunisia regarding noise pollution.

Establishing conservation areas which are important to cetaceans:

There are two MPAs in Tunisia the containing dwelling populations of cetacean species, these are:

- Zembra-Zembretta, SPAMI,

- Archipel de la Galite, SPAMI.

TURKEY

Appropriate regulations measures regarding deliberate killing:

In Turkey, there are general laws about the protection of biodiversity and endangered species such as:

- The Environmental Law 2872

- National Parks Law 2873 -1983 amended by Law 5400 in 2005

- Natural & Cultural Heritage Law 2863 – 1983 amended 2009 and 2011

- Law on Hunting No. 4915 of 01/06/2003

- Fisheries Law No. 1380 last consolidation by Law No. 4950 of 22/07/2003

- Fisheries Regulation No. 22223 of 1995,

- Decree Law 383 for the establishment of the Environment Protection Agency for Special Areas SEPASA

Appropriate regulations measures regarding whale watching:

No whale watching activities are taking place in Turkey.

Implementation of the ACOOBAMS Survey Initiative (ASI):

Survey took place in the Turkish waters I the summer of 2018.

Assessment of cetaceans Bycatch, depredation, and the adoption of mitigation measures:

The issue of Bycatch is being addressed by serval projects such as The MAVA funded Project "Understanding Mediterranean multi-taxa 'bycatch' of vulnerable species. it is taking place in Turkey since 2017 and itis looking at identifying hotspots of bycatch relevant to all marine top predator species (including cetaceans), quantify and estimate the amount of bycatch using a standard methodology, develop and test mitigation measures to reduce the threat.

Implementation of Noise pollution strategy framework, development of acoustic maps, and raise awareness about the impact of noise:

No measure, monitoring or activities were implemented in Turkey regarding noise pollution.

Establishing conservation areas which are important to cetaceans:

There are marine conservation areas in Turkey with a tola coverage of 1,495,513 Ha. some of these areas are known to hold one or more cetaceans' species. These are:

- Dilek peninsula, National Park, 1966.
- Fethiye – Gocek, SEPA, 1988.
- Gokova, SEPA, 1988.
- Koycegiz-Dalyan, SEPA, 1988.
- Foca, SEPA, 1990.
- Datca Bozburum, SEPA, 1990.
- Patara, SEPA, 1990.
- Kas Kekova, SEPA, 1990.
- Ayvalik Island, Nature park, 1995.
- Marmaris National park, 1996.
- Saros Korfezi, SEPA, 2010.
- Finike seamounts, SEPA, 2013.
- Troya National Park, 1996.
- Karaburun-Ildır Bay SEPA, 2019.

Annex IV

Draft updated Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea
(Dark Habitats Action Plan)

Table of contents

I. Foreword

1. The Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemosynthetic phenomena in the Mediterranean Sea follows a series of eight Action plans adopted by the Mediterranean countries within the framework of the Barcelona Convention, devoted to the conservation of species or groups of species. These Action plans are:

- Action Plan for the management of the monk seal
- Action Plan for the conservation of marine turtles
- Action Plan for the conservation of cetaceans
- Action Plan for the conservation of marine vegetation
- Action Plan for the conservation of bird species registered in annex II of the SPA/BD Protocol
- Action Plan for the conservation of cartilaginous fishes (Chondrichtyans) in the Mediterranean Sea
- Action Plan concerning species introduction and invasive species
- Action Plan for the conservation of the coralligenous and other calcareous bio-concretions in the Mediterranean Sea

2. Dark Habitats are considered as fragile and sensitive habitats requiring protection (Directive 92/43/EEC). They constitute veritable reservoirs of biodiversity that, therefore, must be protected and need further attention.

3. This draft Action plan was the result of a Meeting of the ad hoc group of Mediterranean experts, nominated in consultation with the Contracting Parties and relevant partner organizations (Marseilles (France), May 2013). It was reviewed and adopted by the Eleventh Meeting of Focal Points for SPAs (Rabat - Morocco, 2 – 5 July 2013).

4. The Action Plan was adopted in the Eighteenth Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols (Istanbul - Turkey, 3-6 December 2013). The document of the Action Plan was first published in 2015 under the reference: UNEP-MAP-RAC/SPA, 2015. Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea. Dark Habitats Action Plan. Ed. RAC/SPA, Tunis: 17 pp.

5. This document is the draft update of the Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea as requested by the contracting Parties in their decision IG.24/07 (CoP 21- Naples (Italy), 2-5 December 2019).

II. Presentation

6. Dark habitats are those where either no sunlight arrives or where the light that does arrive is insufficient for the development of plant or algal assemblages. These are known as the aphotic and the disphotic or twilight zones. They are distributed throughout the Mediterranean basin and include both shallow marine dark caves[1] and deep-sea habitats (usually at depths below 150-200 m, Figure 1). However, inventorying and monitoring initiatives focusing on marine caves should consider the cave habitat as a whole. Therefore, this document covers both semi-dark and dark caves. Diverse geomorphological structures such as underwater caves, canyons, slopes, isolated rocks, seamounts, abyssal plains and areas presenting chemosynthetic phenomena, can characterise the dark habitats and can support sensitive habitats and assemblages that are of unique scientific and conservation interest and require special protection.

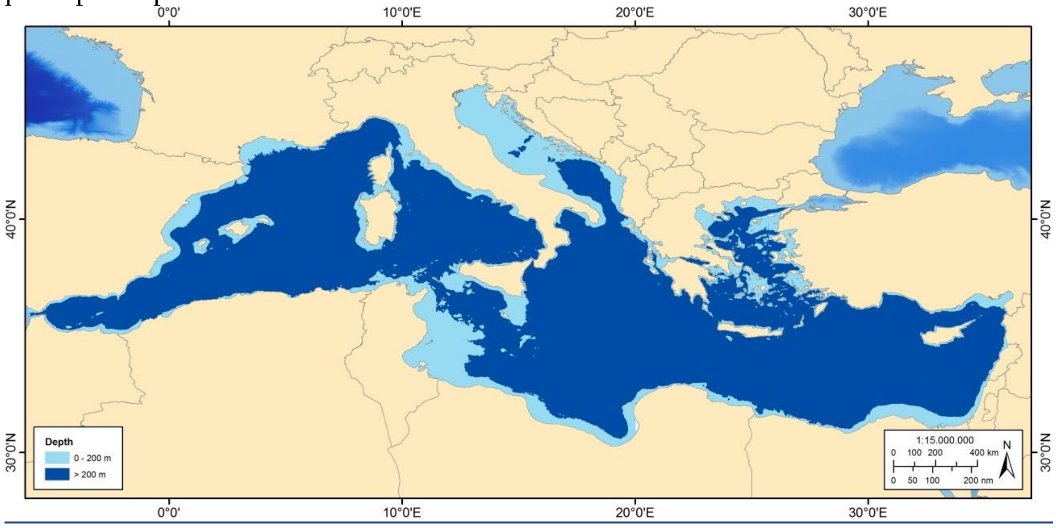

Figure 1:Deep-sea areas in the Mediterranean Sea below 200 m depth (from SPA/RAC-UN Environment/MAP & OCEANA, 2017; compiled by the authors based on data available from different sources)

III. State of knowledge

III.1 Distribution

III.1.1 Marine caves

7. To date approximately 3,000 marine caves have been recorded in the Mediterranean Sea (see Figure 2) (Giakoumi et al., 2013; SPA/RAC-UNEP/MAP, 2020). Most of these caves are located in the North Mediterranean, which encompasses a higher percentage of rocky coasts and has been more extensively studied for this particular habitat. Specifically, the highest numbers of known caves are in the Eastern Adriatic, Aegean, Tyrrhenian, Provencal and Ionian coasts, where they are sometimes densely concentrated on islands and rocky peninsulas (SPA/RAC-UNEP/MAP, 2020). Mapping initiatives have taken place in Italy (Cicogna et al., 2003), Corsica (CREOCEAN-DREAL, 2010), Croatia (Surić et al., 2010) and Greece (Gerovasileiou et al., 2015; Sini et al., 2017). Expeditions in the framework of the research projects MedKeyHabitats, MedMPAnet and LIFE BaĦAR for N2K provided information on the distribution of marine caves in Algeria (PNUE/PAM-CAR/ASP, 2016a), Lebanon (SPA/RAC-UN Environment/MAP, 2017), Montenegro (UNEP-MAP-RAC/SPA, 2016a, b), Morocco (Espinosa et al., 2015; PNUE/PAM-CAR/ASP, 2016b), Malta and Gozo (Evans et al., 2016; Borg et al., 2017). The latter studies also extended the bathymetric distribution of the marine cave habitat to the deep sea (between 205 and 795 m). Numerous marine caves from the coasts of Turkey were also described in a recent publication (Öztürk, 2019). However, given the logistic difficulties in the inventorying of underwater caves, and especially the submerged ones, their number is assumed to

[1] Semi-dark cave communities have been integrated into the Action Plan for the conservation of the coralligenous and other calcareous bio-concretions in the Mediterranean Sea (UNEP-MAP-RAC/SPA, 2008).

be much higher than we know (SPA/RAC-UNEP/MAP & OCEANA, 2017). Mapping efforts are required in order to fill current distribution gaps in the Eastern and Southern Mediterranean regions, and in deeper waters.

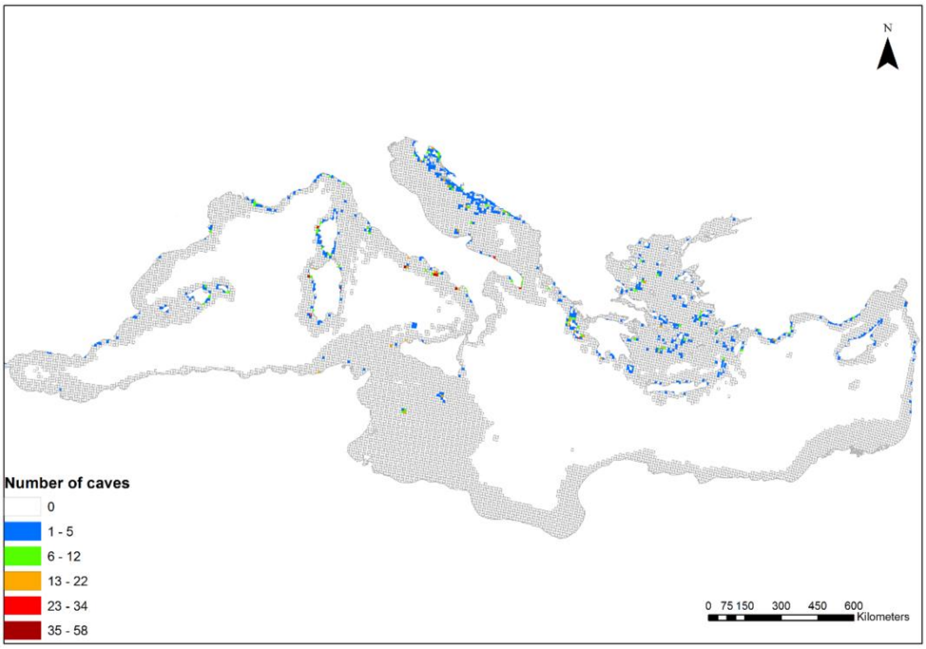

Figure 2: Distribution of marine caves in the Mediterranean Sea. Different colours indicate the number of caves recorded in cells of 10x10 km (from Giakoumi et al., 2013)

III.1.2 Deep sea

8. Geomorphologic structures such as canyons (Figure 3), seamounts (Figure 4) and rocky aphotic escarpments may be localized by the acquisition and study of high-resolution geomorphologic seafloor data. Spatial information on deep-sea geomorphologic structures such as canyons have been compiled at the Mediterranean scale (Würtz, 2012) and have been updated (Harris & Macmillan-Lawler, 2015). The distribution of seamounts and seamount-like structures have also been mapped in the Mediterranean (Würtz & Rovere, 2015).

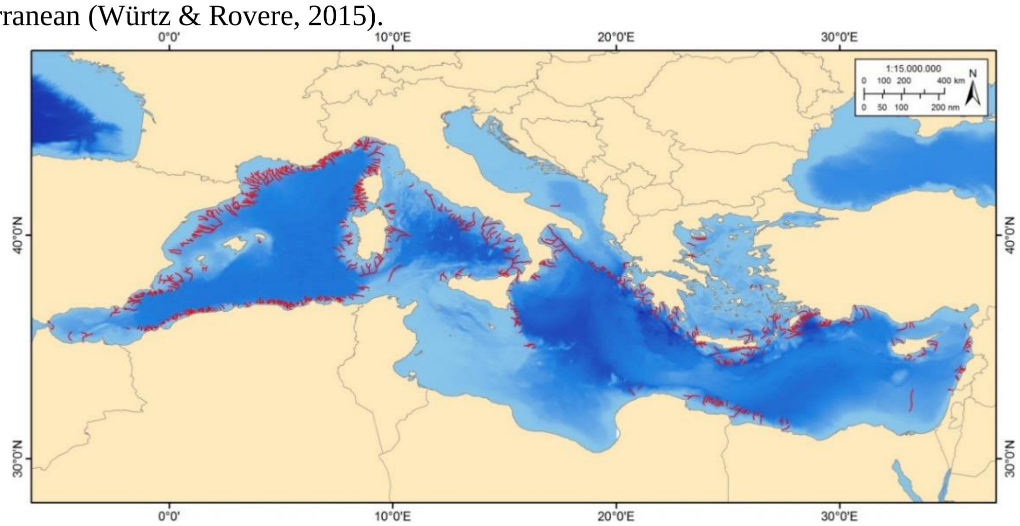

Figure 3: Distribution of Mediterranean submarine canyons (from SPA/RAC-UN Environment/MAP & OCEANA, 2017; compiled by the authors based on data available from different sources)

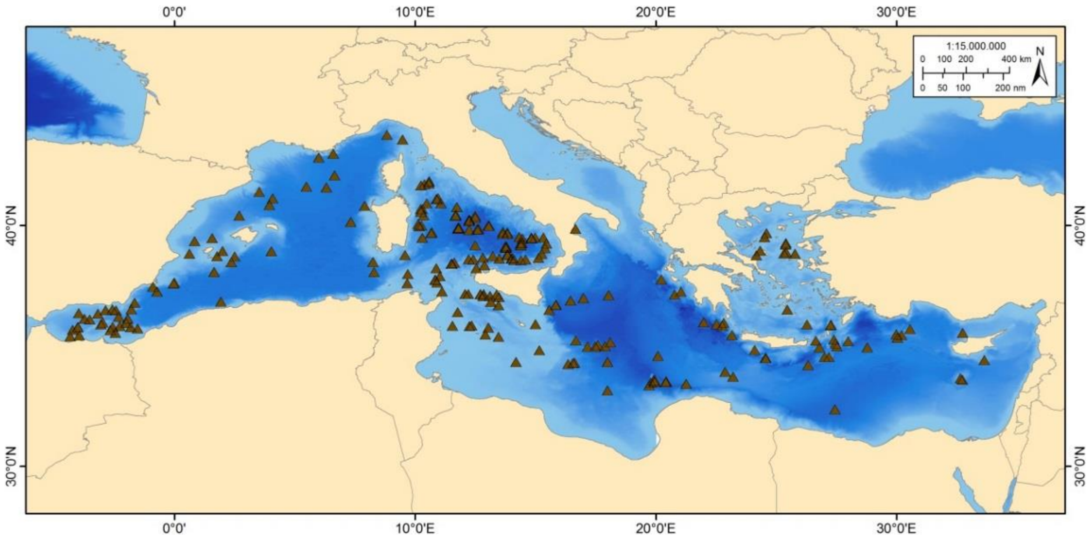

Figure 4: Distribution of Mediterranean seamounts (from SPA/RAC-UN Environment/MAP & OCEANA, 2017; compiled by the authors based on data available from different sources)

9. These structures offer heterogeneous habitats that enhance biodiversity and are considered as hotspots of biodiversity (Danovaro et al., 2010; Würtz & Rovere, 2015). They may harbour slow growing, long-living species, constitutive of sponge aggregations, coral forests and Cold-Water Corals (CWCs) that are considered as Vulnerable Marine Ecosystems (VMEs), according to *The International Guidelines for the Management of Deep-sea Fisheries in the High Seas* (FAO, 2009). Areas with chemosynthetic phenomena (*e.g.* cold seeps, mud volcanoes, hydrothermal fields, pockmarks, brine pools) (Figure 5), represent rare and fragile morphological structures and shelter unique ecosystems and species (*e.g.* Angeletti et al., 2015; Esposito et al., 2015; Beccari et al., 2020).

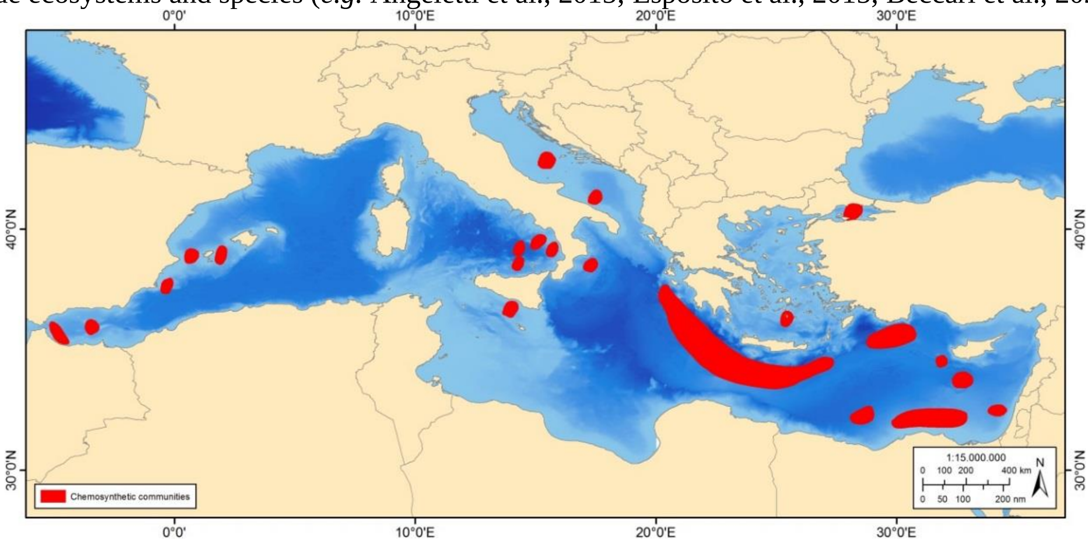

Figure 5: Identified areas with chemosynthetic assemblages (from SPA/RAC-UN Environment/MAP & OCEANA, 2017; compiled by the authors based on data available from different sources)

10. Recent exploration has uncovered unique deep-sea communities on the Israeli continental shelf at the "Palmahim Disturbance". Vast coral gardens are distributed along the margins of the Palmahim disturbance, CWC (Cold Water Coral) meadows grow in the compact sediments around the coral gardens and cold seep communities thrive in the deeper western zones of the site[2]. Recently, brine seepage and brine pools were documented in the north - west part of the proposed FRA[3], with dense

[2] See https://www.sciencedirect.com/science/article/abs/pii/S0967064519300244?via%3Dihub
[3] See http://mafish.org.il/wp-content/uploads/2021/05/FRA-Proposal-Palmahim-Disturbance-SPNI-revised-310521-.pdf

chemosynthetic tube-worm cover, and their vicinity appears to function as a reproduction hotspot for blackmouth catshark (*Galeus melastomus*), with numerous eggs laid on the benthos. These benthic habitats form important deep-sea ecosystems, which are extremely rare in the eastern Mediterranean.

11.The distribution of one of the most emblematic and fragile Mediterranean deep-sea assemblages, the Cold-Water Corals (CWCs), has been mapped at the Mediterranean scale (see Figure 6 from Chimienti et al., 2019).

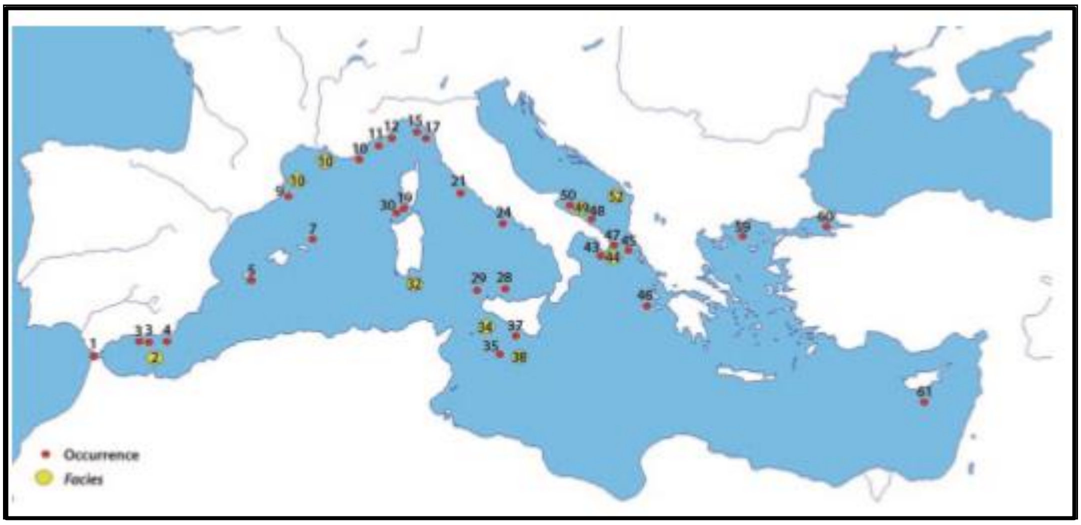

Figure 6: The actual information on the distribution of the Cold-Water Corals (CWCs) in the Mediterranean (Chimienti et al., 2019)

12.A recent book reviews the cold and deep coral habitats known to date in the Mediterranean Basin (see Orejas & Jiménez, 2019). The known distribution of the black coral *Leiopathes glaberrima* (Massi et al., 2018) as well as the scleractinian *Dendrophyllia cornigera* (Castellan et al., 2019) have also been published at the Mediterranean scale. These species are present in the Alboran, Ligurian and Tyrrhenian Sea, the Algero-Provençal Basin, the Sicily channel, the Ionian Sea, the Southern Adriatic, the Aegean Sea and the North Levantine (near Rhodes Island).

13.The spatial distributions of some other deep-sea benthic species have been published but they are limited to an area or a country (*e.g.* distribution of the bamboo coral *Isidella elongata* in the Aegean Sea (Gerovasileiou et al., 2019), 130 taxa from the French Mediterranean canyons and shelf brake (Fourt et al., 2017)).

14.The inventory of Mediterranean canyons, seamounts and areas with chemosynthetic phenomena is still not complete (Harris & Macmillan-Lawler, 2015; Würtz & Rovere, 2015), the distribution knowledge of associated assemblages and ecosystems presents therefore even larger gaps. Only part of the Mediterranean deep-sea habitats has been explored mainly in the north-western sector. To be in capacity of building a coherent Mediterranean network of protected deep-sea marine habitats, efforts are still needed to acquire basic data on spatial and bathymetric distribution of deep-sea habitats in the Mediterranean Sea.

III.2 Composition

III.2.1 Marine caves

15.Marine caves are acknowledged as "biodiversity reservoirs" and "refuge habitats" of great conservation value, as they harbour a rich biodiversity (32-71% of the Mediterranean sponge, anthozoan, bryozoan, tardigrade and brachiopod fauna) that includes several rare, exclusive, endangered, protected, as well as deep-sea species (Harmelin et al., 1985; Gerovasileiou & Voultsiadou, 2012; Gerovasileiou et al., 2015; Ouerghi et al., 2019; SPA/RAC-UNEP/MAP, 2020). A total of 2,369 taxa has been reported from ca. 350 marine caves in 15 Mediterranean countries (Gerovasileiou & Voultsiadou, 2014; Gerovasileiou & Bianchi, in press). Studies in Mediterranean marine caves are continuously bringing to light new species, several of which have not been yet reported from other habitats, and thus can be considered as cave-exclusive *sensu lato* (Gerovasileiou & Voultsiadou, 2012). However, the majority of species found in marine caves are cryptobiotic or crevicular and deep-water species which secondarily colonize caves, originating from external dim-light and dark environments (*e.g.* coralligenous beds, circalittoral bottoms and deep-water habitats) (Gerovasileiou & Bianchi, in press). Therefore, marine dark caves have been considered as “natural laboratories” or “deep-sea mesocosms” in the littoral zone because they provide direct human access to bathyal-like conditions (Harmelin & Vacelet, 1997).

III.2.2 Deep sea

16. Remotely Operated underwater Vehicles (ROVs) have enabled a better exploration and understanding especially of rocky substrates. Extensive areas can be covered by photographs and video-footages allowing researchers to describe habitats and mega-benthic species composing the assemblages. ROVs, but also landers and dropping cameras can reveal precious information on the habitus, coloration and behaviour of species (Bo et al., 2020). Many explorations of deep-sea habitats, based on images and videos, allow qualitative/quantitative analysis of mega-benthic assemblages and description of the associated megafauna. Nevertheless, sampling is often necessary to assert species identifications and determine composition of small (not identifiable on images) species.

17. Recent publications have focused on the emblematic ecological role of CWC assemblages, describing their composition and function (Orejas & Jiménez, 2019). Other deep-sea anthozoan assemblages, described as gardens or forests because of their three dimensional development, show a rich biodiversity (*e.g.* Bo et al., 2015; Ingrassia et al., 2016). In parallel, the composition of sponge aggregations has been studied in the western Mediterranean (see Maldonado et al., 2015; Santín et al., 2018).

18. Furthermore, ecosystem functioning and relations between deep-sea benthic and vagile species are more and more investigated. Publications suggest that fish are very abundant in CWC assemblages and canyons (D’Onghia et al., 2015; Capezzuto et al., 2018a, b). Besides, the nursery function of coral forests appears to be important as they are described as spawning areas for fish and sharks (see Cau et al., 2017).

19. To better understand the sensitivity of CWC communities to climate change impacts, relations between bacteria and CWC are also being investigated (Meistertzheim et al., 2016).

20. New species of the Mediterranean deep-sea are regularly described (*e.g.* Boury-Esnault et al., 2015, 2017; López-González et al., 2015; Fernandez-Leborans et al., 2017; Bo et al., 2020) but difficulty in collecting samples limits their identifications. Many species of the deep-sea assemblages are still to be discovered and their population dynamics and interrelations need more systematic and rigorous investigation.

IV. Main threats

IV.1 <u>For marine caves</u>

21. Considering marine caves as a whole (semi-dark and dark parts), they are fragile ecosystems with low resilience (Harmelin et al., 1985; Rastorgueff et al., 2015) that are vulnerable to seawater warming, unregulated visits by SCUBA divers and tourist boats (*e.g.* mechanical damages by unintentional contact, sediment resuspension and accumulation of exhaled air bubbles), red coral harvesting, spearfishing, urbanization and building of coastal structures, waste outflows, littering and non-indigenous species (Chevaldonné & Lejeusne, 2003; Parravicini et al., 2010; Di Franco et al.,

2010; Guarnieri et al., 2012; Giakoumi et al., 2013; Rastorgueff et al., 2015; Gerovasileiou et al., 2016; Nepote et al., 2017; SPA/RAC-UNEP/MAP, 2020).

22. Climate change effects (*e.g.* heat waves and temperature anomalies) and local disturbances caused by coastal interventions and constructions (*e.g.* extension of harbours and beach nourishments) have proved to generate structural and functional homogenization of marine cave communities, such as the decrease of structural complexity and parallel increase of turf and sediment (Nepote et al., 2017; Montefalcone et al., 2018; Sempere-Valverde et al., 2019). Marine pollution and littering constitute additional threats especially in semi-submerged caves where litter often accumulate on internal beaches, drifted by wave action (Mačić et al., 2018) or dark cave zones where the lack of water movement may also favour the entrapment of litter (Gerovasileiou & Bianchi, in press).

23. An additional threat to Mediterranean marine cave communities involves the continuous spreading of non-indigenous species (NIS), especially in the south-eastern Mediterranean Sea (Gerovasileiou et al., 2016; Öztürk, 2019). NIS are mainly observed at the entrance and semi-dark zones of shallow and semi-submerged caves and less frequently in dark zones. However, their impact on cave communities is unknown and should be urgently monitored, especially in marine caves of the Levantine and Aegean ecoregions.

IV.2 <u>For Mediterranean deep sea</u>

IV.2.1 Trawling

24. The most important threats perhaps for deep-sea habitats are the direct and indirect impacts of trawling activities. In canyons, soft bottom corals undergo direct destruction by trawling activities (Petović et al., 2016; Lauria et al., 2017; Pierdomenico et al., 2018). *Isidella elongata,* the only Mediterranean Anthozoan considered as Critically Endangered (Otero et al., 2017), is directly threatened by trawling impacts (Pierdomenico et al., 2018). CWC assemblages represent a threat for bottom trawling and since the adoption of electronic maps and GPS navigation systems allowing trawlers to navigate precisely, these areas are generally avoided although the present direct trawling impact by destruction of the vulnerable structures of the main builders, is not excluded. Until the mid-1990s, when the GPS systems were not available on trawling boats and scientific knowledge on the CWC areas was minimal, trawlers hit most CWC areas causing severe damage (Tunesi et al., 2001).

25. Trawling also impacts indirectly canyon habitats and CWC assemblages by increasing water turbidity and sediment resuspension and deposit (Puig et al., 2015; Paradis et al., 2017; Arjona-Camas et al., 2019; Lastras et al., 2016; 2019). Thus, recent studies have shown that as well as displacing sediments, trawling affects the morphology of the seabed, as is known by high-resolution relief maps of seabed, causing damage comparable to that caused by ploughing farmland (Puig et al., 2012). Also, discards of vulnerable by-caught species from deep-sea trawling are not negligible (Gorelli et al., 2016).

26. In the Mediterranean Sea, the General Fisheries Commission for the Mediterranean (GFCM), led by the precautionary principal, banned bottom trawling activities in depths over 1000 m since 2005. However, CWC dwell also shallower than 1000 m depth, highlighting the ineffectiveness of this restriction for a large part of these vulnerable ecosystems. Therefore, the deep-sea habitats between 200 and 1000 m depth, especially along canyons, stay threatened and vulnerable to bottom trawling. To address this issue, in certain areas, GFCM has adopted Fisheries Restricted Areas (FRAs), ecosystem based spatial management measures that restrict fishing activities with a total closure to bottom trawling. FRAs insure the protection of deep-sea sensitive habitats such as VMEs (it is the case of the *Lophelia* reef off Capo Santa Maria di Leuca in 2006; the Eratosthenes seamount in 2006; an area in the Nile delta with cold hydrocarbon seeps since 2006) and essential fish habitats (it is the case of the Eastern Gulf of Lion area in 2009; the three areas in the Strait of Sicily in 2016; and the Jabuka/Pomo Pit in the Adriatic in 2018).

IV.2.2 Other fishing activities

27.Practically every recent publication based on mega-benthic deep-sea observations mentions visible anthropogenic impacts with a high number of derelict fishing gear either on CWC assemblages, or on other coral assemblages (Angiolillo & Canese 2018; Capezzuto et al., 2018a; Chimienti et al., 2019; Giusti et al., 2019; Angiolillo & Fortibuoni, 2020). Presence and impact of lost fishing nets and longlines are especially noticeable on deep-sea habitats that are close to the coast because more accessible to artisanal and recreational fishing activities.

IV.2.3 Industrial discharges and marine litter

28.Impacts of terrestrial human activities such as industrial discharges (Bouchoucha et al., 2019; Fontanier et al., 2020), dumping (Taviani et al., 2019), marine litter (Pierdomenico et al., 2019; Angiolillo & Fortibuoni, 2020) and transfer of pollutants to the deep-sea (Sanchez-Vidal et al., 2015) represent important pressures on deep-sea habitats and species.

29.Because of their geomorphology and the oceanographic currents occurring around submarine canyons, these structures tend to funnel, collect and accumulate litter at the base or in depression. This is particularly true for canyons that are close to the coast. The Mediterranean holds the submarine canyons with the highest concentration of plastic in Europe (Aguilar et al., 2020; Canals et al., 2021). The other deep-sea geomorphological structures undergo the impact of marine litter as well (see Aguilar et al., 2020).

IV.2.4 Climate change

30.Although poorly known, climate change impacts cumulated to the previous threats, could drive important changes in Mediterranean deep-sea ecosystem structures (Sweetman et al., 2017). The impacts of acidification combined to the increase of the sea temperature on reef building deep species such as scleractinian CWCs is not yet well known but the development of these species seems altered (see Maier et al., 2012; Hennige et al., 2014; Rodolfo-Metalpa et al., 2015; Gómez et al., 2018).

31.Benthic non-indigenous species (NIS) have rather rarely been reported in deep-sea habitats (Galil et al., 2019) and for the moment they do not represent the most important threat. Nonetheless, the rise of sea temperature attributed to climate changes occurs also in deep-sea and could contribute significantly to expand the bathymetric distribution of actual shallow NIS (see *e.g.* Innocenti et al., 2017).

IV.2.5 Other threats that could develop in the future

32.Offshore oil and gas developments (exploration, offshore infrastructures, drilling operations and transport by pipelines and/or tankers) represent a direct and increasing threat for deep-sea ecosystems, especially for benthic habitats (Cordes et al., 2016). Discoveries of new hydrocarbon resources in the Mediterranean will probably lead to an increasing number of drilling licences as well as the development of pipelines crossing deep-sea benthic habitats and increasing tanker traffic in the Mediterranean.

33.Marine noise pollution (MNP) can be a side effects of such explorations and developments but can also originate from many other anthropogenic activities (*e.g.* maritime traffic, military activities). MNP have considerably increased since the second world war (Frisk, 2012) and can interfere with behaviour and vital processes of marine mammals (*e.g.* Erbe et al., 2018) but also have various impacts on deep-sea fauna including invertebrates (see Di Franco et al., 2020).

V. Objectives of the Action Plan

34.The objectives of the Action Plan are to:

- develop and improve knowledge about dark habitats and their assemblages (*e.g.* distribution, species richness, composition, functioning, and ecology).
- conserve the habitats' integrity, functionality (favourable state of conservation) by maintaining the main ecosystem services (*e.g.* carbon sink, halieutic recruitment and production, biogeochemical cycles) and their interest in terms of biodiversity (*e.g.* specific diversity, genetics);
- encourage the natural restoration of degraded habitats (*e.g.* reduction of anthropogenic impacts)

VI. Actions required to attain the objectives of the Action Plan

VI.1 <u>Improving inventories, location and characterisation</u>

35.During recent decades, interest and concern for dark habitats has increased, and knowledge has been improved by newly available exploration technologies (see SPA/RAC-UN Environment/MAP & OCEANA, 2017). However, this knowledge is often scattered, even at national level, and spatially uneven throughout the Mediterranean. Efforts are made by the scientific community, international and national bodies to acquire information on the distribution and composition of marine caves and deep-sea benthic habitats. Still, the difficulty of access and the high cost of deep-sea scientific campaigns explain the large knowledge gaps on the distribution, biodiversity, ecosystem functioning, dynamics and ecological status of the various types of dark habitats and their assemblages. Yet, this information is vital for the implementation of an optimal management strategy on these ecosystems.

36.The following actions could help improve the lack of knowledge for all dark habitats:

- Aggregate the available knowledge, taking into account not only national and regional data (*e.g.* RAC/SPA, GFCM, IUCN, OCEANA, WCMC) but also scientific works. The information should be integrated within a geographical information system (GIS) and could be shared via online consultation.
- Identify geographical areas of interest presenting important knowledge gaps and enhance national capacities and international cooperation for investigation campaigns.
- Set up a database of people-resources in identified fields (*i.e.* caves, deep-sea populations), of institutes and bodies working in this field and of the available means of investigation.
- Quantify the proven or potential pressures (*e.g.* commercial and recreational fishing, leisure activities and diving, undersea prospecting). New knowledge must be acquired in areas of regional interest to promote a multidisciplinary approach and enhance international cooperation over these sites. Such joint action will permit the exchange of experience and the setting up of shared management strategies (building guidelines).
- Maintain regular theme-based workshops that bring together experts on dark habitats (biodiversity, methodology, monitoring, threats, conservation etc.).

VI.2 <u>Building-up management measures</u>

37.Management procedures involve enacting laws aimed at regulating human activities likely to affect dark habitats and permit their long-term conservation.

VI.2.1 Legislation

38.At national level, endangered and threatened species and populations of dark habitats should be identified in order to update corresponding national species lists. They can then be considered as protected species as defined in Article 11 of the Protocol on Specially Protected Areas and Biological Diversity (SPA/BD Protocol, 1995). Special consideration should be given to species of Vulnerable Marine Ecosystems (VMEs)4.

39.The regulations on impact studies must be strengthened to make compulsory the assessment of impacts on species and assemblages of dark habitats. The regulations should pay particular attention in the event of coastal development, the prospecting and exploiting of natural resources and the discharge and dumping of materials at sea.

40.Insofar as regulatory procedures already exist at international level to restrict or ban certain human activities, further actions are required in order to have them applied and develop new propositions. This is particularly so for the setting up of Fisheries Restricted Areas (FRA) as adopted in the context of the mandate of the General Commission on Mediterranean Fisheries, including the ban on trawling, in the Mediterranean, at depths of over 1,000 meters down (FAO-GFCM, 2006; GFCM, 2019). The Mediterranean states are invited to use and enhance, all means already available to ensure better conservation of dark habitats.

VI.2.2 Setting MPAs

41.Numerous Mediterranean MPAs encompass marine caves and in several cases, coastal areas with marine caves have been suggested for protection. Nevertheless, their number in MPAs remains unknown and - despite the establishment of new MPAs, EU environmental legislation and the Dark Habitats Action Plan - in most cases there is a lack of specific regulations or management plans for their protection, monitoring and restoration. Further specific regulations are needed for dark habitats within MPAs, especially marine caves.

42.Mediterranean deep-sea habitats are still poorly represented in MPAs partly due to the fact that these habitats are often distant from the coast and difficult to access, therefore their effective protection represents a real challenge. Adding to the difficulty of access, is the fact that deep-sea habitats are often areas beyond national jurisdiction (ABNJ).

43.Designation of Marine Protected Areas intended to permit more efficient conservation of these assemblages must be based on the identification of sites on the basis of the criteria such as uniqueness or rarity, particular importance for species biological stages, importance for threatened, endangered or declining habitats or species, vulnerability and reduced recuperative capacity after disturbance, biological productivity, biodiversity and naturalness as adopted in 2009 by the Contracting Parties (UNEP-MAP-RAC/SPA, 2009). At the Mediterranean level, the selection of sites to be protected must also be based on the ecosystem approach and take in consideration the patchy distribution of these habitats, as the only way to ensure a coherent and efficient network of MPAs for a sustainable management of the various types of dark habitats.

VI.2.3 Other management measures

44.Measures should be identified to reduce the pressures that hang over assemblages of dark habitats and to implement them. In the light of the precautionary principle, particular attention should be paid to the impacts that could arise as a result of the seawater temperature rise, acidification and/or fertilization of the oceans and the setting up of new emergent fisheries (border areas).

45.MPAs which host dark habitats (e.g. dark marine caves) should update their management plans to include measures adapted to their conservation.

46.Procedures aimed at assessing the efficiency of these measures as a whole should be defined in consultation with the organisations concerned by the management of these assemblages (*e.g.*

[4] See report of GFCM Working Group on Vulnerable Marine Ecosystems (WGVME), Malaga, Spain, 3-5 April 2017

international conventions, GFCM, IUCN, NGOs) to promote sustainable, adaptable and concerted management.

47. In sites that have not yet been studied, a state of reference ('zero state') is a necessary precondition for setting up a monitoring system for these assemblages. For the sites for which data already exists, monitoring procedures should be started.

VI.3 Strengthening national plans

48. To give greater efficiency to the measures for setting up the present Action Plan, the Mediterranean countries are invited to build-up national plans for the protection of dark habitats. Each national plan should propose appropriate legislative measures, particularly as regards impact studies for coastal development and check the activities that can affect these assemblages.

49. The national plan should be elaborated on the basis of the available scientific data and should include programmes for:

- (i) gathering and continuous updating of data,
- (ii) training and updating of specialists,
- (iii) education and awareness for the public, actors and decision makers, and
- (iv) conservation of dark habitats and their assemblages that are significant for the marine environment in the Mediterranean Sea.

50. These national plans must be brought to the attention of all the concerned actors and as far as possible ensure coordination with other permanent national plans (*e. g.* emergency plan against accidental pollution).

VI.4 Establishing monitoring plans

51. Recent technological advances have enhanced the possibilities of studying and monitoring deep-sea habitats by acoustic, visual or sampling methods. These methods must be combined to obtain the most cost-efficient monitoring of deep-sea habitats to reach the most accurate state of conservation. Plans for monitoring dark habitats and associated assemblages should be communicated at a Mediterranean scale to encourage transboundary exchanges, regional coherence, sharing effort and means of investigations (see Deep-sea exploration in France, Monaco and Italy in the framework of the international agreement Ramoge - Daniel et al., 2019).

52. The *Guidelines for inventorying and monitoring of Dark Habitats in the Mediterranean Sea* (SPA/RAC-UN Environment/MAP & OCEANA, 2017) details the methodologies and the IMAP common indicators selected for monitoring dark habitats. Monitoring of dark habitats should be based on these guidelines. Nevertheless, the absence of long time series depicting the past ecological status of dark habitats (*e.g.* marine caves) is a major impediment to the monitoring and evaluation of impacts and changes in their ecological status.

VI.5 Enhancing transboundary exchanges

53. In the light of the geographical distribution of many types of dark habitats in areas beyond national jurisdiction (ABNJ), and the difficulties of reaching them (bathymetric range, lack of knowledge, scientific means required and cost of study), it is important to:

- (i) encourage the establishment of international cooperation to create synergies between the various actors (decision makers, scientists, socio-professionals) and set up shared management.
- (ii) organise training courses and encourage the exchange of cross-border experience so as to enhance national capacities in the field.

VI.6 <u>Developing public awareness and information</u>

54. Information and awareness programmes to make dark habitats, their vulnerability and the interest for conservation better known should be crafted and continued for decision-makers, but also users such as SCUBA divers, fishermen and mine operators. Communication on these habitats should also be encouraged for the wider public. The participation of NGOs in these programmes should be encouraged.

VII. Regional coordination and implementation

55. Regional coordination of the implementation of the present Action Plan will be handled by the Secretariat of the Mediterranean Action Plan (MAP) via the Regional Activity Centre for Specially Protected Areas. The coordinating structure's main functions are:

(i) gathering, summarizing and circulating knowledge at Mediterranean level and permitting this to be integrated within the available instruments (*e. g.* Standard Data-Entry Form - SDF);
(ii) setting up and updating databases on people/resources, laboratories involved, and investigation means available;
(iii) helping states identify and assess the pressures on the various types of dark habitats and their assemblages at national and regional level;
(iv) promoting studies on dark habitats and making inventories of species in order to better figure out the way they function and better assess the ecosystem services they provide;
(v) promote cross-border cooperation;
(vi) back the setting up of monitoring networks for dark habitats;
(vii) organise meetings of experts and training courses on dark habitats and their biodiversity;
(viii) prepare reports on how implementation of the Action Plan is progressing, for submission to the Meeting of National Focal Points for SPAs and meetings of the Contracting Parties;
(ix) establish a work programme for implementing the Action Plan over a five-year period, which will be submitted to the Contracting Parties for adoption.

56. At the end of this period, if necessary, after assessment and updating, it can be repeated. Implementing the present Action Plan is the responsibility of the national authorities of the Contracting Parties. At each of their meetings, the National Focal Points for SPAs shall assess how far the Action Plan is being implemented on the basis of national reports on the subject and a report made by RAC/SPA on implementation at regional level.

57. In the light of this assessment, the Meeting of National Focal Points for SPAs will suggest recommendations to be submitted to the Contracting Parties. If necessary, the Meeting of Focal Points will also suggest adjustments to the schedule that appears in the Appendix to the Action Plan.

VIII. Participation in the implementation

58. Supplementary work done by other international and/or non-governmental organisations, aiming at the same objectives, should be encouraged, encouraging their coordination and avoiding duplication of effort. At their ordinary meetings, the Contracting Parties could, at the suggestion of the Meeting of National Focal Points for SPAs, in order to encourage and reward implementation of the Action Plan, grant the title of 'Action Plan Partner' to any structure that may so request.

59. This label will be granted on the evidence of proven involvement in the implementing of the present Action Plan attested by concrete actions (*e. g.* conservation, management, research, awareness etc.).

60. The label can be extended at the same time as the multi- annual work programme on the grounds of an assessment of actions carried out during that period.

IX. Implementation schedule

Actions	Time	Who
Making a summary of knowledge of dark habitats and their distribution around the Mediterranean in the form of a geo-referenced information system	As soon as possible and continuously	RAC/SPA & Contracting Parties
Setting up a database of people/resources and means of investigation available	As soon as possible and continuously	RAC/SPA
Identify and assess proven pressures on each of the various types of dark habitats	Year 1 and 2	RAC/ SPA, Partners and Contracting Parties
Gathering data and information on research activities	Continuously	RAC/SPA & Contracting Parties
Revise the reference list of types of marine habitats for the selection of sites for inclusion in the national inventories of natural sites of conservation interest, in order to take into account dark habitats	Year 1 and 2	Contracting Parties
Revise the list of endangered or threatened species in order to take account of species and assemblages of dark habitats	Year 1 and 2	RAC/SPA & Contracting Parties
Promote the identifying of areas of interest for the conservation of dark habitats in the Mediterranean and carry out concerted actions in national and/or cross-border sites	Year 1 and 2	RAC/SPA & Contracting Parties
Implement and/or extend MPAs to include already identified sites of interest that host dark habitats at a national level and in areas beyond national jurisdiction (ABNJ)	As soon as possible and continuously	RAC/SPA & Contracting Parties
Introduce national legislation to reduce negative impacts on dark habitats and associated assemblages (including impact studies procedures)	On adoption	Contracting Parties
Regularly hold theme-based workshops (in coordination with those of the 'Coralligenous' AP)	Every three years	RAC/SPA
Update guidelines suited to the inventorying and monitoring of dark habitats and associated assemblages	Every five years	RAC/SPA and Partners
Implement monitoring systems	As soon as possible	RAC/SPA & Contracting Parties
Develop detailed guidelines for effective management measures of dark habitats	Year 1 and 2	RAC/ SPA, Partners and Contracting Parties
Enhance cooperation actions with concerned organisations and in particular with GFCM	Continuously	RAC/SPA
Step up awareness and information about dark habitats and associated assemblages with the various actors	Continuously	RAC/ SPA, Partners and Contracting Parties
Enhance national capacities and improve skills in taxonomy and monitoring methods	As needed	RAC/SPA

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Annex V

Draft Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs

Draft Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs

I. Introduction

1. Decision IG.24/6[1] "Identification and Conservation of Sites of Particular Ecological Interest in the Mediterranean, including Specially Protected Areas of Mediterranean Importance", adopted by the 21st ordinary meeting of the Contracting Parties to the Barcelona Convention and its Protocols (COP 21; Naples, Italy, 2-5 December 2019), requested the Secretariat to establish a Directory of Mediterranean Specially Protected Areas (SPAs), and the Specially Protected Areas Regional Activity Centre (SPA/RAC) to elaborate criteria for inclusion of SPAs in the directory, for consideration by the Contracting Parties at their 22nd meeting (COP 22; Antalya, Turkey, 7-10 December 2021).

2. Decision IG.24/6 further decided to set up the Ad hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) to support the Secretariat and the Contracting Parties to progress with the 2020 and post-2020 marine protected areas agenda in the Mediterranean and to work on related issues such as preparing guidelines, setting up definitions and measurable indicators, and tailoring global concepts and approaches to the Mediterranean context.

3. The present draft Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs were prepared by SPA/RAC with the full expertise and support of AGEM.

II. Elaboration of the draft Criteria for inclusion of SPAs in the Directory of Mediterranean SPAs

4. In view of the development of the draft Criteria for inclusion of SPAs in the Directory of Mediterranean SPAs, AGEM had a rich discussion on the following points:
   - Difference between Specially Protected Areas (SPAs) and Marine and Coastal Protected Areas (MCPAs), and if SPAs should be a special category of MCPAs similar to the Specially Protected Areas of Mediterranean Importance (SPAMIs);
   - Definition of a SPA;
   - Purpose of the Directory of Mediterranean SPAs;
   - Criteria for inclusion of SPAs in the Directory of Mediterranean SPAs (and format of the proposal);
   - Format/data to be contained in the Directory of Mediterranean SPAs;
   - Maintenance and update of the Directory of Mediterranean SPAs.

5. AGEM unanimously agreed on the following points:

II.1. Difference between Specially Protected Areas (SPAs) and Marine and Coastal Protected Areas (MCPAs)

6. Specially Protected Areas (SPAs) don't have special criteria different from Marine and Coastal Protected Areas (MCPAs). They are the same as MCPAs, but they are meant to be "officially established and fully managed" MCPAs (as opposed to paper parks).

[1] Decision IG.24/6 "Identification and Conservation of Sites of Particular Ecological Interest in the Mediterranean, including Specially Protected Areas of Mediterranean Importance": http://www.rac-spa.org/sites/default/files/doc_cop/cop21/decision_24_6_eng.pdf

II.2. Definition of a SPA

7. Given that there is no definition of "SPA" under the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean[2] (SPA/BD Protocol), it would be useful to have such definition, particularly to avoid confusions that may arise.

8. Based on an examination of the various relevant articles of the SPA/BD Protocol, it was agreed that this definition should include the following points:

- A geographically defined marine or terrestrial coastal area (Article 2, para. 1, of the SPA/BD Protocol);
- Established by legal enactment;
- Devoted to protection (should be amongst its objectives); and
- Includes measures in the legal enactment-indications about key elements for management.

9. The following wording for a SPA definition was discussed and agreed: "**a geographically defined marine or coastal area that is designated by legal enactment and managed to achieve specific protection objectives (as listed in Article 4 of the SPA/BD Protocol) through appropriate protection measures**".

10. It was also agreed that it is particularly important that SPAs have clear protection objectives that aim to reach a specific conservation goal. It is not enough that the SPA is legally established. The SPA/BD Protocol is clear that the SPA needs to have some binding management measures in it, and in particular a management plan. In addition, it would be useful to account for the effectiveness of the protection measures in the data to be requested in the Directory of Mediterranean SPAs.

11. It was further agreed that it may be useful to have guidance on which MCPA categories could be considered as SPAs and included in the Directory of Mediterranean SPAs.

II.3. Purpose of the Directory of Mediterranean SPAs

12. It was agreed that the main purpose of the Directory of Mediterranean SPAs is to facilitate and standardize reporting on progress toward the implementation of the Barcelona Convention and its SPA/BD Protocol.

13. AGEM stressed the fact that the current reporting format for the implementation of the Barcelona Convention and its Protocols has a section on SPAs. However, the information requested in this reporting format is very limited. Improving this format of standard reporting on SPAs would be needed, taking into account the criteria for the areas that should be considered as SPAs.

14. The Directory of Mediterranean SPAs could also serve as a tool recognized by the country to report on international and regional MCPA targets (the Post-2020 Regional Strategy for MCPAs and OECMs in the Mediterranean) and improve level of transparency in reporting, and measure progress towards these targets. It therefore should accommodate reporting needs for various commitments on marine protected areas (MPAs) to CBD, EU, etc., and also enable reporting on other effective area-based conservation measures (OECMs).

15. With regard to OECMs, AGEM was of the views that the Barcelona Convention COP 22 should invite SPA/RAC to have a section on OECMs in the Database of Marine Protected Areas in the Mediterranean (MAPAMED) of SPA/RAC and MedPAN, and also invite Contracting Parties to identify and report OECMs. However, it is important to have a clear distinction on reporting between SPAs and OECMs and avoid creating confusion.

16. The Directory of Mediterranean SPAs could also provide other objectives and services including:

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[2] http://rac-spa.org/sites/default/files/spamis_temp/spa_bd_protocol_annexes1_to_3_v_2019_eng.pdf

- enable reporting effectiveness of the protection measures. This could ultimately enable enhance management effectiveness of these protected areas;
- facilitate the creation of networks at Mediterranean level amongst MCPAs in different countries sharing similar objectives;
- enable analysis of Mediterranean OECMs.

17. AGEM also discussed that ideally a SPAMI should be first listed as SPA and meet all the SPA criteria before being evaluated as SPAMI. Every SPAMI should be a SPA, but not all SPAs are expected to become SPAMIs.

II.4. Criteria for inclusion of SPAs in the Directory of Mediterranean SPAs (and format of the proposal)

18. AGEM examined in details Articles 4, 6, 7, 16, 19, 23 and 26 of the SPA/BD Protocol and agreed on the following criteria for inclusion of an area in the Directory of Mediterranean SPAs:

(a) The SPA must be declared (established) through a legal enactment that clearly states its protection objective(s) and its boundaries. The text of the legal enactment must be provided and included in the Directory of Mediterranean SPAs.

(b) The legal enactment of the SPA must include at least one of the following conservation objectives, as listed in Article 4 of the SPA/BD Protocol:
   (i) to safeguard representative types of coastal and marine ecosystems of adequate size to ensure their long-term viability and to maintain their biological diversity;
   (ii) to safeguard habitats which are in danger of disappearing in their natural area of distribution in the Mediterranean or which have a reduced natural area of distribution as a consequence of their regression or on account of their intrinsically restricted area;
   (iii) to safeguard habitats critical to the survival, reproduction and recovery of endangered, threatened or endemic species of flora or fauna;
   (iv) to safeguard sites of particular importance because of their scientific, aesthetic, cultural or educational interest.

(c) To achieve the area’s conservation objectives, the legal framework of the SPA must define relevant protection measures as per Article 6 of the SPA/BD Protocol. In particular, the protection measures should include:
   (i) the regulation or prohibition of fishing, hunting, taking of animals and harvesting of plants or their destruction, as well as trade in animals, parts of animals, plants, parts of plants, which originate in specially protected areas;
   (ii) the regulation and if necessary the prohibition of any other activity or act likely to harm or disturb the species or that might endanger the state of conservation of the ecosystems or species or might impair the natural or cultural characteristics of the specially protected area.

(d) As relevant[3], the legal framework of the SPA should also include the following protection measures (protection measures also listed in Article 6 of the SPA/BD Protocol):
   (i) the regulation of the introduction of any species not indigenous to the specially protected area in question, or of genetically modified species, as well as the introduction or reintroduction of species which are or have been present in the specially protected area;
   (ii) the prohibition of the dumping or discharge of wastes and other substances likely directly or indirectly to impair the integrity of the specially protected area;
   (iii) the regulation of the passage of ships and any stopping or anchoring;
   (iv) the regulation or prohibition of any activity involving the exploration or modification of the soil or the exploitation of the subsoil of the land part, the seabed or its subsoil;

[3] The term “as relevant” means that a SPA does not necessarily need to have in place all of the listed protection measures, but only those that are required, taking into account its own characteristics and conservation objective.

(v) the regulation of any scientific research activity;
(vi) the strengthening of the application of the other Protocols to the Convention and of other relevant treaties to which they are Parties;
(vii) any other measure aimed at safeguarding ecological and biological processes and the landscape.

(e) To be included in the Directory of Mediterranean SPAs, a SPA must[4] have planning, management, surveillance and monitoring measures. As per Article 7 of the SPA/BD Protocol, they should include:
(i) the development and adoption of a management plan that specifies the legal and institutional framework and the management and protection measures applicable;
(ii) the continuous monitoring of ecological processes, habitats, population dynamics, landscapes, as well as the impact of human activities;
(iii) the active involvement of local communities and populations, as appropriate, in the management of the specially protected area, including assistance to local inhabitants who might be affected by its establishment;
(iv) the adoption of mechanisms for financing the promotion and management of the specially protected area, as well as the development of activities which ensure that management is compatible with its objectives;
(v) the regulation of activities compatible with the objectives for which the specially protected area was established and the terms of the related permits;
(vi) the training of managers and qualified technical personnel, as well as the development of an appropriate infrastructure.

II.5. Format/data to be contained in the Directory of Mediterranean SPAs

19. The Directory of Mediterranean SPAs should be constructed as a multifunctional tool that would accommodate the different demands in terms of reporting, as discussed under section II.3. above.

20. AGEM agreed that the reporting of the Contracting Parties to the Directory of Mediterranean SPAs should build upon the current reporting requirement under the Barcelona Convention and its Protocols. Taking into consideration the proposed purpose of the Directory of Mediterranean SPAs and SPA criteria, the current reporting requirement should be amended to include the additional information contained in **Annex 1** (bold underlined text).

21. In addition, AGEM noted that it is necessary for the SPA to have a management plan that is adopted as per Article 7 of the SPA/BD Protocol (see section II.4. (e) (i) above). The reporting format should therefore be amended to delete the sub-columns "No" and "Under Development" with reference to the management plan (see Annex 1, stricken-through text).

II.6. Maintenance and update of the Directory of Mediterranean SPAs

22. AGEM agreed that the Directory of Mediterranean SPAs should be updated every two years, as part of the regular reporting under the Barcelona Convention and its Protocols.

23. AGEM also agreed that it is important that an analysis of all submitted reports is provided by SPA/RAC at every meeting of the SPA/BD Focal Points. AGEM also agreed that the COP 22 of the Barcelona Convention should request SPA/RAC to include the submitted reports on SPAs in the Database of Marine Protected Areas in the Mediterranean (MAPAMED), and should also encourage Contracting Parties to report additional information on other MCPAs and OECMs to the MAPAMED database.

[4] Article 7, para. 1, of the SPA/BD Protocol states that Parties "*shall*" adopt planning, management, supervision and monitoring measures. The verb "shall" is understood as "have an obligation to" and, therefore, the term "must" is used here to convey the mandatory nature of these requirements.

Annex 1

Additional information on Specially Protected Areas (SPAs) to be added to the reporting format for the implementation of the Barcelona Convention and its Protocols, for purposes of inclusion in the Directory of Mediterranean SPAs

Note: The additional information is underlined and in bold.
The amendment of the reporting format should also delete the stricken-though text.

Table III. List of SPAs within the SPA/BD Protocol's geographical coverage

No	Name of the SPA	Date of establishment	**Legal enactment (copy of the text should be attached)**	Category	Jurisdiction	Coordinates **Polygons**	Surface (marine, terrestrial, wetland) **(total and if it's the case distinguished into marine, coastal, wetland)**	Main ecosystems, species and their habitats **(incl. species listed under Annexes II and III)**	Management plan			**Protection objectives (drop down menu from objectives in Article 4)**	**Protection measures (drop down menu from list in Article 6)** **Other measures?**	**Are the measures legally binding (e.g. included in an applicable regulation)?** **If yes, provide reference to relevant regulation**	**Existence of No-Take Zone[5] (Yes/No)** **If yes, provide total extent of the No-Take Zone as officially declared (in km²)**
									Date of adoption **(link or attachment provided)**	~~NO~~	~~Under development~~				
N															
N+1															
…															

[5] No-Take Zones are geographically defined zones within marine protected areas that do not allow any fishing, mining, drilling, or other extractive activities.

Annex VI

Draft Post-2020 Regional Strategy for marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean

Executive Summary

In December 2019, the Conference of Parties to the Barcelona Convention (COP 21) requested the Mediterranean Action Plan of the United Nations Environment Programme (UNEP/MAP) Secretariat, through the Specially Protected Areas Regional Activity Centre (SPA/RAC), to elaborate a post-2020 strategic document to further advance and strengthen the network of marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean. It was further recognized that to achieve comprehensive and coherent systems of well-managed MCPAs/OECMs, the strategy should be ambitious, transformational, and in line with the Post-2020 Global Biodiversity Framework of the Convention on Biological Diversity (CBD) and other regional and global processes. Central to the transformative approach will be the incorporation and integration of recognized OECMs in the region to help achieve the ambitious Post-2020 Global Biodiversity Framework relevant targets.

Through a series of consultations and workshops, this Post-2020 Strategy for MCPAs and OECMs in the Mediterranean was developed under the leadership of the Specially Protected Areas Regional Activity Centre, (SPA/RAC) the guidance of its Ad hoc Group of Experts for Marine Protected Areas s in the Mediterranean (AGEM), and in consultation with Contracting Parties Focal Points and Regional and International Organizations active in the Mediterranean. The strategy is aligned with a number of international, regional and sub-regional relevant strategies and ongoing programmes.

POST-2020 TARGETS

It is recognized that each individual country will have its own specific MCPA and OECM coverage targets, however in keeping with global targets for protected areas, regional marine conservation community recommendations, and sub-regional targets for enhanced levels of protection. Two post-2020 targets have been identified for the Mediterranean Sea as a whole; these are-:

i) By 2030, at least [30] per cent of the Mediterranean Sea is protected and conserved through well connected, ecologically representative and effective systems of marine and coastal protected areas and other effective area-based conservation measures, ensuring adequate geographical balance, with the focus on areas particularly important for biodiversity.

ii) By 2030, the number and coverage of marine and coastal protected areas with enhanced protection levels is increased, contributing to the recovery of marine ecosystems.

STRATEGY

To help achieve these ambitious targets, the strategy has identified five strategic pillars-:

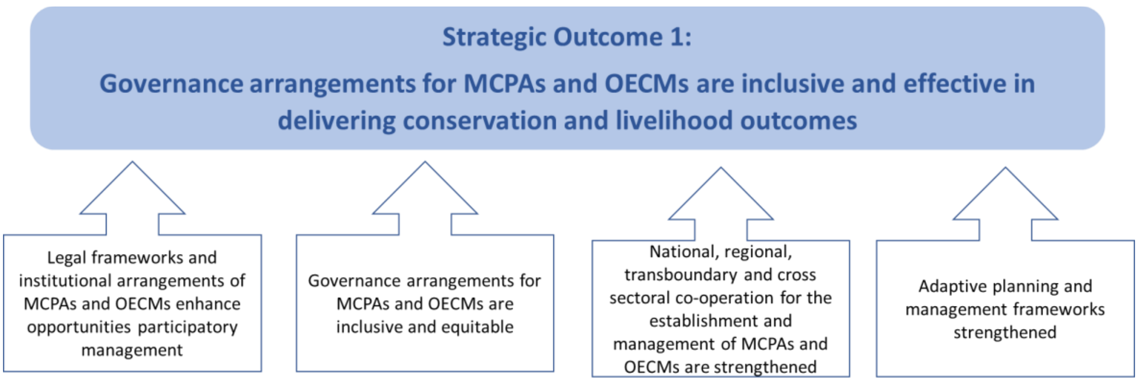
1. **Governance-** Inclusive governance is essential to ensure effective systems of MCPAs and OECMs. This pillar promotes the participation of all levels of stakeholders in both the decision-making processes and management of these systems.
2. **MCPA coverage-** There is a clear need to establish and expand the MCPA network to achieve the ambitious post-2020 target for the Mediterranean. The design of these systems, however, requires a greater balance across countries, sub-regions and habitats coverage to achieve a greater ecological representation across the region and to consider enhanced levels of protection for MCPAs or parts of MCPAs.
3. **OECMs-** A relatively new concept for the region, recognizing marine OECMs, in addition to **increasing** MCPA coverage, will be critical to help advance towards the [30]% coverage target for the region.
4. **MCPA effectiveness-** Increasing the management effectiveness of MCPAs is necessary to achieve conservation outcomes and is essential to avoid MCPA existence on paper only. As the coverage of MCPAs increases over the coming years, it is essential to mitigate barriers to effective management

ensuring these new MCPAs and those already established, are managed effectively to enhance their conservation outcomes.

5. **Government and stakeholder action and support-** A cross-cutting pillar essential to all other pillars identified. Government and stakeholder action and support will be the foundation of achieving all other outcomes and outputs.

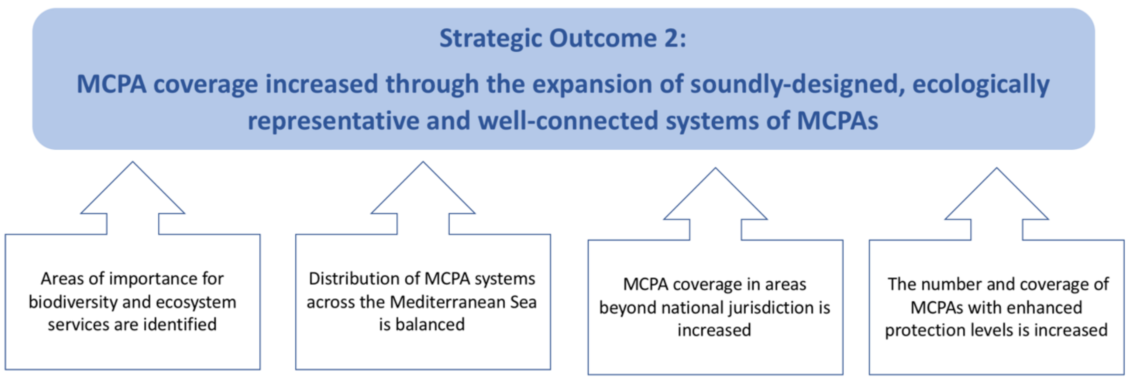
Under each of these pillars, a clear strategic outcome, with corresponding outputs have been identified. Recognizing that countries are at different stages with regard to the establishment and management of their MCPAs, a number of indicative, rather than prescriptive, actions are also proposed at both, Contracting Parties and Regional and International Organization levels. Below summarizes the main aspects for each of the five pillars identified.

Pillar 1: Governance



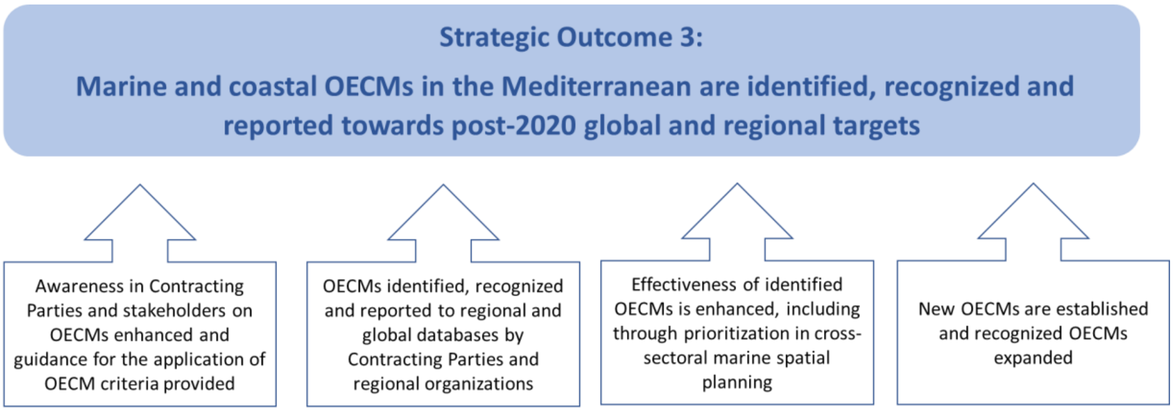
To meet post-2020 targets for the region, it is essential that governance and co-operation among other sectors and stakeholders, including transboundary co-operation, is strengthened for the establishment and management of MCPAs and OECMs. Effective and inclusive governance is a core element for achieving effective systems of MCPAs and OECMs. It is necessary therefore to ensure that enabling legislation and best practices are applied, that promote the effective and equitable involvement of key stakeholders of all levels in decision-making processes and the management of MPCAs and OECMs, and that their respective planning and management frameworks can adapt to any changes in political, social and environmental conditions that arise. Appropriate governance models are critical for creating and maintaining the necessary conditions for efficient management. Participatory, inclusive and adaptive decision-making, therefore, is critical to the overall success of MCPAs and OECMs.

Pillar 2: MCPA coverage



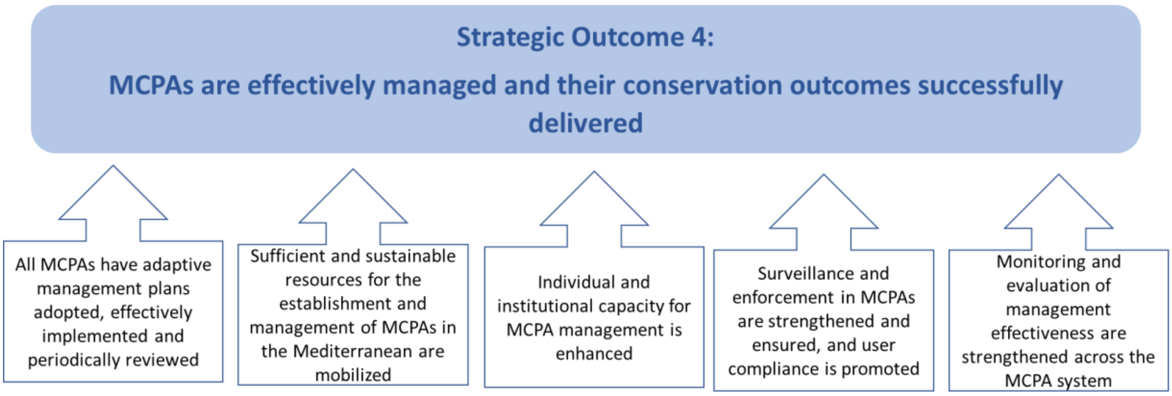
MPCA coverage in the Mediterranean currently stands at 8.3%, there is clear need therefore to establish new MCPAs and to expand existing networks if the region is to advance towards meeting this ambitious post-2020 target. It is further essential that this increase in coverage coincides with a more balanced representation across countries, sub-regions and depths and includes areas beyond national jurisdiction. In addition, and in keeping with regional and sub-regional targets, there is a need to enhance the protection measures of MCPAs and to consider identifying or establishing MCPAs or core zones within MCPAs with enhanced protection measures, for example, no-entry, no-take and no-fishing zones. Identifying important areas for protection, documenting and sharing knowledge between Contracting Parties and enhanced transboundary co-operation, will be essential actions under this pillar if outputs and outcomes are to be achieved.

Pillar 3: OECMs



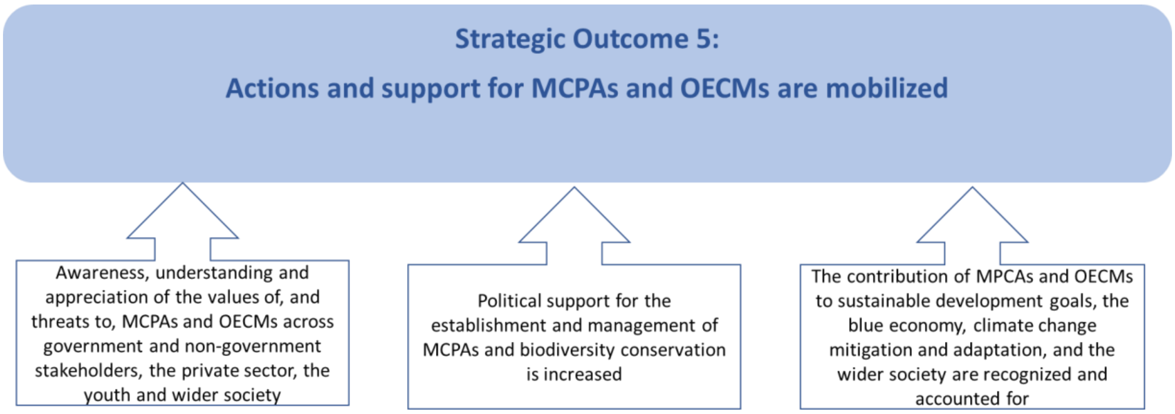
In addition to expanding MCPA coverage, OECMs will play an increasingly important role in progressing the region towards its post-2020 target. As a relatively new concept for the region, creating awareness on OECMs, providing guidance for applying screening tools and assessments against criteria, and supporting their subsequent reporting to the relevant databases will be key elements under this pillar. Effective inter-sectoral and multi-stakeholder cooperation and engagement, and documenting and sharing experiences, will be critical for the success of this outcome. Since the responsibility for OECMs will generally fall under other sectors, marine spatial planning processes will be an important avenue to help prioritize and promote the identification and recognition of OECMs and to enhance their biodiversity conservation measures. This strategy focuses on the identification, recognition and reporting of OECMs only, and not their subsequent management and monitoring, which are likely to fall under other sectors' mandates.

Pillar 4: MCPA Management Effectiveness



Global Biodiversity targets for MCPAs recognize that increasing their coverage is not sufficient on its own and once established, MCPAs must be effectively managed. Identifying desired conservation outcomes, developing frameworks for their management, and ensuring management effectiveness is routinely evaluated are critical steps for ensuring adaptive and effective management of MCPAs. Plans alone however will not safeguard the biodiversity and socio-economic values of MCPAs, such plans need to be implemented effectively. To do so, it is critical that sufficient and sustainable funds are available to MCPA managers across the region and that institutions and their staff have the relevant capacity for management plan implementation. Increasing funds will also be necessary to support all actions under this strategy including the establishment of MCPAs. As part of management plan implementation and assessing conservation outcomes, strengthening surveillance and enforcement of MCPA rules and regulations, fostering good co-operation with relevant law enforcement agencies, and monitoring ecosystem health, threats and socio-economic indicators will be essential to achieve this outcome.

Pillar 5: Government and stakeholder action and support



To move away from business-as-usual, it is necessary to ensure that across all stakeholder groups, including the wider society, MCPAs and potential OECMs are valued and appreciated for their functional and supportive role in helping to achieve other non-biodiversity related national agendas and their role as nature-based solutions. Enhancing political support is particularly crucial as without political will, the Region cannot meet the relevant post 2020 targets. Key to increasing political support will be advancing their recognition of the value and importance of MPAs and OECMs in achieving national and international commitments, particularly as they related to Sustainable Development Goals and Nationally Determined Contributions, as well as their contribution to the national economy. The development and implementation of effective and targeted communication and awareness strategies will be essential for mobilizing action in government and non-government stakeholders.

STRATEGY IMPLEMENTATION

Implementation

The implementation of this strategy should be a co-operative process and as such places the effective participation and collaboration of local, national, sub-regional, and regional stakeholders, encompassing inter-governmental agencies, local communities, civil society, private sector, research/academic community, MCPA networks, and relevant Regional and International Organizations at its core for successful implementation.

Contracting Parties will be responsible for the delivery of relevant indicative actions at the national and local levels and creating the enabling conditions for fostering the effective collaboration and active participation of national and local stakeholders and other sectors. SPA/RAC will undertake a central role in co-ordinating and facilitating the delivery of the strategic outcomes through technical, logistical and financial support to the Contracting Parties and fostering regional collaboration between Contracting Parties, and Regional and International Organizations. Regional and International Organizations will also play a supportive role in delivering the outcomes of this strategy through sharing best practices, building capacity, co-financing activities and advising on new tools and approaches.

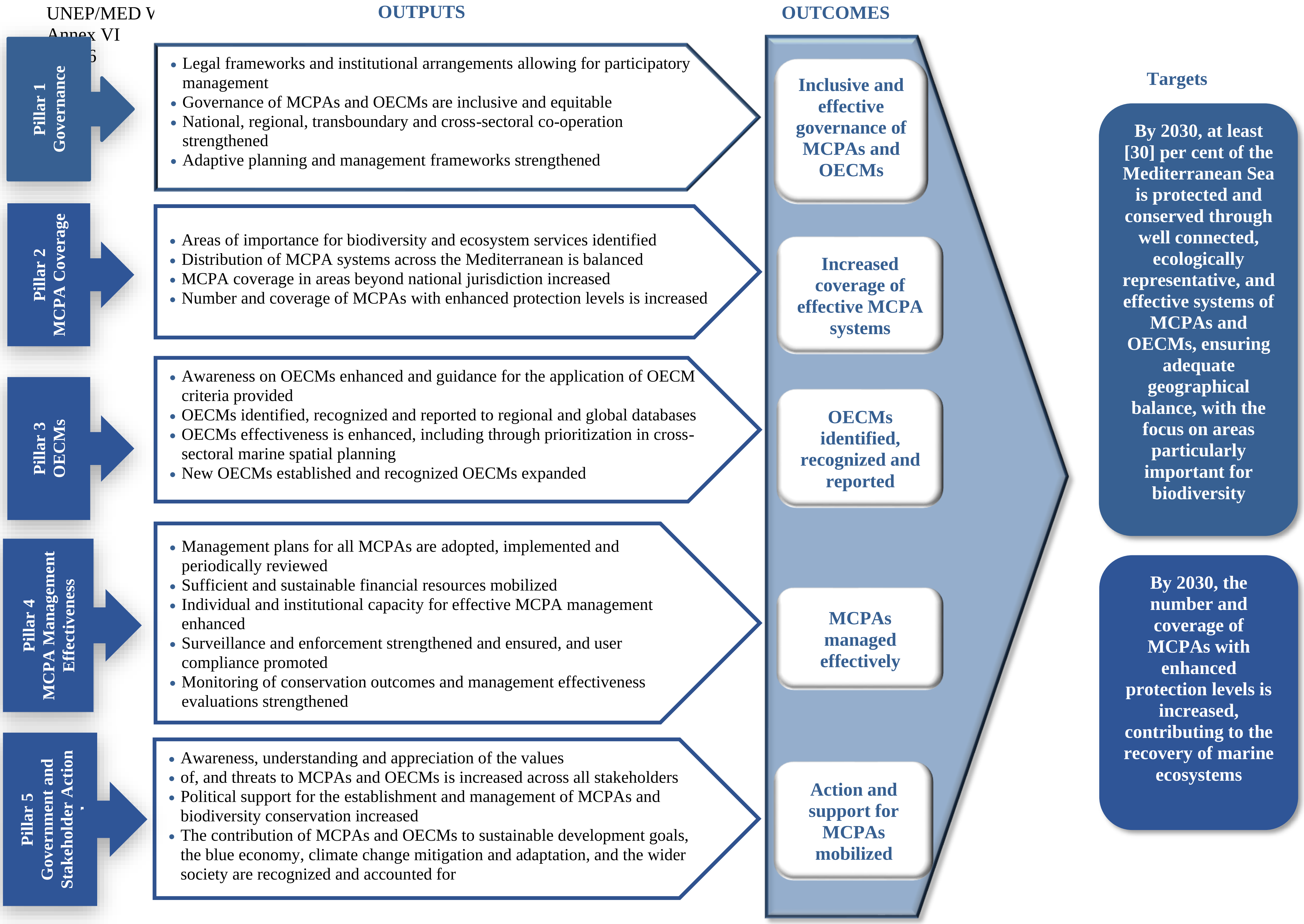
Financing

Additional and substantial financing will be necessary to support the implementation of national and regional actions identified under this strategy. This will be achieved through the identification and implementation of innovative and diversified financing mechanisms across Contracting Parties and the region, and through the support of Regional and International Organizations and donors.

Monitoring and evaluation

The timeframe for the implementation of this strategy is 2021-2030. A full review of the strategy should occur at its mid-point (2026) and at the end of its timeframe (2030). Once adopted, a detailed monitoring and evaluation framework, with associated indicators and targets will be developed. As a living document, progress towards output and outcome indicators and targets should be periodically reviewed and the strategy and its actions revised as required.

A schematic representation of the strategy is provided on the following page.


OUTPUTS
OUTCOMES
Targets
Pillar 1
Governance
• Legal frameworks and institutional arrangements allowing for participatory management
• Governance of MCPAs and OECMs are inclusive and equitable
• National, regional, transboundary and cross-sectoral co-operation strengthened
• Adaptive planning and management frameworks strengthened
Inclusive and effective governance of MCPAs and OECMs
Pillar 2
MCPA Coverage
• Areas of importance for biodiversity and ecosystem services identified
• Distribution of MCPA systems across the Mediterranean is balanced
• MCPA coverage in areas beyond national jurisdiction increased
• Number and coverage of MCPAs with enhanced protection levels is increased
Increased coverage of effective MCPA systems
Pillar 3
OECMs
• Awareness on OECMs enhanced and guidance for the application of OECM criteria provided
• OECMs identified, recognized and reported to regional and global databases
• OECMs effectiveness is enhanced, including through prioritization in cross-sectoral marine spatial planning
• New OECMs established and recognized OECMs expanded
OECMs identified, recognized and reported
Pillar 4
MCPA Management Effectiveness
• Management plans for all MCPAs are adopted, implemented and periodically reviewed
• Sufficient and sustainable financial resources mobilized
• Individual and institutional capacity for effective MCPA management enhanced
• Surveillance and enforcement strengthened and ensured, and user compliance promoted
• Monitoring of conservation outcomes and management effectiveness evaluations strengthened
MCPAs managed effectively
Pillar 5
Government and Stakeholder Action
• Awareness, understanding and appreciation of the values
• of, and threats to MCPAs and OECMs is increased across all stakeholders
• Political support for the establishment and management of MCPAs and biodiversity conservation increased
• The contribution of MCPAs and OECMs to sustainable development goals, the blue economy, climate change mitigation and adaptation, and the wider society are recognized and accounted for
Action and support for MCPAs mobilized
By 2030, at least [30] per cent of the Mediterranean Sea is protected and conserved through well connected, ecologically representative, and effective systems of MCPAs and OECMs, ensuring adequate geographical balance, with the focus on areas particularly important for biodiversity
By 2030, the number and coverage of MCPAs with enhanced protection levels is increased, contributing to the recovery of marine ecosystems

Acronyms

ABNJ	Areas Beyond National Jurisdiction
AGEM	Ad hoc Group of Experts for Marine Protected Areas s in the Mediterranean
CBD	Convention on Biological Diversity
CCH	Cetacean Critical Habitat
COP	Conference of Parties
CP	Contracting Party
EBSA	Ecologically or Biologically Significant Marine Area
EcAp	Ecosystem Approach
EEZ	Exclusive Economic Zone
EU	European Union
FRA	Fisheries Reserve Area
GBF	Global Biodiversity Framework
GFCM	General Fisheries Commission for the Mediterranean
IBA	Important Bird Area
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and related Assessment Criteria
IMMA	Important Marine Mammal Area
MAP	Mediterranean Action Plan
MAPAMED	Database on marine protected areas in the Mediterranean
MedPAN	Network of Marine Protected Areas Managers in the Mediterranean
MAP CU	Mediterranean Action Plan Coordinating Unit
MCPA	Marine and Coastal Protected Areas
MPA	Marine Protected Area
MSP	Marine Spatial Planning
NbS	Nature-based Solution
NDC	Nationally Determined Contribution
NIS	Non-indigenous Species
OECM	Other effective area-based conservation measures
PA	Protected Area
PR	Public Relations
SDG	Sustainable Development Goal
SPA	Specially Protected Area
SPA/BD	Specially protected areas and biological diversity
SPAMI	Specially Protected Area of Mediterranean Importance
SPA/RAC	Specially Protected Areas Regional Activity Centre
PSSA	Particularly Sensitive Sea Areas
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WD	World Database

Table of Contents

LIST OF FIGURES

LIST OF TABLES

Draft Post-2020 Regional Strategy for marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean

I. Introduction

I.1. Background

1. The Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD) in the Mediterranean was adopted in 1995 under the Barcelona Convention, to provide a regional framework for the conservation and sustainable use of marine and coastal biological diversity in the Mediterranean. Since its adoption a number of strategies, programmes, action plans and roadmaps have been developed to help the Contracting Parties meet their obligations under the Protocol. In 2016, at COP 16, a Roadmap for a Comprehensive Coherent Network of Well-Managed Marine Protected Areas to achieve Aichi Target 11 in the Mediterranean was adopted, and in 2019, a final evaluation of this roadmap was made, where findings and priority actions for marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) post-2020 were presented at COP 21. In response to this, and noting the shortcomings of the region in meeting global 2020 targets for MCPAs, the geographical imbalance, the strong bias regarding the type of ecosystems protected, and the weak management and enforcement, Contracting Parties requested the Mediterranean Action Plan of the United Nations Environment Programme (UNEP/MAP)-Barcelona Convention Secretariat, through its Specially Protected Areas Regional Activity Centre (SPA/RAC), to elaborate an ambitious and transformational post-2020 strategy that would further advance and strengthen the network of MCPAs and OECMs in the Mediterranean, and that is in line with the Post-2020 Global Biodiversity Framework and other regional and global processes (Decision IG.24/6). Central to the transformative approach will be the incorporation and integration of recognized OECMs as a means to achieve the ambitious Post-2020 Global Biodiversity Framework relevant targets.

I.2. Strategy Development

2. This strategy was developed under the leadership of the Specially Protected Areas Regional Activity Centre, the guidance of its Ad hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM), and in consultation with the Contracting Parties SPA/BD Focal Points and Regional and International Organizations active in the Mediterranean over a period of 5 months.

3. A draft strategic framework (strategic pillars, outcomes and outputs), developed in consultation with SPA/RAC and the AGEM members, was presented in a 2-day remote workshop with 51 participants representing National, Regional and International Organizations, as well as Focal Points, individual experts and representatives from academic institutions. During this 2-day workshop the framework was finalized, and a number of key actions identified for each output. Actions were identified at two levels: Contracting Parties level and Regional and International Organization level. Workshop outputs were incorporated into the strategy with participants provided a further opportunity for review.

4. The revised strategy was then presented to the second meeting of AGEM, then to the SPA/BD Focal Points in a remote consultation workshop where comments were incorporated.

5. A second draft Post-2020 Strategy was presented at the Fifteenth Meeting of the SPA/BD Focal Points in June 2021, and subsequently revised.

6. This strategy intends to be further submitted to the Meeting of MAP Focal Points (Teleconference, 10, 13-15 and 17 September 2021) and eventually to COP 22 (Antalya, Turkey, 7-10 December 2021) for consideration.

I.3. Context

7. The Mediterranean Sea is the world largest semi-enclosed sea. It is considered a biodiversity hotspot, representing just 0.3% of the global ocean volume while hosting 4 to 18 % of identified global marine species[1]. In addition to its biodiversity value, the Mediterranean has significant historical, cultural and socio-economic value. The Mediterranean comprises 20% of the global marine product despite representing only 1% of all global oceans[2], is among the world's leading tourism destination[3] and encompasses three major maritime crossings. In addition, fisheries and aquaculture, another very important sector in the Mediterranean's blue economy, is thought to provide direct and indirect employment for at least one million people[4].

8. As a semi-enclosed sea, the Mediterranean is more susceptible to human impacts than more open waters and is one of the world's biomes that shows strong negative responses to land use and climate change pressures[5]. The Mediterranean Sea is already being impacted by climate change at rates exceeding global averages, with more rapid warming during all seasons and a trend towards drier conditions[6]. The Adriatic, Aegean, Levantine and north-east Ionian Seas in particular are amongst the areas currently most impacted by climate change[7].

9. Approximately 80% of marine pollution comes from land-based sources, mainly agriculture, industry, and municipal waste[8]. Marine litter, largely comprising macro and microplastics, is considered one of the main sources of pollution in the Mediterranean Sea. Commercial fishing however has also been recognized as a significant source of litter, particularly discarded fishing gear, such as nets, and fish stock waste[9]. As a major shipping hub, underwater noise and accidental discharges from oil spills and other hazardous substances are also sources of pollution in the region. The high shipping traffic in the Sea presents a further hazard to many marine mammals and the risk of collision between ships and marine mammals is high[10].

10. The Mediterranean is among the most overfished seas in the world[11] with bottom trawling and gill nets extensively used in the region. Bottom trawling is the main pressure facing coralligenous assemblages and accidental bycatch is having a profound impact on a number of species, such as marine turtles and seabirds. Non-indigenous and invasive species (NIS) are also increasingly present in the Mediterranean Sea, with a total of more than 1,199 non-indigenous marine species recorded, of which more than 107 are invasive[12]. The main introduction of non-indigenous species to the Mediterranean, excluding natural migration or in response to climate change impacts, are largely from the shipping industry through ballast water and hull biofouling.

11. MCPAs are widely considered to be one of the key tools to preserving and restoring biodiversity and regular functioning of marine ecosystems[13]. A healthy and functioning marine ecosystem is essential to

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[1] Bianchi, C. and Morri, C. 2000. Marine Biodiversity of the Mediterranean Sea: Situation, Problems and Prospects for Future Research. Marine Pollution Bulletin, 40 (5): 367-376. https://doi.org/10.1016/S0025-326X(00)00027-8.
[2] Randone et al. 2017. Reviving the economy of the Mediterranean Sea: Actions for a Sustainable Future. WWF Marine Initiative, Rome, Italy
[3] UNWTO 2015. Mediterranean trends. 2015 edition
[4] UNEP/MAP and Plan Bleu 2020. State of the Environment and Development in the Mediterranean. Nairobi
[5] Newbold, T., Oppenheimer, P., Etard, A. et al. 2020. Tropical and Mediterranean biodiversity is disproportionately sensitive to land-use and climate change. Natural Ecology and Evolution, 4: 1630–1638. https://doi.org/10.1038/s41559-020-01303-0
[6] UNEP/MAP and Plan Bleu 2020. State of the Environment and Development in the Mediterranean. Nairobi
[7] MedECC 2020. Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the Future. First Mediterranean Assessment Report [Cramer, W., Guiot, J., Marini, K. (eds.)] Union for the Mediterranean, Plan Bleu, UNEP/MAP, Marseille, France, 600pp, in press
[8] Hildering, A., Keessen, A.M. & van Rijswick, F.M.W. 2009. Tackling pollution of the Mediterranean Sea from land-based sources by an integrated ecosystem approach and the use of the combined international and European legal regimes. Utrecht Law Review, 5(1), 80.
[9] UNEP-MAP-RAC/SPA. 2015. Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea. Dark Habitats Action Plan. Ed. RAC/SPA, Tunis
[10] IUCN 2012. Marine Mammals and Sea Turtles of the Mediterranean and Black Seas. Gland, Switzerland and Malaga, Spain: IUCN
[11] FAO. 2020. The State of Mediterranean and Black Sea Fisheries 2020. General Fisheries Commission for the Mediterranean. Rome
[12] UNEP/MAP, 2020, Status of NIS in the Mediterranean and Roadmap for the Elaboration of Baseline at National and Regional Levels. Integrated Meetings of the Ecosystem Approach Correspondence Groups on IMAP Implementation (CORMONs), Videoconference, 1-3 December 2020. UNEP/MED WG.482/Inf.6. 8 p
[13] Claudet, J., Loiseau, C., Sostres, M. & Zupan, M. 2020, Underprotected Marine Protected Areas in a Global Biodiversity Hotspot. One Earth 2, 380–384

provide food security, jobs, climate regulation and human wellbeing, and therefore for achieving the Sustainable Development Goals (SDGs). The important role MCPAs play in helping Contracting Parties to meet national, regional and global commitments is well recognized. Mediterranean countries propose the enlargement of the marine protected area network, setting up ecological corridors to prevent genetic isolation and to allow for species migration, while making it more representative of the Mediterranean Sea ecoregions, particularly extending to the Southern and Eastern coasts. Incorporating Other Effective Area Based Conservation Measures (OECMs), in line with the CBD criteria, such as protected cultural areas, and military zones and expanding into the open seas through Fisheries Restricted Areas (FRAs of GFCM) and candidate areas in Vulnerable Marine Ecosystems (VME of FAO), Particularly Sea Sensitive Areas (PSSAs of IMO) while favouring their setting within Ecologically or Biologically Significant Marine Areas (EBSAs listed in the CBD repository), are also proposed.

I.4. The value of MCPAs and OECMs

12. Biodiversity loss and environmental degradation are considered two of the most significant threats to the global economy over the next decade[14]. Nature-based Solutions (NbS) are defined as "*actions that protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively simultaneously providing human well-being and biodiversity benefits*[15]". MCPAs and OECMs offer nature-based solutions to support global efforts towards climate change adaptation and mitigation. They preserve marine biodiversity, enable marine ecosystems to act as heat and carbon pumps, strengthen their resilience to global warming and help to combat acidification. *Posidonia oceanica* meadows in particular, are an important carbon sink and buffer against sea acidification and MPCAs play a very important role in protecting this vulnerable habitat. MCPAs can also protect important coastal habitats by acting as natural barriers to the impacts of climatic hazards through ensuring the effective functioning of the land-sea interface, and by being nature-based solutions for mitigating extreme events, thereby reducing coastal erosion and flood regulation.

13. MCPAs and OECMs also play a critical role in sustainable blue economic growth by restoring and enhancing the value of the Mediterranean's natural capital on which many sectors depend. Strategically designed MCPAs have shown to increase fish yield via spillover of larvae and adults[16]. It is thought that if 30% of the Mediterranean is effectively conserved, the biomass of predatory and large pelagic fish species will show a noticeable increase[17]. In addition, MCPAs with high levels of enforcement, among other attributes, have demonstrated healthier fish stocks in their buffer zones, and as a result the incomes of fishers were higher[18]. Well-managed MCPAs and OECMs that maintain healthy biodiversity and ecosystems are also an important driver of tourism demand - another significant industry in the region.

I.5. Current status of MCPAs and OECMs in the region

14. There are currently 1,126 MCPAs in the Mediterranean Sea covering 209 303 km² (8.3%), including only 0.06% of strictly protected areas. There are no OECMs reported for the Mediterranean to date, however combining areas that could be potential OECMs (i.e. 1 Particularly Sensitive Sea Area and 8 Fisheries Restricted Areas) the total MCPA and potential OECM coverage currently stands at 9.3% of the Mediterranean Sea. Although good progress has been made, with some countries exceeding, meeting, or very close to the 10% by 2020 (Aichi target 11), the region as a whole fell short. Figure 1 clearly shows a large disparity in MCPA coverage between countries, with the majority of MCPAs occurring in the western Mediterranean Sea and 90.05% occurring in EU waters[19]. In addition to geographical representation, there is also uneven distribution of MPAs according to sea depth, with less than 4% of depths greater than 1000 m covered by MPAs. As the region now faces new targets, not only

[14] World Economic Forum 2021. Global risk report 2021 16th edition
[15] WCC-2016-Res-069-EN. Defining Nature-based Solutions. IUCN, World Conservation Congress Hawaii
[16] Cabral et al. 2020. A global network of marine protected areas for food. PNAS 117 (45).
[17] WWF 2021. 30 BY 30: Scenarios to recover biodiversity and rebuild fish stocks in the Mediterranean
[18] Di Franco et al. 2016. Five key attributes can increase marine protected areas performance for small-scale fisheries management. Scientific Reports, volume 6, Article number: 38135
[19] https://medpan.org/marine-protected-areas/mediterranean-mpas/

is coverage expected to increase, but it is essential that coverage is more equitably represented across Contracting Parties and the different ecosystems.

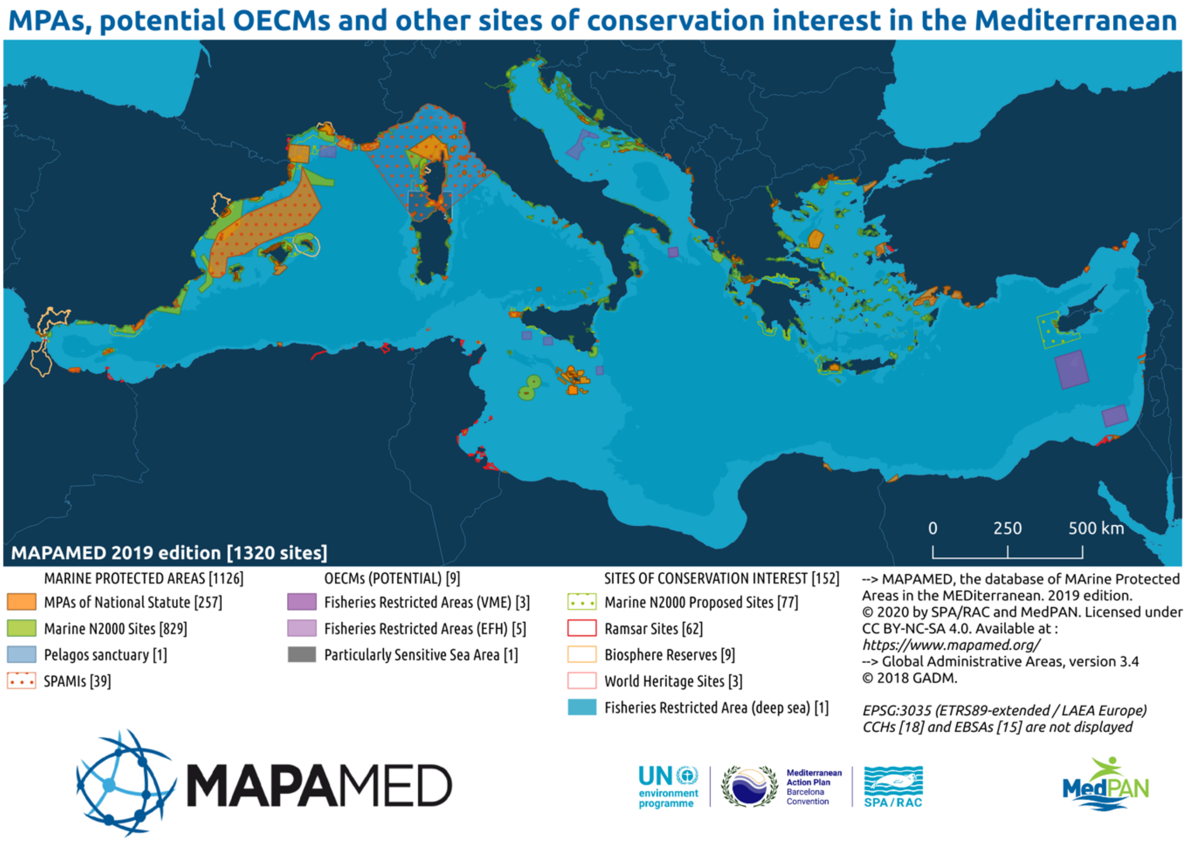


Figure 1. Map showing MPA coverage in the Mediterranean[20]

15. In addition to coverage, previous and current targets (Post-2020 Global Biodiversity Framework) for protected areas stipulate that systems of protected areas (PAs) and OECMs must be effectively managed. Several surveys have been conducted over the years[21] to assess management effectiveness and to identify barriers and limiting factors for the establishment and management of MCPAs, however few MCPAs and systems of MCPAs complete regular evaluations of management effectiveness. The surveys and country assessments revealed a number of cross-cutting barriers to the effective management of MCPAs (table 1). Ensuring political will and support for the establishment and management of MCPAs and OECMs is one of the most crucial elements to overcome the remaining barriers in order to meet 2030 targets for MCPAs and OECMs in the region.

[20] MAPAMED, the database of MArine Protected Areas in the MEDiterranean. 2019 edition. © 2020 by SPA/RAC and MedPAN. Licensed under CC BY-NC-SA 4.0

[21] A survey launched by SPA/RAC and MedPAN, in 2015, for the 2016 MPA status report (MedPAN and SPA/RAC, 2019. The 2016 status of Marine Protected Areas in the Mediterranean. By Meola B. and Webster C. Ed SPA/RAC & MedPAN. Tunis 222 pages.); a survey launched by MedPAN, in 2019, about MPA management and enforcement; and a survey launched by SPA/RAC, MedPAN and WWF, in 2020, to prioritise the limiting factors hindering the achievement of MPA objectives, in the framework of the 2020 MPA Forum process and its related post-2020 MPA roadmap development.

Table 1: *Main Barriers to effective MCPA management*

- **Lack of Political Will and Support**

For MPA establishment and management

- **Insufficient Financing**

Not enough, not sustainable, heavy reliance on external funds

- **Inadequate Human Resources**

Not enough MPA staff, where staff are occurring, many do not have the necessary technical skills for MPA management

- **Lack of Sectoral and Stakeholder Involvement, Cooperation and Support**

Poor coherence and harmonization of policies plans and actions

- **Insufficient Knowledge**

Knowledge gaps for effective decision-making

- **Lack of Management Plans**

- **Inadequate Surveillance and Enforcement**

Unclear procedures in legislation, lack of by-laws, poor cooperation with enforcement agencies, irregular routine patrols, unclear mandates and responsibilities for enforcement

- **Insufficient Monitoring and Evaluation**

Insufficient and inadequate monitoring of management effectiveness, insufficient biodiversity and biological monitoring

I.6. Other Effective Area-based Conservation Measures

16. As mentioned previously, the Mediterranean Sea does not currently have any formally recognized OECMs. OECMs will be an essential tool to help Contracting Parties achieve their global and also regional targets for biodiversity conservation under the Barcelona Convention, and to recognize the effort of other sectors in mainstreaming biodiversity conservation into sustainable development. As an increasingly important tool to help Contracting Parties meet these targets and, given the lack of experience across the region in recognizing OECMs in the marine and coastal environment, it is necessary to provide clear guidance and to harmonize the recognition of OECMs across the Contracting Parties. As such, OECMs have been identified as a key strategic pillar (chapter 2) to help Contracting Parties achieve relevant targets of the Global Biodiversity Framework in the Mediterranean Sea. OECMs are defined as-:

> A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the *in situ* conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values. (CBD 2018).

17. OECMs provide a means for more formal recognition of important areas for biodiversity beyond MCPAs. A key difference between MCPAs and OECMs is that protected areas have a primary conservation objective, whereas OECMs deliver effective conservation of biodiversity regardless of

their objectives and their types of governance[22]. In 2018, at their 14th Conference, Contracting Parties to the CBD agreed on a definition, guiding principles, common characteristics, and criteria for the identification of OECMs (Decision 14/8). The CBD decision however highlights that the criteria should be applied "*in a flexible way and on a case-by-case basis*".

18. The adoption of the definition and the criteria creates opportunities for Contracting Parties to the Barcelona Convention to begin to recognize and report on OECMs, which, as mentioned, will likely be necessary if the region is to meet the ambitious Post-2020 Global Biodiversity Framework. Further, the process of identifying OECMs also provides opportunities to bring together the Fisheries and Conservation sectors, both at national and regional levels, with the possibility of fishery-related OECMs helping to achieve both General Fisheries Commission for the Mediterranean (GFCM) and Barcelona Convention objectives. Although no marine OECMs are currently reported for the region, terrestrial OECMs have been recognized and reported in countries within and outside the Mediterranean region. This presents an opportunity for Contracting Parties to learn from the experience gained by these countries in applying the CBD criteria. The following provides a non-exhaustive list of the types of areas that could be potential OECMs in the Mediterranean:

- Fisheries Restricted Areas (FRAs)[23], in particular those that host critical species, and those that are permanently restricted so as to enhance the long-term conservation outcomes
- Marine or coastal military closure areas, as some are often no go-areas and can have good conservation outcomes[24]
- Archaeological and cultural heritage[25] (sunken ships, archaeological shipwrecks, underwater ancient remains, cities, etc.)
- Areas with oil and gas restrictions
- Areas managed for navigation purposes such as IMO Particularly Sensitive Sea Areas.

II. Strategy

19. Protected areas are considered the cornerstone of biodiversity conservation. Marine and coastal protected areas (MCPAs) are being increasingly recognized as one of the most effective management and conservation tools to help mitigate the global trends in marine and coastal ecosystem degradation and biodiversity loss. In addition to providing biodiversity and ecosystem service benefits, MCPAs and OECMs are also critical tools in helping countries meet their Sustainable Development Goals (SGDs) and Nationally Determined Contributions (NDCs) through the protection and restoration of natural capital. Despite this, their immense socio-economic and cultural values, as well as their role as nature-based solutions, are often poorly understood and underappreciated.

20. The Convention on Biological Diversity (CBD) is the most important international legal instrument addressing protected areas. The [zero draft of the] Post-2020 Global Biodiversity Framework (GBF) [CBD, August 2020] represents a new era for biodiversity conservation, with new goals and targets [currently being developed by the Contracting Parties to the CBD]. The target for protected areas (target 2) [currently under review] has set out an ambitious target to: "*By 2030, protect and conserve through well connected and effective systems of protected areas and other effective area-based conservation measures at least 30 per cent of the planet with the focus on areas particularly important for biodiversity*". It is recognized that each individual country will have its own specific MCPA and OECM coverage targets, however in keeping with these global targets for protected areas, the post-2020 target

[22] IUCN/WCPA 2020. Potential contribution of "Other-effective area-based conservation measures" to achieving Aichi Target 11 in Southern and Eastern Mediterranean countries. IUCN Gland, Switzerland and Malaga, Spain. IUCN 20 pp
[23] A Fisheries Restricted Area (FRA) is a geographically defined area in which some specific fishing activities are temporarily or permanently banned or restricted in order to improve the exploitation patterns and conservation of specific stocks as well as of habitats and deep-sea ecosystems
[24] Note: some areas may be for weapon testing and could have impacts on ecosystems.
[25] Note: the location of these areas may be sensitive to share publicly due to risks of looting and illegal trade.

for Mediterranean MCPAs and OECMs across the region as a whole [which could be amended as the draft Post-2020 GBF progresses] has been identified as:

By 2030, at least [30] per cent of the Mediterranean Sea is protected and conserved through well connected, ecologically representative and effective[26] systems of marine and coastal protected areas and other effective area-based conservation measures, ensuring adequate geographical balance, with the focus on areas particularly important for biodiversity.

21. In addition, and in keeping with the regional marine conservation community recommendations (2%- The 2016 Forum of MPAs in the Mediterranean, Tangier declaration) and sub-regional targets (10%- EU Biodiversity Strategy) for enhanced levels of protection, a further regional sub-target has been identified:

By 2030, the number and coverage of marine and coastal protected areas with enhanced protection levels is increased, contributing to the recovery of marine ecosystems.

22. In order to achieve these ambitious targets, Contracting Parties and the region require transformative actions over the next decade, with an increasing role for OECMs. This Strategy therefore has identified five main strategic pillars necessary to achieve the post-2020 target for Mediterranean MCPAs and OECMs. These are: Governance, MCPA network expansion, OECMs, MCPA management effectiveness, and Government and stakeholder action and support. All of the pillars are inextricably linked and there are several cross-cutting outputs. For example, sustainable financing and enhanced cooperation between sectors, MCPA networks, stakeholders, countries and the region, are necessary for all five pillars. This strategy is aligned with a number of relevant international, regional and sub-regional strategies and policies (Appendix 1).

23. Under each pillar a clear strategic outcome, with corresponding outputs and proposed key actions at both Contracting Party, and Regional and International Organization levels, has been identified. Recognizing that countries are at different stages with regard to the establishment and management of their MCPAs, the proposed actions under each output therefore are meant to be indicative and not prescriptive.

24. This chapter presents each strategic pillar separately and provides a brief rationale and overview of the main focus for each of these five pillars.

II.1 Strategic Pillar 1: MCPA and OECM Governance

Strategic Outcome 1:
Governance arrangements for MCPAs and OECMs are inclusive and effective in delivering conservation and livelihood outcomes

25. Strengthening governance and co-operation among actors for both the establishment and management of MCPAs is essential if 2030 targets are to be achieved. Effective governance establishes the overarching framework for MCPA establishment and the management to follow. Governance[27] is multi-faceted and considers not only which body or institution has authority over MCPAs, but also who makes decisions and how these decisions are made. MCPA-relevant legislation is relatively strong across the region however a number of gaps have been identified. These gaps largely centre around procedures for enforcement of both national legislation and local by-laws, overlapping or conflicting policies across

[26] Effective systems are understood to comprise the four components identified by the IUCN Green List standards: Good governance; sound design and planning, management effectiveness and achieving conservation outcomes. https://iucngreenlist.org/
[27] Governance is "the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken and how citizens or other stakeholders have their say" (Borrini-Feyerabend et al. 2013)

the different sectors for MCPA governance within and outside MCPAs, and poor legislation for promoting/supporting participatory and delegated management of MCPAs. Several countries also report a need for institutional reform, especially to avoid overlap in cases where different authorities are responsible for the country's protected areas. There is a need therefore to ensure that appropriate legislation and institutional frameworks are in place for the establishment and management of MCPAs (output 1.1) and that MCPAs are integrated into countries' SDGs and NDCs, and that, as per best practices, governance models include equitable and effective participation of stakeholders (output 1.2).

26. It is recognized that MCPAs cannot be managed in isolation and stakeholders must be involved at all levels. There is a need therefore for MCPAs to be integrated, recognized and engaged in the governance of surrounding territories, and that inter-sectoral co-operation, policy and action harmonization is improved (output 1.3). Lastly, recognizing that decisions can change in response to changes in political, social and environmental conditions, it is important to ensure that there is flexibility in planning and management frameworks to adapt to these changes (output 1.4).

Table 2: *Key outputs and proposed actions for outcome 1*

Output 1.1: Legal frameworks and institutional arrangements of MCPAs and OECMs allow for opportunities for participatory management
Contracting Parties
A.1.1.1 Assess current relevant legislation and institutional arrangements to allow for participatory management and identify any gaps or areas which need revision, paying particular attention to national and local regulations and participatory mechanisms
A.1.1.2 Develop appropriate governance frameworks to integrate MCPA strategy goals and policies into other sectors' policies
A.1.1.3 Establish, as appropriate, a readily accessible process to identify, hear and resolve complaints, disputes or grievances related to the governance or management of MCPAs and OECMs, or tackle this through already existing processes such as appeals and tribunals.
A.1.1.4 Develop national MCPA and OECM system strategies, standalone or as part of relevant national strategies, with clearly identified monitoring frameworks for system expansion and management
Regional/International Organizations
A.1.1.5 Provide tailored assistance to Contracting Parties for strengthening appropriate legal and institutional frameworks as required
A.1.1.6 Support the development and implementation of national MCPA and OECM system strategies, including when relevant, transboundary and sub-regional MCPA and OECM systems and action plans
Output 1.2: Governance arrangements for MCPAs and OECMs are inclusive and equitable
Contracting Parties
A.1.2.1 Adapt governance structures and mechanisms of MCPAs to provide civil society, stakeholders and rights-holders with appropriate opportunities to participate in management planning, decision-making processes and actions
A.1.2.2 Where appropriate, create a national commission for MCPAs and marine conservation comprising government and non-government stakeholders including the private sector
A.1.2.3 Enhance governance arrangements to advance gender equity in and around MCPAs and OECMs
Regional/International Organizations
A.1.2.4 Provide case studies and guidelines for best practices on co-management and participatory governance arrangements and support their replication and scaling-up
A.1.2.5 Promote the prerequisite for co-management as an eligibility criterion for regional and national MCPA financing institutions
A.1.2.6 Enhance opportunities for building capacity of national and local stakeholders in co-management
Output 1.3: National, regional, transboundary and cross sectoral co-operation for the establishment and management of MCPAs and OECMs are strengthened
Contracting Parties
A.1.3.1 Establish cross-sectoral platforms to improve integrated marine spatial planning and co-ordination and to enhance dialogue between MCPAs and other sectors

A.1.3.2 Enhance transboundary co-operation for the identification of new priority areas of conservation and for the establishment and management of MCPAs
Regional/International Organizations
A.1.3.3 Facilitate regional and transboundary co-operation
A.1.3.4 Support sharing of experiences and best practices between Mediterranean countries
A.1.3.5 Strengthen and support existing national, regional and sub-regional networks of MCPA managers and other stakeholders
A.1.3.6 Facilitate exchanges among similar types of MCPAs such as the previous SPA/RAC's SPAMI Twinning Programme, and build capacity for MCPAs and OECMs' establishment and management across countries
Output 1.4: Adaptive planning and management frameworks of MCPAs and OECMs that anticipate, learn from and respond to changes in decision-making are strengthened
Contracting Parties
A.1.4.1 Ensure flexible and responsive institutional frameworks for governance, management and finance
A.1.4.2 Raise awareness and promote the use of MCPAs/OECMs as reference sites for IMAP within the Barcelona Convention Ecosystem Approach (EcAp) process
A.1.4.3 Ensure appropriate multi-stakeholder feedback mechanisms for the integration of scientifically sound monitoring results and any changes in political, social and environmental conditions into MCPA management plans and actions
Regional/International Organizations
A.1.4.4 Follow progress of the BBNJ negotiations and ensure integration of its implementation in the Mediterranean context
A.1.4.5 Support Contracting Parties' disaster and emergency responses to natural hazards, human-made disasters and future pandemics by sharing experiences, human and other resources across the MCPA and OECM systems as necessary

II.2. Strategic Pillar 2: MCPA Network Expansion

Strategic Outcome 2:
MCPA coverage increased through the expansion of soundly-designed, ecologically representative and well-connected systems of MCPAs

27. MCPA coverage in the Mediterranean Sea currently stands at 8.3%[28]. This figure alone however does not illustrate the uneven distribution of MCPAs across the region. There are disproportionately more MCPAs occurring in the western Mediterranean sub-region compared to other sub-regions, significantly more MCPAs occurring in northern Mediterranean countries' waters compared to southern and eastern Mediterranean countries, and the majority of MCPAs occur in shallow waters close to the coast. It is evident that in order for Contracting Parties to advance towards the [30]% target, a more strategic approach to establishing MCPAs is needed, so that there is more equal representation of MCPAs across the Mediterranean Sea sub-regions and ecosystems.

28. A first step in applying a more strategic approach to the establishment of MCPAs is to ensure that areas important for biodiversity and ecosystem services and their planned level of protection are clearly identified across the region (output 2.1), and that Contracting Parties with particularly low MCPA coverage, such as the southern and eastern Mediterranean countries, are supported to establish soundly designed MCPAs across these priority areas (output 2.2). MCPAs are also poorly represented in areas beyond national jurisdiction and, particularly as threats continue to emerge in these open waters, there is an urgent need for the establishment of soundly designed MCPAs in these areas (output 2.3). Building

[28] MAPAMED, the Mediterranean Marine Protected Areas Database. 2019 Edition. © 2020 by SPA/RAC and MedPAN. Licensed under CC BY-NC-SA 4.0

upon the text for UNCLOS[29], an international legally binding instrument under the Convention for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction, of which measures such as area-based management tools, including marine protected areas, are currently being elaborated[30]. This initiative is expected to provide a more explicit framework for establishing and governing MPAs in areas beyond Exclusive Economic Zones in the future and this strategy will ensure synergy with the elaborated text once finalized.

29. MCPAs with enhanced protection levels, including no-take or no-fishing zones, are also severely underrepresented across the Mediterranean MCPA system, with only 0.06% of the Mediterranean considered strictly protected. In keeping with regional and sub-regional expert recommendations and commitments therefore, output 2.4 identifies a need for increasing the percentage of MCPAs with enhanced protection levels, including no-take zones and other enhanced protection measures, across the Mediterranean Sea.

Table 3: *Key outputs and proposed actions for outcome 2*

Output 2.1: Areas of importance for biodiversity and ecosystem services are identified
Contracting Parties
A.2.1.1 Adequately support the identification of areas of importance for biodiversity and ecosystem services and share information through regional platforms in particular for under-represented ecosystems such as offshore and deep seas
A.2.1.2 Based on a gap analysis, identify and prioritize areas requiring conservation along with their expected level of protection
A.2.1.3 Collaborate with neighbouring countries to promote joint co-ordinated research in ABNJs and to identify potential MCPAs based on harmonized monitoring protocols
A.2.1.4 Develop plan for establishing an ecologically coherent national MCPA system with clear priorities, levels of protection and time-frames, based on priority natural, cultural and landscape values and associated ecosystem services
Regional/International Organizations
A.2.1.5 Provide scientific, logistical and financial support for the identification of important areas based on countries' needs
A.2.1.6 Support the creation of stakeholder meeting/dialogue platforms for proposed MCPAs to obtain appropriate levels of engagement and buy-in from the beginning
Output 2.2: Distribution of MCPA systems across the Mediterranean Sea is balanced
Contracting Parties
A.2.2.1 Contracting Parties with advanced MCPA systems to share experiences and lessons learnt in system design
A.2.2.2 Design and establish a well-connected, soundly designed and effective MCPA system covering all key biodiversity areas, coastal and offshore, based on the best available knowledge and ensuring appropriate engagement of local communities and stakeholders
Regional/International Organizations
A.2.2.3 Provide priority technical, financial and awareness raising support to southern and eastern Mediterranean Contracting Parties to design and establish well-connected, soundly designed and effective MCPA systems
Output 2.3: MCPA coverage in areas beyond national jurisdiction is increased
Contracting Parties
A.2.3.1 Strengthen co-operation between neighbouring States in areas where marine boundaries have not yet been agreed upon, making use of area-based management tools, as relevant
Regional/International Organizations
A.2.3.2 Encourage states to collaborate in establishing transboundary MCPAs to ensure representation of ecosystems beyond their national jurisdiction, as guided by the BBNJ process
A.2.3.3 Assist and support Contracting Parties in the identification of potential transboundary MCPAs and create a platform for initiating and facilitating dialogue
Output 2.4: The number and coverage of MCPAs with enhanced protection levels is increased

[29] The reference made to the United Nations Convention on the Law of the Sea (UNCLOS) should not be interpreted as a change in the legal position of States not party to UNCLOS, nor could it be interpreted as imposing any legally binding obligation on non-party States to UNCLOS.
[30] UN General Assembly Resolution 69/292 and Resolution 72/249

Contracting Parties
A.2.4.1 Establish new MCPAs with enhanced protection levels and review existing MCPAs leading to enhanced protection levels, facilitate their rezoning, and increase protection measures, [in line with the EU Biodiversity Strategy 2030]
A.2.4.2 Document experiences and impacts of MCPAs with enhanced protection levels, including the no-take zones
Regional/International Organizations
A.2.4.3 Provide scientific, logistical and financial support, build capacity and enhance experience sharing for the creation of new MCPAs with enhanced protection levels, including no-take zones
A.2.4.4 Provide tools for monitoring, documenting and communicating impacts of MCPAs with enhanced protection levels

II.3. Strategic Pillar 3: Other Effective Area-based Conservation Measures

Strategic Outcome 3:
Marine and coastal OECMs in the Mediterranean are identified, recognized and reported towards post-2020 global and regional targets

30. OECMs will be a critical tool to help Contracting Parties to the Barcelona Convention meet Post-2020 GBF targets. The Barcelona Convention has an important role to play in facilitating the identification, recognition and reporting of OECMs, but their management and monitoring would generally fall under other sectors and within the mandate of other regional organizations. Therefore, under this strategic pillar, outputs and activities centre around supporting Contracting Parties to identify, recognize and report on OECMs in areas within and beyond their jurisdiction, but not their subsequent management or monitoring.

31. Although no marine OECMs are currently recognized in the region, there has been some experience among Contracting Parties in the recognition of terrestrial OECMs. These present an opportunity for learning and for adapting these to the marine context. Activities under this pillar will therefore focus on supporting Contracting Parties in understanding OECM criteria and ensuring appropriate and harmonized approaches to the application and testing of sites against these criteria (output 3.1). Further guidance and support will be provided for potential and candidate OECM recognition and reporting to relevant regional and global databases (output 3.2).

32. OECMs provide an opportunity to recognize efforts and contributions by other sectors to biodiversity conservation. Some OECMs may host important biodiversity and ecosystem services that would benefit from additional area-based measures to increase their biodiversity outcomes, and should therefore be prioritized in cross-sectoral marine spatial planning[31] (MSP) (output 3.3) so that new OECMs can be established (output 3.4). This is highly relevant to achieving Target 1 of the current GBF but also to achieving the various commitments and initiatives on MSP under the Barcelona Convention.

Table 4: *Key outputs and proposed actions for outcome 3*

Output 3.1: Awareness in Contracting Parties and stakeholders on OECMs enhanced and guidance for the application of OECM criteria provided
Contracting Parties
A.3.1.1 Raise awareness on OECMs across multi-sectoral stakeholders and promote understanding of the CBD criteria[32] for their identification

[31] MSP is a "public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process" (Ehler & Douvere, 2009)
[32] CBD COP Decision 14/8

A.3.1.2 Where appropriate, establish multi-stakeholder platforms and use relevant screening tools to identify potential OECMs
Regional/International Organizations
A.3.1.3 Increase awareness on OECM identification, recognition and reporting across Contracting Parties and key sectors
A.3.1.4 Increase communication and awareness about OECMs and their role in contributing to biodiversity conservation and SDGs across Contracting Parties and sectors
A.3.1.5 Facilitate and initiate inter-sectoral and regional dialogue and sharing experiences around OECMs
A.3.1.6 Develop sectoral and other guidance, such as tools and templates, for applying OECM criteria and establishing processes for identifying OECMs
A.3.1.7 Provide training on the identification of OECMs and the application of OECM criteria
Output 3.2: OECMs identified, recognized and reported to regional and global databases by Contracting Parties and regional organizations
Contracting Parties
A.3.2.1 Engage with the relevant sectors and governance authorities of the potential OECMs identified to encourage and establish processes for a full assessment of the potential OECMs against the CBD criteria
A.3.2.2 Enable assessments of the potential OECMs (identified in output 3.1) against the CBD criteria through a multi-stakeholder process and following relevant guidelines, and recognize OECMs that meet the CBD criteria, ensuring consent by the governing authorities of the areas
A.3.2.3 Report OECMs to MAPAMED and WD-OECM databases and ensure regular update of OECM data as new OECMs are identified and provide relevant data for OECM status reports, as part of regular reporting.
Regional/International Organizations
A.3.2.4 Support countries in their efforts to identify, recognize and report OECMs
A.3.2.5 Document and analyze Mediterranean countries' experiences and challenges of applying OECM criteria to marine and coastal areas
A.3.2.6 Relevant regional organizations to assess potential OECMs under their mandate, recognize the areas meeting the CBD criteria as OECMs, and accordingly report them to MAPAMED and WD-OECM
Output 3.3: Effectiveness of identified OECMs is enhanced, including through prioritization in cross-sectoral marine spatial planning
Contracting Parties
A.3.3.1 Initiate and/or advance Marine Spatial Planning (MSP)
A.3.3.2 Prioritize OECMs (alongside MCPAs) in the MSP process and encourage cross-sectoral dialogue to enhance their biodiversity outcomes
A.3.3.3 Encourage OECM governance authorities to include specific biodiversity conservation objectives in OECM management, where needed
Regional/International Organizations
A.3.3.4 Support Contracting Parties in their MSP processes
A.3.3.5 Encourage and assist Contracting Parties to identify potential threats to OECMs from other sectors
A.3.3.6 Facilitate dialogue with other sectors to increase the protection level of identified OECMs
A.3.3.7 Develop best practices and share lessons learnt/success stories on integrating OECMs and MCPAs in marine spatial planning exercises
Output 3.4: New OECMs are established and recognized OECMs expanded
Contracting Parties
A.3.4.1 Engage with the relevant sectors, stakeholders and governance authorities of potential OECMs that partially met the full assessment, to enhance governance, management and/or monitoring of the areas in order to fully meet the OECM criteria and be recognized as OECMs
A.3.4.2 Engage with the relevant sectors and stakeholders to establish new OECMs or expand areas of existing OECMs ensuring compliance with the CBD criteria
Regional/International Organizations
A.3.4.3 Develop guidance for future OECM designation, recognition and reporting
A.3.4.4 Undertake analyses and provide recommendations to Contracting Parties and relevant regional organizations on needs for additional new OECMs

II.4. Strategic Pillar 4: MCPA Management Effectiveness

Strategic Outcome 4:
MCPAs are effectively managed and their conservation outcomes successfully delivered

33. Post-2020 GBF targets go beyond simply increasing coverage of MCPAs and OECMs and require that protected area systems must also be effectively managed. There are a number of MCPAs in the Mediterranean that currently lack management plans, and many of those that have plans are not implementing them effectively, if at all. Management plans should be developed in participation with stakeholders and are a crucial tool in providing clear guidance to both MCPA managers and users alike. There is a clear need therefore to support the development of practical and cost-effective management plans for MCPAs in the region (output 4.1). Although an essential first step, a standalone plan will not increase the management effectiveness of MCPAs, and these plans, once developed, need to be implemented in an effective and cost-efficient manner. Lack of sufficient and sustainable finances and lack of institutional and staff capacity have been identified across all countries as the main barriers for effective management plan implementation. If MCPAs are to be established and managed effectively in the long-term, sufficient and sustainable finances are also required (output 4.2). Many Mediterranean MCPAs in addition have insufficient staff numbers and capacity. Once MCPAs have staff in place, it is essential that there are targeted and regular capacity development and training programmes available. Thus, capacity and training needs specific to MCPAs should be reviewed and regional capacity development programmes supported (output 4.3).

34. A central activity to reduce threats and enhance MCPA management effectiveness is ensuring the effective enforcement of MCPA rules and regulations and promoting compliance among MCPA users (output 4.4.). Strengthening enforcement across MCPAs will require appropriate infrastructure and equipment, and agreed and clearly defined roles, responsibilities and powers identified for all agencies responsible for enforcing MCPA regulations. Since enforcement requires the support of external enforcement agencies, ensuring they are fully aware of MCPA regulations and that guidelines for enforcement procedures are provided will be essential actions under this output.

35. Lastly, routine and regular patrolling and monitoring of illegal activities, ecosystem and biodiversity health and socio-economic benefits is critical to support adaptive management efforts and in turn the effective management of MCPAs. Supporting and harmonizing biodiversity, socio-economic, and threat monitoring methods will help fill the biodiversity and threat status information gaps that exist and provide the information necessary to carry out management effectiveness evaluations (output 4.5). Ensuring there is adequate handling, management, analysis and interpretation of data, and that data is fed back into management, will be key to strengthening the effective management of MCPAs and MCPA systems across the region.

Table 5: *Key outputs and proposed actions for outcome 4*

Output 4.1: All MCPAs have adaptive management plans adopted, effectively implemented and periodically reviewed
Contracting Parties
A.4.1.1 Identify MCPAs where management plans are lacking and ensure that all MCPAs develop integrated conservation and management measures that include MCPA conservation challenges beyond their border, climate change mitigation and adaptation actions, a zoning plan, and site-specific measures for all marine activities
A.4.1.2 Ensure there is a mandatory requirement for all MCPAs to have a management plan that is developed in participation with stakeholders (local and national actors, users and other sectors and ministries)
A.4.1.3 Periodically review, revise and adapt MCPA management plans and actions and ensure plans are effectively implemented, monitored and enforced
Regional/International Organizations
A.4.1.4 Develop guidelines for participatory management planning tools and key components to be included in management plans and support their development by providing small grants and building capacity for management planning
A.4.1.5 Strengthen networks of MCPA managers at national, regional and sub-regional scales to facilitate experience and knowledge sharing regarding management plan development and adoption
A.4.1.6 Encourage national and regional financing tools to include the existence of a management plan for access to funding
Output 4.2: Sufficient and sustainable resources for the establishment and management of MCPAs in the Mediterranean are mobilized
Contracting Parties
A.4.2.1 Build capacity for, and develop sustainable financing plans for MCPAs and national systems of MCPAs, and where appropriate develop business plans
A.4.2.2 Diversify income generation opportunities by MCPAs beyond tourism to ensure greater resilience to the financial impacts of future pandemics, human-made risks or natural hazards
A.4.2.3 Establish national environmental/MCPA financing mechanisms (including trust funds) to increase the ear-marking of finances for MCPAs from national trust funds
A.4.2.4 Establish offset mechanisms[33] for MCPAs establishment including MCPA conservation
A.4.2.5 Include values of MCPAs into natural capital accounting and increase MCPA investments funding as part of National Recovery Plans, if applicable
Regional/International Organizations
A.4.2.6 Support and promote the regional MedFund and national MCPA trust funds to donors
A.4.2.7 Identify opportunities for regional and national MCPA financing mechanisms (e.g. blue carbon, blue bonds, etc.) including in case of emergencies
A.4.2.8 Provide guidance to Contracting Parties and build capacity in MCPA managers for diversified and sustainable financing mechanisms
Output 4.3: Individual and institutional capacity for MCPA management is enhanced
Contracting Parties
A.4.3.1 Carry out capacity development needs' assessments and undertake capacity development programmes for MCPA staff, management authorities and MCPA-related stakeholders
A.4.3.2 Support the establishment and long-term functioning of national networks of MCPA managers to enhance the sharing of experiences
A.4.3.3 Strengthen stakeholder involvement and engagement particularly in conflict prevention and resolution
Regional/International Organizations
A.4.3.4 Support capacity development programmes in meeting MCPA staff training needs across the region and support and strengthen joint training programmes from different regional organizations to target MCPA managers and other relevant stakeholders
A.4.3.5 Support and prioritize national, sub-regional and regional MCPA manager networking, capacity building initiatives, and experience sharing and exchange programmes, in particular between north and south Mediterranean countries

[33] offsets are measurable conservation outcomes designed to compensate for adverse and unavoidable impacts of projects, in addition to prevention and mitigation measures already implemented (https://www.iucn.org/resources/issues-briefs/biodiversity-offsets)

Output 4.4: Surveillance and enforcement in MCPAs are strengthened and ensured, and user compliance is promoted
Contracting Parties
A.4.4.1 Identify and pilot innovative and cost-effective approaches for surveillance control and enforcement including by engaging with the private sector, academics and universities etc., to identify potential emerging technologies (for example drones or VMS for tracking movement of boats)
A.4.4.2 Identify and meet staff, infrastructure and equipment needs for effective surveillance and enforcement
A.4.4.3 Strengthen collaboration and where appropriate establish enforcement inter-agency committees to build awareness and capacity in enforcing MCPA rules and regulations, as well as to jointly develop enforcement procedures with clearly defined roles and responsibilities
A.4.4.4 Raise awareness to improve knowledge of environmental legislation and MCPA regulations at local and national levels, and engage resource users in the decision-making process to increase compliance
Regional/International Organizations
A.4.4.5 Strengthen and support regional co-operation, experience and data sharing between Contracting Parties and other key actors (e.g. networks of environmental prosecutors) for effective surveillance and enforcement
A.4.4.6 Provide technical and financial support to Contracting Parties for the effective surveillance and enforcement of MCPA rules and regulations
A.4.4.7 Provide information on new, emerging and cost-effective technologies and their applications for surveillance
Output 4.5: Monitoring of conservation outcomes and evaluation of management effectiveness are strengthened across the MCPA system
Contracting Parties
A.4.5.1 Establish monitoring programmes and define a set of performance measures and thresholds to evaluate conservation outcomes of MCPAs and systems of MPCAs, including levels of conservation of MCPA values, level and intensity of threats, and achievement of management goals and objectives
A.4.5.2 Adopt standards and undertake regular evaluations of MCPA management effectiveness
A.4.5.3 Ensure data collection methods are environmentally friendly, sustainable, feasible in terms of cost and capacities, reliable, and adaptive
A.4.5.4 Build partnerships with academic institutions, NGOs, and citizen science initiatives, to meeting needs for both monitoring and management effectiveness evaluation and seek out opportunities for increasing stakeholder participation in these activities
A.4.5.5 Establish national information systems and databases and ensure data sharing and data viability
A.4.5.6 Identify potential emerging technologies that could be piloted and used to assist MCPAs with monitoring
Regional/International Organizations
A.4.5.7 Support MCPA contributions to IMAP within the Barcelona Convention Ecosystem Approach (EcAp) process
A.4.5.8 Identify priority information gaps for the region as a whole and promote them widely across academic institutions
A.4.5.9 Identify regional and harmonized biodiversity, socio-economic and threat indicators for MCPAs and establish a data repository
A.4.5.10 Strengthen and support regional co-operation for monitoring and data sharing between Contracting Parties and other MCPA-related stakeholders and institutions
A.4.5.11 Provide information on emerging technologies and their applications for monitoring to Contracting Parties
A.4.5.12 Provide guidance on, and implement a regional approach for evaluating management effectiveness of MCPAs and OECMs
A.4.5.13 Facilitate capacity building across Contracting Parties for the implementation of MCPA management effectiveness assessments, including on the socio-economic aspects

II.5. Strategic Pillar 5: Government and Stakeholder Action and Support

Strategic Outcome 5:
Actions and support for MCPAs and OECMs are mobilized

36. The central aim of this outcome is to initiate change in behaviour across the different sectors, to move away from business-as-usual and to have MCPAs and OECMs valued as essential elements to achieve national agendas. Output 5.1 therefore aims to increase understanding and appreciation of the values of, and threats to, MCPAs and OECMs across government and non-government stakeholders, the private sector, the youth and wider society. Key actions under this output will centre around the development of a communication and awareness strategy targeting the different groups though a variety of mechanisms, including workshops, publications and other awareness creating activities. The socio-economic values of MCPAs and the impact of poorly managed MCPAs on these socio-economic values should be a major focus of these activities in addition to their biodiversity values and threats. It is important that harmonization of communication and awareness messages occur across the region, and that positive, non-technical language and wording are used to convey key MCPA-related terms and concepts to local actors and other key stakeholders. In addition to communicating messages and information, encouraging the greater involvement of stakeholders in management activities can also promote more positive attitudes towards MCPAs, which is an important driver for initiating change and enhancing support.

37. A major barrier to achieving the 2020 target for MCPAs has been the lack of political will to establish MCPAs and to support MCPA management. Without political will and support, Contracting Parties will not be able to achieve the new Post-2020 GBF targets for MCPAs and OECMs. Critical to securing government support will be advancing their recognition of the value and importance of MCPAs and OECMs in contributing to achieving national and international commitments as well as their contribution to the national economy. There is a need therefore to establishing strong communication channels between MCPA management and governments and to reinforce networking and co-operation between governmental and non-governmental stakeholders at local, national and Mediterranean levels. Further, ensuring governments are familiar with their MCPAs, the biodiversity they protect, their economic importance, and their importance as nature-based solutions for meeting SDGs and national climate change agendas, will be a key focus of actions under this output (output 5.2).

38. Stakeholders often perceive MCPAs to be in direct competition with their own needs. Ensuring that the wider society recognizes the functional and supportive role that MCPAs and OECMs play in helping to achieve other non-biodiversity conservation agendas, and their socio-economic value, especially through opportunities for sustainable livelihoods, will be critical to mobilizing action and support across the different sectors and wider society (output 5.3). There is a need therefore to strengthen cross-sectoral partnerships and collaboration in order to recognize MCPAs and OECMs values and their contribution to achieving countries' SDGs and NDCs. Studies and success stories demonstrating the tangible benefits of MCPAs and OECMs to these sectors need to be shared, and the benefits of MCPAs and OECMs to livelihoods and ecosystem service protection must be enhanced, understood and valued in the wider society.

Table 6: *Key outputs and proposed actions for outcome 5*

Output 5.1: Awareness, understanding and appreciation of the values of, and threats to, MCPAs and OECMs across government and non-government stakeholders, the private sector, the youth and wider society
Contracting Parties
A.5.1.1 Develop a national communication and awareness strategy tailored to each intended audience on MCPAs/OECMs focusing on the ecological, cultural and socio-economic values of MCPAs and the impact of poorly managed MCPAs/OECMs to these values
A 5.1.2 Establish a national online repository accessible to stakeholders and the general public for accessing information and updates on marine ecosystems and MCPAs/OECMs
A.5.1.3 Seek out opportunities for increasing exposure of MCPAs/OECMs and the marine environment on national media outlets (TV, radio, newspapers, social media)
A.5.1.4 Provide concrete examples of successful MCPAs, in particular no-take zones, providing ecological and socio-economic benefits to local actors and how they contribute to the national economy and GDP, as well as towards other national policies and agendas
A.5.1.5 Promote further research on the financial impacts of unhealthy marine ecosystems on the national economy, socio-economic benefits and other sectors and compare with costs for MCPA and OECM protection
A.5.1.6 Engage in in-country consultations with local and national stakeholders about the environmental and socio-economic effects of MCPAs with enhanced protection levels
Regional/International Organizations
A.5.1.7 Promote a regional approach to communication and environmental education regarding the marine environment and MCPAs/OECMs ensuring harmonization of wording and messages
A.5.1.8 Gather and share success stories of MCPAs providing social, cultural and economic benefits to local stakeholders and the private sector and the negative financial impacts of a degraded marine environment
A.5.1.9 Develop and disseminate regional communication and awareness publication materials for use across Contracting Parties
Output 5.2: Political support for the establishment and management of MCPAs and biodiversity conservation is increased
Contracting Parties
A.5.2.1 Increase awareness and appreciation of the wider reaching values, in particular climate adaptation and socio-economic contribution of MCPAs, across the different ministries
A.5.2.2 Provide concrete examples of the contribution of the countries MCPA network to wider society and the national economy
A.5.2.3 Reinforce knowledge sharing and networking links between government and MCPAs
A.5.2.4 Ensure key decision makers are familiar with national MCPA networks, by supporting familiarization trips and develop opportunities for interactions between government and field actors and recognition of efforts towards MCPAs
A.5.2.5 Establish and encourage Public-Private Partnerships
Regional/International Organizations
A.5.2.6 Facilitate higher level government decision-makers field trips to successful MCPAs across the region, in particular for Contracting Parties with low MCPA representation or where political support is significantly lacking
A.5.2.7 Strengthen information and capacity for benefit assessments of MCPA's ecosystem services
Output 5.3: The contribution of MPCAs and OECMs to sustainable development goals, the blue economy, climate change mitigation and adaptation, and the wider society are recognized and accounted for
Contracting Parties
A.5.3.1 Enhance knowledge of the role of MCPAs and promote the inclusion of MCPA initiatives in NDCs and other climate-related programmes and funding
A.5.3.2 Initiate pilot projects that demonstrate sustainable blue economy growth in line with MCPA/OECM objectives
A.5.3.3 Encourage further studies on the values of MCPAs/OECMs to the sustainable blue economy, local livelihood and climate change mitigation and adaptation and other SDGs, and widely disseminate findings to the wider society using various media
A.5.3.4 Promote the use of MCPAs as sentinel sites for climate change monitoring

Regional/International Organizations
A.5.3.6 Provide cases studies and best practices for scaling up benefits of MCPAs to wider society
A.5.3.7 Enhance collaboration between regional organizations supporting MCPAs and OECMs and other platforms on SDGs, blue economy, and climate change mitigation and adaptation
A.5.3.8 Provide guidance on using MCPAs and OECMs as nature-based solutions to contribute to climate change and SDGs building on success stories, case studies and exchanges, at a regional level

III. Strategy implementation

III.1. Implementation

39. This Post-2020 Strategy should be used as a tool to harmonize efforts to meet 2030 targets for MCPAs and OECMs in the Mediterranean and to promote joint activities by Contracting Parties, SPA/RAC, and other Regional and International Organizations and programmes. As such, the implementation of this strategy should be a co-operative process and its successful implementation will depend on the effective participation and collaboration of local, national, sub-regional, and regional stakeholders, encompassing inter-governmental agencies, local communities, civil society, the private sector, the research/academic community, MPA networks, and relevant Regional and International Organizations.

40. Under the direction of the UNEP/MAP and the supervision of the MAP co-ordinating Unit (MAP CU), SPA/RAC, supported by the AGEM, will undertake a central role in co-ordinating and facilitating the delivery of the strategic outcomes. The main role of SPA/RAC will be to provide technical assistance and support to the Barcelona Convention Contracting Parties, to foster collaboration, strengthen synergies and joint efforts between the different implementing partners, as well as other MAP regional activity centres, to contribute in mobilizing resources for strategy implementation, to support and strengthen existing relevant regional initiatives, and to ensure that awareness of the strategy is raised, and progress towards outcomes are regularly communicated among all key actors engaged with MCPA- and OECM-related activities in the Mediterranean.

41. The overall success of this strategy, however, relies on the political will of Contracting Parties for its implementation. Contracting Parties will be responsible for the delivery of indicative actions at the national and local levels and for creating the enabling conditions for fostering the effective collaboration and active participation of national and local stakeholders, including socio-economic sectors. Key socio-economic sectors and industries include spatial planning, fisheries, tourism, culture, shipping, oil and gas, trade and industry, agriculture, education, research, social affairs, economic, local small, medium and large enterprises and multinationals. Implementation of strategic actions will also require transboundary cooperation between the Contracting Parties.

42. Although shouldering the main responsibilities for strategy implementation, Contracting Parties and SPA/RAC will depend on crucial partnerships and technical, logistical and financial support from National, Regional and International Organizations that are active in marine biodiversity conservation and MCPAs/OECMs in the Mediterranean. The efforts of these organizations to share best practices, build capacity, co-finance activities and advise on new tools and approaches will be critical. In addition, and although not directly responsible for implementation, the inclusive, equitable and meaningful co-operation, collaboration and participation of local communities, civil society, the general public and other sectors, an overarching principle central to all five strategic pillars, will be essential to successfully achieving the targets of this Post-2020 Strategy.

43. Lastly, in order to recognize and report marine OECMs as a relatively new concept for the region, effective inter-sectoral dialogue and co-operation will be essential to successfully achieve this particular outcome. Therefore, engagement with stakeholders involved in countries' MSP processes, as well as the General Fisheries Commission for the Mediterranean, will be important.

III.2. Financing

44. Mobilizing sufficient and sustainable finances for the establishment and management of MCPAs and OECMs at both national and regional levels is a key output under this strategy. Additional and substantial financing will be required however to implement the national and regional actions identified under this strategy. The development of this strategy provides an opportunity for enhanced regional co-operation, the harmonization of activities and the avoidance of duplication of effort across organizations, thereby increasing overall cost-efficiency through the co-financing and joint implementation of overlapping interests from Regional and International Organizations. The strategy also provides clearly identified actions for implementation, aspects of which can be packaged and presented to potential donors targeting specific and individual mandates by each donor agency. The adoption of this strategy by the Contracting Parties to the Barcelona Convention will further create opportunities for funding by demonstrating Contracting Parties' commitments to the outputs identified, making it more attractive to potential regional and international trust funds and donors such as The MedFund, EU, and the GEF, for example. Countries and MPA actors are encouraged to identify and use innovative, diversified and sustainable financing mechanisms, that suit best their context, at national and local levels.

III.3. Monitoring and Evaluation

45. Adaptive management is an important guiding principle for this strategy. It is essential that as the Post-2020 Global Biodiversity Framework targets evolve, and as knowledge and circumstances change, that the plan is responsive and is adapted accordingly. Conducting periodic reviews that allow for learning and adaption of actions as necessary will be important to ensure 2030 targets for MCPAs and OECMs in the Mediterranean are met. The Directory of Mediterranean Specially Protected Areas (SPAs) could serve as a tool recognized by the countries to report and measure the progress towards the targets of the post-2020 strategy.

46. An external mid-term evaluation of the strategy should be conducted in 2026. The mid-term evaluation should focus on evaluating progress against indicators and on providing recommendations for any necessary changes required to increase the likelihood of achieving the strategy's post-2020 targets. Mid-term review findings and proposed amendments should be presented at the 2027 subsequent COP meeting of the Barcelona Convention, and an effective communication and awareness strategy should be developed to disseminate findings among Contracting Parties and National, Regional and International Organization and stakeholders. A final external evaluation should also be conducted towards the end of the strategy's timeframe, focusing on lessons learnt and any barriers or enabling factors that either prevented or enhanced the achievement of the proposed outcomes. The final evaluation (to be conducted in 2030) and its recommendations should assist with the development, in 2031, of a new strategy for the post-2030 decade (2031-2040) and findings should be presented at the 2031 COP meeting and distributed to the wider stakeholder community.

47. To ensure the necessary time to identify practical indicators, a detailed monitoring framework with indicators and targets will be developed in line with the global biodiversity one, under the guidance of the Contracting Parties and with the support of AGEM, once the strategy is adopted at the next COP meeting. This detailed monitoring framework will be then submitted for adoption at the following COP meeting.

Appendix 1: Linkages with other global, regional and sub-regional strategies

Other strategies	Post-2020 Strategy MCPAs and OECMs
International	
Zero draft Post-2020 Global Biodiversity Framework	Target 1& 2, 7, 10, 11 *All outcomes*
Sustainable Development Goals	SDG 14.1 *outcome 1 &5*; SDG 14.2 *outcome 4*; SDG 14.3 *outcome 1 &5*; SDG 14.4 *outcome 2,3 &* 4; SDG 14.5 *outcome 2*; SDG 14.7 *outcome 4;* SDG 14.c *output 2.;* SDG 12.2 *all outcomes*; SDG 12.8 *output 5.1;* SDG 13.1 *outcome 1 & 5*
Convention of the Law of the Sea	Output 2.3
Regional	
UNEP/MAP Mid-Term Strategy 2016-2021	SO 3.1 *all outcomes*; IKO 1.1.4 *output 5.2*; SO 1.6 *output 5.1*; SO 2.6 *output 1.3*; IKO 3.2.2/3 *output 3.1&3.2*; IKO 3.3.2./3 *output 4.4*; SO 3.4 *output 4.*5; SO 3.5 *output 4.3*; SO 3.5 *output 4.3*; SO 3.6 *outcome 1&5*; SO 3.7 *output 2.3*; IKO 5.1.2 *outcome 1*; IKO 6.4.1, 7.1.1, 7.1.5 *output 5.3*
Strategic Action Programme for the Conservation of Biological Diversity (SAP BIO) in the Mediterranean Region.	*All outcomes*
Mediterranean Strategy for Sustainable Development 2016-2025.	SD 1.1, 6.1, 6.3 *output 1.3*; SD 2.1, 2.3, 5.3-5.3 *outcome 5*; SD 4.1 *output 5*.3; SD 4.4 *output 1.1*; SD 6.2 *output 1.2*; SD 6.5 *output 4.3*
Ecosystem Approach and agreed roadmap for its implementation	EO1 *outcome 2,3 &* 4; EO2,4-11 *outcome 1&5*
Common Regional Framework for Integrated Coastal Zone Management	*Outcomes 1 and 5*
Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and related Assessment Criteria	*Output 1.4*
Regional Climate Change Adaptation Framework for the Mediterranean Marine and Coastal Areas	SD 1.5 *output 4.1;* SD 2.2 *output 1.3*; SD 4.1 *output 5.1*; SD 4.3 *outcome 5*
Regional Action Plan on Sustainable Consumption and Production (SCP) in the Mediterranean4.	OO 3.1 *output 1.3, 5.3*
UfM post 2020 Environment Agenda	Thematic axis 3; *All outcomes*
GFCM strategy towards sustainable fisheries and aquaculture in the Mediterranean and Black Sea	Target 1 and 4; *all outcomes*
Post-2020 MPA roadmap (jointly led by SPA/RAC, MedPAN and WWF)	*Outcomes 1,2,4,5*

Sub-regional	
EU Marine Strategy Framework Directive	*Outcome 2*
EU Biodiversity Strategy for 2030	Obj. 2.1 *outcome 2; Obj. 2.2.6/9/10 output 1.3, outcome 5*
EUSAIR	S.O. 1.2, 1.3, 3.1, 3.2 *All outcomes*
Initiative for the sustainable development of the blue economy in the western Mediterranean	Priority 2.4; Goal 3 -*All outcomes*
The EU Habitats Directive	*All outcomes*
The EU Birds Directive	*All outcomes*
EU Green Deal	Preserving and protecting biodiversity policy and actions; *All outcomes*

Annex VII

Draft Concepts to set up the Specially Protected Areas of Mediterranean Importance Day (SPAMI Day) and SPAMI Certificate

TABLE OF CONTENTS

ACRONYMS

COP	Conference of Parties
CSO	Civil society organization
EU	European Union
MAP	Mediterranean Action Plan
MPA	Marine Protected Area
NGO	Non-governmental organization
SPA/BD	Specially Protected Areas and Biological Diversity
SPAMI	Specially Protected Area of Mediterranean Importance
SPA/RAC	Specially Protected Areas Regional Activity Centre
TAC	Technical Advisory Commission
UNEP	United Nations Environment Programme
WWF	World Wide Fund for Nature

Draft Concepts to set up the Specially Protected Areas of Mediterranean Importance Day (SPAMI Day) and SPAMI Certificate

1. Background

1. The Specially Protected Areas Regional Activity Centre (SPA/RAC) is a Component of the United Nations Environment Programme / Mediterranean Action Plan (UNEP/MAP)-Barcelona Convention system. It was established by the Contracting Parties to the Barcelona Convention in order to assist the Mediterranean countries in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) of the Barcelona Convention. SPA/RAC's main objective is to contribute to the protection, preservation and sustainable management of marine and coastal biological diversity in the Mediterranean and, in particular, the creation and effective management of marine and coastal areas of particular natural and cultural value and the conservation of threatened and endangered species of flora and fauna in the Mediterranean.

2. In order to promote cooperation in the management and conservation of natural areas, as well as in the protection of threatened species and their habitats, the Contracting Parties to the Barcelona Convention have drawn up, in 2001, the "List of Specially Protected Areas of Mediterranean Importance" (SPAMI List). A SPAMI is a coastal, marine and/or high sea area that is of importance for conserving the components of biological diversity in the Mediterranean, contains ecosystems specific to the Mediterranean area or the habitats of endangered species, or is of special interest at the scientific, aesthetic, cultural or educational levels. The sites included in the SPAMI List are intended to have a value of example and model for the protection of the natural heritage of the region. To this end, the Parties must provide each SPAMI area with a legal status guaranteeing its effective long-term protection.

3. After several rounds of SPAMI ordinary periodic reviews (since the biennial period 2008-2009), the various technical advisory commissions (TACs) in charge of the evaluations have recommended to SPA/RAC to further promote networking and exchange among SPAMIs.

4. In this context, SPA/RAC initiated in 2018 the SPAMI Twinning Programme, which aims at developing and strengthening an effective management of SPAMIs, promoting networking and best practices/experience sharing among managers, building capacities, and involving the civil society organizations (CSOs) in marine and coastal protected areas management.

5. In order to facilitate exchanges among SPAMI managers, promote the SPAMI List and enhance its visibility, SPA/RAC has developed a SPAMI Collaborative Platform[1], which is a virtual workspace that provides users with resources and tools aiming to facilitate communication and human interactions around SPAMIs and marine and coastal protected areas (MCPAs) in general.

6. After having encouraged further cooperation and collaboration in the management and conservation of SPAMIs among Contracting Parties as well as among individual SPAMIs, COP 21 (Naples, Italy, 2-5 December 2019) requested the UNEP/MAP Secretariat (through SPA/RAC) to draft the concepts in order to set up the SPAMI Day and SPAMI Certificate, and submit them for consideration by the Contracting Parties at their COP 22 (Antalya, Turkey, on 7-10 December 2021) (Decision IG.24/6).

[1] http://spami.medchm.net/en

2. Methodology

7. The elaboration of the present SPAMI Day and SPAMI Certificate concepts was based on the review and analysis of useful documentation and sources of information related to relevant global and regional environmental initiatives, days and celebrations. This allowed to identify success stories and best practices to inspire and guide the development of these concepts.

8. Furthermore, a rapid overview of the previous SPAMI ordinary periodic review recommendations was made, in order to identify the main gaps hindering a greater SPAMI efficiency and outreach.

3. Objectives

9. The SPAMI Day intends to raise awareness on SPAMIs and marine and coastal protected areas in particular, and on Mediterranean marine and coastal ecosystem conservation and natural resource management, in general.

10. The target audiences are the following:
    - Decision makers relevant to MAP's mandate, such as Contracting Parties officials, and Focal Points;
    - Main actors relevant to MPAs management/development such as MPA/SPAMI managers, national institutions, CSOs, MAP partners, donors and business;
    - General public and influencers, such us journalists, scientific community, academic community.

11. The concepts to set up the SPAMI Day and SPAMI Certificate are tailored to address the challenges related to communication and outreach about SPAMIs at the Mediterranean level and beyond. Hence, the SPAMI Day and SPAMI Certificate aim to achieve the main following objectives:
    - to raise awareness of the general public on issues related to SPAMIs/MPAs;
    - to mobilize political will and resources to address the problems of SPAMI/MPA management and marine ecosystems conservation in the Mediterranean region;
    - to acknowledge and promote the achievements of existent SPAMIs, and value the initiatives of individual managers, rangers, mayors, volunteers, etc.;
    - to celebrate the inclusion of and deliver SPAMI Certificates to areas newly included in the SPAMI List;
    - to communicate on the SPAMI ordinary reviews results and lessons learned on a biennial basis;
    - to focus on cooperation, collaboration, exchange and dialogue, and encourage unity and not disparity or competition;
    - to create a forum/platform for SPAMI managers to meet and build a network, with a view to fostering cooperation among SPAMIs, sharing knowledge, offering twinning opportunities and encouraging the emergence of new projects and ideas with the contribution and collaboration of different stakeholders (e.g. donors, managers, CSOs, NGOs, institutional partners, and the research and conservation communities).

4. Expected outcomes and impacts

12. The SPAMI Day and SPAMI Certificate expected outcomes and impacts include:
    - The SPAMIs and SPAMI Day are promoted, and various target groups participation, including the general public, is enhanced;
    - The role of SPAMIs as examples and models for the protection of the Mediterranean natural heritage is promoted, at local, national and regional levels;
    - Effective conservation of the Mediterranean natural and cultural heritages;

- Collaboration, cooperation, participation, and involvement of local communities is enhanced;
- Political will and resources are mobilized;
- The sustainability of SPAMIs through financing and co-financing opportunities is enhanced, and solid partnerships are implemented at regional and international levels;
- Increase opportunities for inclusion of new areas in SPAMIs List and their sound management.

5. SPAMI Day concepts

5.1. Themes

13. A SPAMI Day theme would be identified for each biennial SPAMI Day event. Preliminary discussions on the SPAMI Day theme could be held with relevant stakeholders such as the UNEP/MAP-Barcelona Convention Secretariat and other Components, SPA/BD Focal Points and SPAMI managers, to brainstorm ideas in this regard while observing the criteria listed below:
    - Effective event theming would be utilized as to attract and inspire participants and the wider public, create pre-event interest, promote social media sharing and heighten engagement.
    - Themes would be simple, clear, appealing and relevant to the stakeholders. Incentives should be built-in the themes such as providing sustainable livelihoods and benefits of biodiversity conservation for all.
    - Themes would be linked to the main features characterizing SPAMIs, such as effective conservation of the Mediterranean natural and cultural heritage, collaboration, cooperation (bilateral and multilateral), participation, involvement of local communities, enforcement, exemplary and adaptive management methods and practices, effective protection measures, monitoring, education, awareness, effective legal framework enforcement, promotion of scientific research, promotion of sustainable development and coastal zone management within and around SPAMIs, etc.
    - Themes would determine the SPAMI Day event's prevalent aims at that period of time, linked to emerging global and/or regional priorities and does not distract from those aims and priorities.
    - Themes would reveal what the "takeaway" from the events would be and what is intended for the participants to remember and act upon after the events are concluded.
    - Themes would be incorporated onto invitations, programmes, brochures and electronic marketing, name tags, signs and event-related gifts or memorabilia.

14. Target groups could be engaged pre-launch, by voting for one of the theme options. Annual themes should be specified in the annual announcements to be made prior to the event, explaining the rationale and links with topical developments.

15. SPAMI Day themes could be derived from the following keywords: SPAMIs, marine protected areas, Mediterranean, importance, natural heritage, sustainability, cooperation, biodiversity conservation, sustainable livelihoods. Examples of themes: **"SPAMIs, the Mediterranean model of a sustainable livelihood"** or…. **"Protecting the Med, sustaining livelihoods"**

5.2. Date and periodicity

16. The starting point should be a COP of the Barcelona Convention, that may decide to include a number of marine and coastal protected areas in the SPAMI List. Usually, COPs take place at the end of an odd-numbered year (e. g. December 2021). Sometimes, it could be held at the beginning of the following year (e. g. February 2022).

17. The first SPAMI Day celebration following a COP should have the format of a regional face-to-face event (ideally in a SPAMI or a new SPAMI venue), where the SPA/RAC Director and MAP Coordinator could deliver the SPAMI Certificates to the newly declared SPAMIs.

18. This regional event could take place in Spring, few months after the COP (e. g. April 2022). It is proposed to be the **second week of April**; and even a specific date could be chosen (e. g. **15 April** 2022 - an international celebration-free day).

19. The following SPAMI Day celebration, during the same biennium, should be a general public celebration at the level of each SPAMI (or those who wish to celebrate), with the support of SPA/RAC (e.g. 15 April 2023).

20. An indicative timeline for the preparation and organization of the first and second SPAMI Day editions (2022 and 2023) is presented in **ANNEX I**.

5.3. Slogans

21. SPAMIs are models for the other Mediterranean marine and coastal protected areas that provide a wide variety of benefits ranging from the conservation of whole areas that are home to important diversity of species, serving as nursery grounds for fisheries and enhancing fish stocks, protecting habitats that buffer the impacts of storms and waves, and removing excess nutrients and pollutants from the water. They also provide more sustainable tourism and economic benefits, as well as enhance other non-use values such as cultural and heritage values.

22. Slogans would be articulated to get the above messages across and expressing SPAMIs issues and the purposes behind these messages in a manner that captures the imagination.

23. Slogans would be linked to the themes of SPAMI Day editions, they would be short, so that they could be used on the different communication material. Hashtag as well as conventional slogans could be used. Following are a few relevant examples of Hashtags:
    - #MedNatureDay
    - #ProtectMedDay
    - #ThinkBlueGoGreen
    - #**S**PAMIs**S**upport**S**ocieties
    - #ManySpecies1Planet1future
    - #SPAMILovers
    - #ProtectMED

    And slogans:
    - Conservation works. Give the Mediterranean a chance
    - Let the Mediterranean heal itself
    - Time to make peace with nature in the Mediterranean
    - SPAMIs, the Mediterranean model of sustainability
    - The sea deserves our respect and care, polluting it is not at all fair
    - Turn the tide on sea level rise.

24. As for the themes, target groups could be engaged pre-launch, by voting for one of the slogan and hashtag options.

5.4. Logos

25. The SPAMI and SPAMI Day logo (a derivation of the latter) should be relevant and convey a key message such as supporting livelihoods, sustainable use of resources or an iconic species.

26. The logos should be attractive, balanced, easily recognizable, simple and follow the SPA/RAC branding, graphic charter colors and graphic lines. The logos should be versatile and well suited for a variety of applications such as letterheads, certificates, promotional materials, etc. Here below is an example of SPAMI and the derived SPAMI Day logos.

Above is an example of a SPAMI logo.

An example of the SPAMI Day logo is a deviation from the above logo (by adding the word Day).

5.5. Online dissemination, delivery and media resources

27. The SPAMI Day would be an occasion to raise awareness of the public on issues of concern, to mobilize political will and resources to address problems, and to celebrate and reinforce achievements. The proposed resources would be designed around the theme; address the gaps, key issues and desired outcomes; and will be performed in an artistic and informative manner using visually appealing material that would inspire and engage.

28. A wide variety of methods and techniques are available for delivering these resources and would be put to use in highlighting the gaps, messages, opportunities and relevant issues and promoting the SPAMI Day.

29. Furthermore, there should be the development of a SPAMI Day toolkit that provides resources to all those who wish to take part in the celebration, including by organizing their own micro-events in locations other than the venue where the main SPAMI Day event would be taking place (e.g. schools, universities, MPAs, etc.).
The following outlines the main dissemination mechanisms and resources to be utilized:

5.5.1. SPAMI Day website and resources

30. The world-wide web, social media and information technologies offer the most efficient means of communicating with a wide and ever-increasing range and number of target audiences.
For a Mediterranean-wide impact, the implementation of the campaign and the production of materials in all Mediterranean languages is recommended.
Following is a ***prioritized*** list of the resources that may be available on the SPAMI Day website (part of the SPAMI Collaborative Platform), many of which will be shared on other platforms:

5.5.1.1. Stylized map/guide of SPAMIs

31. This double-sided poster would include a stylized map of SPAMIs on one side; the map would be inlaid with artwork highlighting iconic marine species, seabirds, authentic people portraits and cultural landmarks. The other side would feature a photo and caption for each of the SPAMIs plus informative text.

32. Downloadable size of this map/guide of SPAMIs would be A0 (841 x 1189 mm) which could be folded to form a travel guide. (example at **ANNEX II**)

33. The map/guide could also be declined in other formats for use in digital communication channels (social media, website, etc.).

5.5.1.2. Interactive SPAMI discovery link

34. This is a progressive link which uses Google Technologies and takes the visitor to a 'Virtual tour across SPAMIs'. This interactive and engaging feature will take the viewer on a tour of discovery showing photos, animations and a caption for each SPAMI. A beta version of this powerful resource with about 30 of the current 39 SPAMIs has been performed for demonstration purposes (click here to view).

5.5.1.3. Royalty free artwork

35. SPAMI Day and sponsors logos would be used by designers, SPAMI management, catalysts and other involved parties for a variety of applications such as inserting them on SPAMI Day posters and banners, artwork, press backdrop panels, drawing and other award certificates, promotional materials, letterheads, etc. Relevant advice and references could be included in the communication toolkit provided to the event organizers.

36. Graphic clipart such as endangered and iconic species silhouettes could be used by designers for creating artwork. Using a template of silhouettes would provide them with a tool for creativity and provide for a recognizable art expression for the SPAMI Day.

5.5.1.4. Posters and banners

37. The main poster/banner will be available in high resolution; Key ideas will include:

A. *SPAMI Day theme poster* (example at **ANNEX III**)

38. This poster will highlight the SPAMI Day theme in the context of marine diversity and cultural values around SPAMIs. Downloadable size posters of A0 (841 x 1189 mm) and A1 (594 x 841 mm) could be designed.

B. *Large Seamless panorama of SPAMIs* (example at **ANNEX IV**)

39. This large attention-grabbing poster/banner/exhibit will highlight main marine and coastal habitats throughout SPAMIs (or a specific SPAMI), iconic species, submersed archaeology, cultural landmarks and sustainable human activities such as artisanal fishing, responsible diving, sailing and whale watching.

40. The resolution and details would allow this banner to be printed at sizes ranging from 1 m x 10 m and up to 3 m x 30 m. It is designed to be printed on outdoor vinyl material and laid flat on the ground in order to eliminate the need for an exhibit space and erection costs while remain clearly visible to visitors. It is easily rolled and stored for later use.

41. A smaller version for standard size posters of A0 (841 x 1189 mm) and A1 (594 x 841 mm) would be available for download.

5.5.1.5. Royalty free photos

42. Royalty free photos (licenced under Creative Commons) are an excellent resource to open the field of creation to others and to enable regulated sharing, grab attention and spread awareness. These would include:
    - SPAMIs seascapes
    - SPAMIs exquisite coast lines
    - Marine and terrestrial flora and fauna within SPAMIs
    - Endangered species
    - Iconic species
    - Local people in authentic attire and cultural landscapes around SPAMIs.

5.5.1.6. Flyers and factsheets

43. Flyers are important in marketing. While we might live in an age of high-tech advertising, the humble flyer is still a priceless promotion tool. Flyers are an effective way to get our messages across, are extremely cost effective and have a high impact.

44. Flyers would focus on the following subjects:
    - SPAMI Day announcements
    - SPAMI Day events
    - Messages
    - Slogans with high impact photos
    - Introducing webinars and other activities.

45. Factsheets provide readers from our target audience with compelling information in a clear and concise format. It is inexpensively presented on a piece of paper or digitally, and informs people about relevant topics such as:
    - Endangered species
    - Iconic species
    - Cultural values in SPAMIs
    - Burning issues
    - Threats to marine conservation and livelihoods
    - What you can do to help
    - Good practices and interesting stories from SPAMIs
    - New trends in marine conservation.

5.5.1.7. PowerPoint presentation

46. Presentations will be tailored in relation to a current SPAMI Day theme to highlight subjects such as:
    - Promotion of networking among SPAMIs
    - Communication skills with decision makers and key stakeholders
    - Adaptive management plans
    - Sustainable financing of SPAMIs
    - Knowledge on values and benefits of SPAMIs/livelihoods
    - Law enforcement
    - Governance and institutions.

5.5.1.8. Stories and news

47. Storytelling can be an effective communication tool. This should be aligned with the messages that are yet to be crafted. Inspiring stories related to conservation such as success stories, cultures from around the Mediterranean, whales back from the brink and best practices in SPAMIs. SPAMI ordinary review results and lessons learned could also inspire and feed news about SPAMIs.

5.5.1.9. Promotional and outreach materials artwork

48. Artwork designed for promotional materials and goodies such as caps, bags, T-shirts and other everyday articles would be effective for conveying messages. These should be crafted if needed and considering the Barcelona Convention's zero-plastic policy and avoidance of all forms of waste.

5.5.1.10. Links to international days

49. Links to relevant social media platforms (following subject) and international days such as the International Day for Biological Diversity, World Environment Day, will be posted:
   - UN World Oceans Day website
   - Intergovernmental Oceanographic Commission (UNESCO)
   - UN Environment-Oceans
   - UN Decade of Ocean Science for Sustainable Development 2021-2030
   - 2020 UN Ocean Conference
   - SDG 14: Life underwater.

5.5.1.11. SPAMIs video

50. In addition to the existing ("SPAMIs : Protecting the Mediterranean natural heritage"), new 3 to 5-minute videos, with actual onsite footage would capture the awesome scenery around SPAMIs, the diverse cultures around the Mediterranean and stimulate the public and inspire them to value and engage in SPAMIs and the marine environment conservation.

51. Possibly, another long version, performed simultaneously, could be around 50 minutes. This is an ambitious project that would require an enticing story and actual onsite footage.

5.5.2. Social media

52. Our primary goal for the social media plan is to widely share the messages listed earlier, raise public awareness about relevant issues and promote the SPAMI Day at least 6 months in advance. Social media platforms will link to SPAMI's website. Twitter, Facebook and Instagram would be performed to promote the SPAMI Day and resources. The SPAMI Day communication toolkit should include assets for sharing on social media, such as digital cards with facts and figures, visuals and quote cards.

5.5.2.1. Twitter

53. What began on Twitter has now spread to Facebook, Instagram, Google search, and almost everywhere in between. Hashtags are an effective way to encourage engagement and get discovered.

54. A new event hashtag (e.g. #ProtectMedDay or #SPAMIDay) is proposed, while the following hashtags can be used whenever possible to connect to other ongoing conversations on Twitter. This also helps to spread the word to new potential users:

- #SPAMIs
- #MPAs
- #BlueParks
- #marineparks
- #ocean
- #marine
- #MPAsWork
- #MedMPAs
- #mybluemed (used by WWF in Med/Euro region)
- #Mediterranean
- #SPARAC

5.5.2.2. Facebook

55. To optimize for the SPAMI Day event attendance and engagement the following should be created:
    - Create the SPAMIs Day event page on Facebook
    - Invite friends and colleagues before promoting it outright
    - Post teasers with necessary details and a sneak peek
    - Post updates regularly
    - Use event hashtag and as most relevant from above twitter hashtags in posts.

56. SPA/RAC Facebook page would be optimized and aesthetics upgraded. More content of interest to engage enthusiasts, catalysts and other stakeholders needs to be included. Another Facebook group should be established in order to spread awareness and cater to these groups.

5.5.2.3. Instagram

57. Instagram is an entirely visual platform. Unlike Facebook, which relies on both text and pictures, or Twitter, which relies on text alone, Instagram's sole purpose is to enable users to share images or videos with their audience. The following could be performed:
    - Share eye-catching imagery with message highlights.
    - Make Instagram stories.
    - Interview attendees on Instagram Stories.
    - Use event hashtag and as most relevant from above twitter hashtags in posts.

5.5.2.4. YouTube

58. SPA/RAC YouTube channel would be optimized in order to seek more views and better rankings. More videos of interest could be added including content exhibiting SPAMIs and their cultural and natural landscapes.

5.6. SPAMI Day activities

59. SPAMI Day activities will take place on the date of the event. These would take place on site and/or online depending on restrictions at the time such as budgets and other conditions, such us the current COVID-19 pandemic restrictions.
    SPAMI Day activities which will take place on the date of the event are to be divided as follows:

5.6.1. SPAMIs Day onsite main event at the regional level

60. The SPAMI Day onsite main event would be supported by SPA/RAC main sponsors and held in rotation within a SPAMI venue, considering criteria such as available infrastructure to support the

event. In the event, a new SPAMI has been declared, the SPAMI Day could be celebrated at that SPAMI. This event will include the following:

5.6.1.1. The large exhibit poster

61. Noted at 5.5.1.3 B above, will be printed and exhibited plus resources available to the local level below will also be utilized.

5.6.1.2. Regional actors

62. Including stakeholders, the press, decision makers and relevant parties will also be invited.

5.6.1.3. Resources

63. Described for the local level below will also be applied as relevant.

5.6.2. SPAMI Day onsite event at the local level

64. The SPAMI Day would be celebrated at the local level utilizing available means and website resources according to available budgets.

5.6.2.1. A Facebook event

65. Would be created at least one month in advance and promoted across relevant online social media and online resources.

5.6.2.2. The venue

66. The venue would be a local meeting spot accessible to the public and stakeholders such as a local library grounds, a SPAMI, an MPA, a park or within an aquarium's grounds. The SPAMI Day may could be also celebrated in other locations, including schools, universities, etc.

5.6.2.3. Open Day

67. At MPAs and SPAMIs would welcome visitors at no charge. A community walk, bike or run on the coast would entice visitors to learn about the key messages and be enlightened and excited about the different ways everyone can enjoy and help conserve these protected areas.

5.6.2.4. A clean-up and zero-waste day

68. Could be held on the coasts to learn about the SPAMIs and raise awareness of the mismanaged waste crisis by mobilizing the public to participate in clean-up and zero-waste actions. A biodiversity watch/talk on key species in the area could also be organized.

5.6.2.5. Promotional and outreach materials

69. Described at *5.5.1.9* above could be utilized and would be an effective for conveying messages.

5.6.2.6. Exhibition

70. Using the SPAMI Day website and other available local resources would be utilized.

5.6.2.7. Awards

71. Awards are an easy way to engage and generate likes and convert participants into catalysts. It's also a great way to uncover some user-generated content. The works would be derived from the theme and messages; it would be posted on Facebook and is one of the best ways to achieve our social media goals. Awards could be monetary, visit to a SPAMI or items from our promotional materials such as caps and T-shirts plus recognition on the SPAMI Day website under the past events link and social media. Awards would be given to:
    - School children drawings competition
    - Mobile photo competition
    - Award of excellence for initiatives of individual managers, rangers, mayors, volunteers, etc.

5.6.2.8. Webinar

72. Addressing gaps, challenges, generating outputs and proposing solutions

5.6.2.9. Press kit

73. Properly crafted and appropriately distributed in a credible and pointed manner would reach key audiences with targeted messages that matter to them.

5.6.2.10. Speakers

74. Speakers representing stakeholders would present issues related to achievements of SPAMIs, challenges, sustainable development issues, sustainable financing, blue economy and investment in SPAMIs.

5.7. Monitoring and feedback

75. The SPAMI Day performance would have to be refined and updated through public and stakeholder engagement, continued review, monitoring and evaluation. Measuring the success after each event would allow us to set attainable goals and make more accurate estimations for future events, their planning and improvement.

76. These concepts successful implementation depends largely on its evolution through a long term and sustained effort. In this sense it is the beginning of a long-term process, which will be continually assessed, refined and implemented.

77. The following mechanisms will be used to monitor, evaluate and adapt the process; tracking progress event-to-event will aid in setting future goals:

5.7.1. Ongoing SPA/RAC internal review and monitoring

78. Internal review by SPA/RAC is key to monitor and analyze the various indicators listed below, adherence to budgets and also built-up experience to better manage future events. Information collected could also be discussed at the SPA/BD Focal Points meetings for feedback and recommendations.

5.7.2. Stakeholder consultation and review

79. Consultation with stakeholders, continued engagement, enhancement and integration of stakeholders' input and feedback is a cornerstone of a sustainable event. An after-event

questionnaire could be prepared and circulated to stakeholders for their evaluation of a completed event and recommendations on future ones. Face to face meetings or phone calls with key stakeholders could be of utmost benefit.

5.7.2.1. Social media and online activity

80. Will be carried on in the days leading up to the event. This will get attendees excited and talking about it on their own social network channels. Social media activity after the event will continue to be closely monitored.

81. Hashtags will be utilized to monitor social media mentions. A quantitative way to measure using social media would be to use audience growth, shares, mentions, likes and views. Various online visitation statistics specially those of the SPAMI Day website will also be monitored.

5.7.2.2. Attendance

82. Would be a measured as an important indicator of success of the event.

5.7.2.3. Post-event surveys

83. Will be evaluated through a post-event survey. This will give a general idea of the attendees' perception. This helps in identifying weak points that could be improved upon.

5.7.2.4. Sponsor recognition

84. Is vital as they are the backbone of the event because they are the ones funding it. Were they pleased with how the event went? Did they feel the event met their expectations? How can future events be improved? To get feedback on this questions, online communication or a sit-down meeting with sponsor representatives will be held to gauge the sponsors' impression.

5.7.2.5. Media coverage

85. Publicity generated before and after the SPAMI Day event. Media coverage is an important indicator of the success of the event and can increase attendance for future events.

5.8. Stakeholders and partnerships

86. Partnerships and stakeholders' involvement are critical for making the SPAMI Day events a success. The following major stakeholder groups have been identified:
    - Organiser(s) and host organisation
    - Host community, including local authorities, businesses, tourism players
    - Sponsors
    - Media
    - Participants and spectators.

87. SPA/RAC will seek ad hoc partnerships based on the SPAMI Day theme, venue, context, budget, etc. SPAMI Managers and national MPA managing authorities (including SPA/BD Focal Points) will be key actors. They could be part of the organizers and host organizations.

88. Partnerships may involve local and national NGOs and CSOs, relevant regional and international partner organizations working on marine protected areas conservation, including SPAMIs, and other MAP Components.

5.9. Financing

89. The SPAMI Day celebrations financing will rely on external funds (external donor-funded projects, other ad hoc mobilized funds, sponsors, local partnerships, etc.).

6. SPAMI Certificate

90. SPAMI Certificates would be given to SPAMIs newly included in the SPAMI List, except for the first ceremony of certificate distribution which will involve all the SPAMIs included in the list since its establishment in 2001. Like most certificates, included fields should be few and relevant. The certificate could also include one outstanding biodiversity feature that makes the SPAMI so special i.e. corals, Posidonia etc. Following is a template which would be applicable:

UN environment programme | Mediterranean Action Plan Barcelona Convention | SPA/RAC

SPAMI

SPECIALLY PROTECTED AREA OF MEDITERRANEAN IMPORTANCE

By decision of the Barcelona Convention Conference of the Parties

Xyyyyyyy Marine Protected Area

has been included in the Specialty Protected Areas of Marine Importance

Athens, Greece
20 December 2023

Valid for six years from the date of issue

Mr. Gaetano Leone
UNEP/MAP coordinator

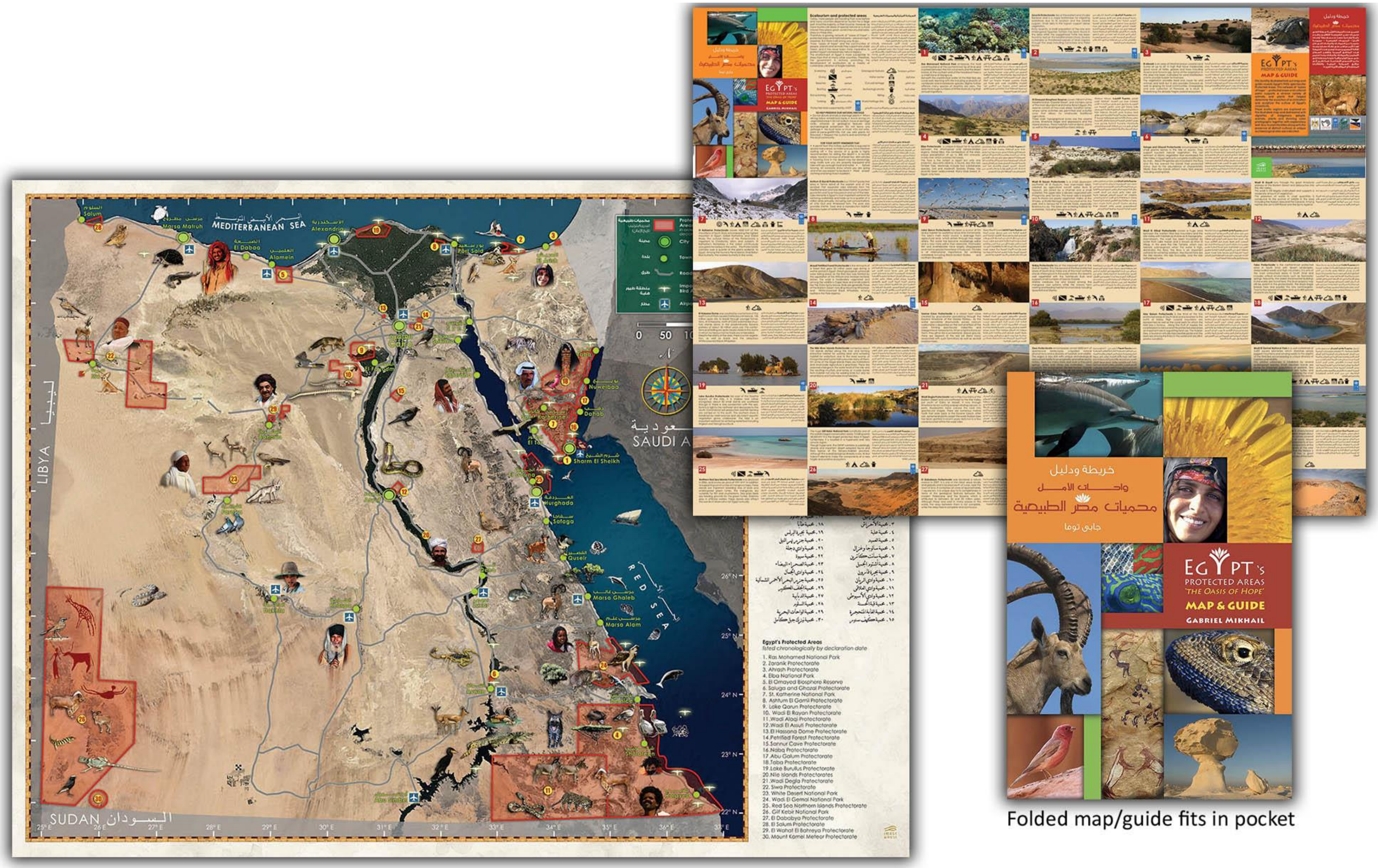
Mr. Khalil Attia
SPA/RAC Director

ANNEX I INDICATIVE TIMELINE

Year	2021	2022												2023											
Month / Action	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
The starting point: Adoption of the SPAMI Day and SPAMI Certificate Concepts (December 2021)																									
Finetune the logo of the SPAMI Day																									
Select the venue of the 2022 SPAMI Day regional face-to-face event with the relevant stakeholders																									
Held preliminary discussions to identify options for the 2022 SPAMI Day theme																									
Adopt the 2022 SPAMI Day theme through an online survey																									
Hold discussions on the 2022 SPAMI Day programme																									
Prepare the activities of the 2022 SPAMI Day in coordination with the relevant stakeholders																									
Prepare / produce the SPAMI Day webpage and resources																									
Prepare the layout and produce the SPAMI Certificates																									
Promote the SPAMI Day																									
2022 SPAMI Day celebration																									
Hold preliminary discussions to identify options for the 2023 SPAMI Day theme																									
Adopt 2023 SPAMI Day theme through an online survey																									
Hold discussions on the 2023 SPAMI Day activities																									
Prepare the activities of the 2023 SPAMI Day																									
Prepare / produce the 2023 SPAMI Day webpage and resources																									
Promote the SPAMI Day																									

Year	**2021**	**2022**												**2023**											
2023 SPAMI Day celebration																									
Hold preliminary discussions to identify options for the 2024 SPAMI Day theme																									
Adopt the 2024 SPAMI Day theme through an online survey																									
Hold discussions on the 2024 SPAMI Day activities																									
Prepare the activities of the 2024 SPAMI Day in coordination with the relevant stakeholders																									
Launch of the preparation / production of the SPAMI Day webpage and resources																									
Start the promotion of the 2024 SPAMI Day edition																									
Barcelona Convention COP 23																									

ANNEX II STYLIZED MAP/GUIDE OF SPAMIs EXAMPLE



Folded map/guide fits in pocket

ANNEX III SPAMI DAY THEME POSTER EXAMPLE

ANNEX IV LARGE SEAMLESS PANORAMA OF SPAMIs EXAMPLE

Annex VIII

Update of Monitoring Protocols on Benthic Habitats

1. Guidelines for monitoring marine vegetation in the Mediterranean

Introduction

1. Seagrass meadows are widely recognized as key habitats in tropical and temperate shallow coastal waters of the world (UNEP-MAP-Blue Plan, 2009). They form some of the most productive ecosystems on earth (McRoy and McMillan, 1977), shaping coastal seascapes and providing essential ecological and economic services (Green and Short, 2003; Vassallo et al., 2013). They support high biodiverse associated communities, primary production and nutrient cycling, sediment stabilization and protection of the littoral, and globally significant carbon sequestration (Waycott et al., 2009 and references therein). A significant economic value of over 17 000 $ per ha and annum has been quantified for seagrass meadows worldwide (Costanza et al., 1997).

2. Seagrass, like all Magnoliophytes, are marine flowering plants of terrestrial origin that returned to the marine environment approx. 120 to 100 million years. The global species diversity of seagrass is low compared to any other marine Phylum or Division, with less than sixty species throughout the world. However, they form extensive meadows that extend for thousands of kilometers of coastline between the surface down to about 50 m depth (according to water transparency) in marine and transitional waters (e.g., estuaries and lagoons). In the Mediterranean region five seagrass species occur: *Cymodocea nodosa*, *Halophila stipulacea* (an invasive Lessepsian species), *Posidonia oceanica*, *Zostera marina*, and *Zostera noltei*. The endemic *Posidonia oceanica* is doubtless the dominant and the most important seagrass species (Green and Short, 2003), and the only one able to build a ‘‘matte’’, a monumental construction resulting from horizontal and vertical growth of rhizomes with entangled roots and entrapped sediment (Boudouresque et al., 2006).

3. Physical damages and stressful conditions resulting from intense human pressures, environmental alterations, climate warming, and reduction of water and sediment quality are causing structural degradation of seagrass meadows worldwide (Orth et al., 2006). Biological impact caused by the spread of non-indigenous species (NIS) on seagrass beds must also be considered (Montefalcone et al., 2007). An alarming decline of seagrass meadows was reported in the Mediterranean Sea and mainly in the north-western side of the basin, where many meadows have been lost during the last decades (Boudouresque et al., 2009; Waycott et al., 2009; Pergent et al., 2012; Marbà et al., 2014; Burgos et al., 2017). However, a deceleration in the rate of loss and some signs of local recovery have also been observed, indicative of a recent trend reversal in seagrass extent and density, thanks to adequate management actions (de los Santos et al., 2019).

4. Concerns about these declines have prompted efforts to protect these habitats legally in several countries. Control and reduction of the full suite of anthropogenic impacts via legislation and enforcement at local and regional scales have been carried out in many countries. *Posidonia oceanica* meadows are defined as priority natural habitats on Annex I of the EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (EEC, 1992), which lists those natural habitat types whose conservation requires the designation of special areas of conservation (SACs), identified as sites of community interest (SCIs). Also, the establishment of marine protected areas (MPAs) locally enforces the level of protection on these priority habitats.

5. Due to their wide distribution and their susceptibility to changing environmental conditions, seagrass are habitually used as biological indicators of water quality in accordance with the Water Framework Directive (WFD, 2000/60/EC) and of environmental quality in accordance with the Marine Strategy Framework Directive (MSFD, 2008/56/EC) (Montefalcone, 2009). Due to its recognized ecological importance, *Posidonia oceanica* is considered as the main biological quality element in monitoring programs developed to evaluate the status of marine coastal environment. Standardized monitoring protocols for evaluating and classifying the conservation status of seagrass meadows already exist, which are summarised in the “Guidelines for standardisation of mapping and monitoring methods of marine Magnoliophyta in the Mediterranean” (UNEP/MAP-RAC/SPA,

2015). These monitoring guidelines have been the base for the updating and harmonization process undertaken in this document.

6. Detailed spatial information on habitat distribution is prerequisite knowledge for the sustainable use of marine coastal areas. The first step in the prior assessment of the status of any benthic habitat is thus the definition of its geographical distribution and bathymetrical ranges. Seagrass distribution maps are a fundamental prerequisite to any conservation action on these habitats. The available information on the exact geographical distribution of seagrass meadows is still fragmentary on a regional level (UNEP/MAP-RAC/SPA, 2015). Few extents of the coastline have been mapped, as only 5 States out of the 21 have a mapped inventory covering at least half of their coasts (UNEP/MAP-Blue Plan, 2009). Within the framework of the Action Plan for the Conservation of Marine Vegetation in the Mediterranean, adopted in 1999 by the Contracting Parties to the Barcelona Convention (UNEP/MAP-RAC/SPA, 1999) and during the implementation evaluation of this Action Plan in 2005 (UNEP/MAP-RAC/SPA, 2005), emerged that very few countries were able to set up adequate and standardized monitoring and mapping programs. As a consequence and following an explicit request by managers on the need for practical guides aimed at harmonizing existing methods for seagrass monitoring and subsequent comparison of results obtained by different countries, the Contracting Parties asked the Regional Activity Centre for Specially Protected Areas (RAC/SPA) to improve the existing inventory tools and to propose standardization of the mapping and monitoring techniques for these habitats. Thus, the "Guidelines for standardisation of mapping and monitoring methods of marine Magnoliophyta in the Mediterranean" (UNEP/MAP-RAC/SPA, 2015) have been produced, as the result of several scientific round tables addressed explicitly on this topic.

7. For mapping seagrass habitats, the previous Guidelines (UNEP/MAP-RAC/SPA, 2015) highlighted the following main findings:

- Several national and international mapping programs have already been carried out;
- Standardization and a clear consensus in the mapping methodology have been reached;
- All the methods proposed are usable in all the Mediterranean regions, but some of them are more suitable for a given species (e.g., large-sized species) or particular assemblages (e.g., dense meadows);
- Implementation of procedures could be difficult in some regions due to the absence of training, competence and/or specific financing.

8. For monitoring the condition of seagrass habitats, the previous Guidelines (UNEP/MAP-RAC/SPA, 2015) highlighted the following main findings:

- Several national and international monitoring programs have been successfully implemented in the Mediterranean (e.g., SeagrassNet, Posidonia national monitoring networks);
- Notwithstanding that most of the Mediterranean monitoring systems are mainly dedicated to *Posidonia oceanica*, there are some programs (e.g., SeagrassNet) that can be used for almost all seagrass species;
- Although the existing monitoring methods are similar, the descriptors used to provide information on the state of the system are quite diverse and cover a vast array of ecological complexity levels (i.e., from the plant to the seascape);
- Some descriptors are used by all the Mediterranean scientific communities (e.g., seagrass shoot density, lower limit depth), but the measuring techniques are often very different, and still require a larger effort to reach precise standardization;
- The different monitoring methods available in the Mediterranean countries seem all feasible when appropriate training is undertaken.

9. Based on recommendations from the previous CPs group meeting, SPA/RAC has been requested to develop an updated version of the "Guidelines for monitoring marine vegetation in Mediterranean" (UNEP/MAP-RAC/SPA, 2015), in the context of the IMAP common indicators and to ease the task of the MPA managers when implementing their monitoring programs. A reviewing

process on the scientific literature, considering the latest techniques and the recent findings by the scientific community at the international level, has been carried out.

Monitoring methods

a) COMMON INDICATOR 1: Habitat distributional range and extent

Approach

10. The CI1 is aimed at providing information about the geographical area in which seagrass meadows occur in the Mediterranean and the total extent of surfaces covered by meadows. The approach proposed for mapping seagrass meadows in the Mediterranean follow the overall procedure established for mapping marine habitats in north-west Europe within the framework of the European projects MESH (Mapping European Seabed Habitats; MESH, 2007) and EUSeaMap (Vasquez et al., 2021a, b). The mapping procedure includes different actions (Fig. 1), that can be synthesised into three main steps:

1) Initial planning
2) Ground surveys
3) Processing and data interpretation

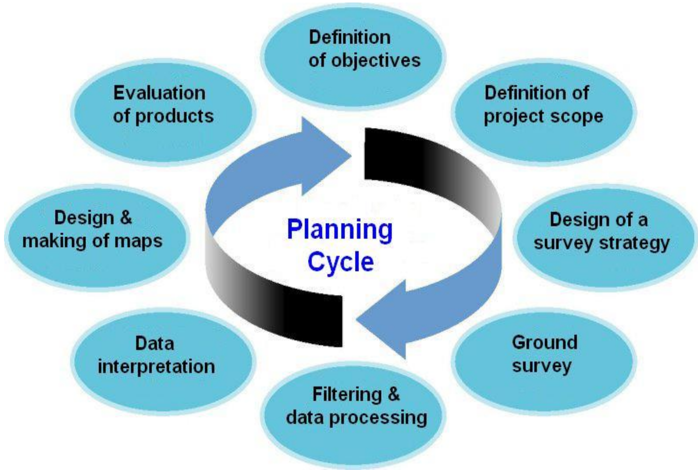


Figure 1: Planning cycle for a habitats' mapping programme (according to the MESH project).

11. Initial planning includes defining the objectives to select the minimum surface to be mapped and the necessary resolution. During this initial phase, tools to be used in the following phases must be defined and the effort (human, material, and financial costs) necessary to produce the mapping evaluated. A successful mapping approach requires the definition of a clear and feasible survey strategy.

12. Ground survey is the practical phase for data collection. It is often the costliest phase as it generally requires field activities. A prior inventory of the existing data for the area being mapped is recommended, to reduce the amount of work or to have better targeting of the work to be done.

13. Processing and data interpretation are doubtlessly the most complex phase, as it requires knowledge and experience, so that the data gathered can be usable and reliable. The products obtained must be evaluated to ensure their coherence and the validity of the results obtained.

Resolution

14. Selecting an appropriate scale is a critical stage in the planning phase (Mc Kenzie et al., 2001). Even though there is no technical impossibility in using a high precision over large surface

areas (or inversely), there is generally an inverse relationship between the accuracy used and the surface area to be mapped (Mc Kenzie et al., 2001; Fig. 2).

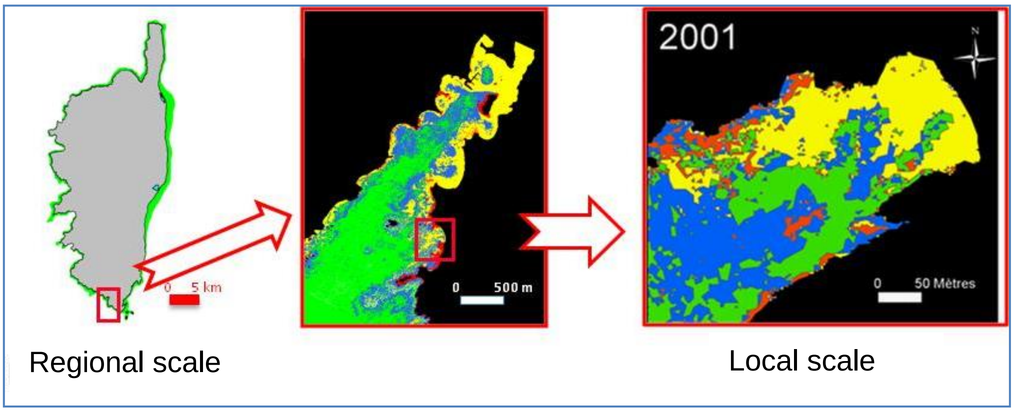


Figure 2: Resolution of a map from regional study to local study (from UNEP/MAP-RAC/SPA, 2015).

15. When large surface areas have to be mapped and global investigations carried out, an average precision and a lower detail level can be accepted, which means that the habitat distribution and the definition of its extension limits are often only indicative. Measures of the total habitat extent may be subjected to high variability. The final value is influenced by the methods used to obtain maps and by the resolution during both data acquisition and final cartographic restitution. This type of approach is used for national or sub-regional studies and the minimum mapped surface area is 25 m² (Pergent et al., 1995a). Recently, some global maps showing the distribution of *Posidonia oceanica* meadows in the Mediterranean have been produced (Giakoumi et al., 2013; Telesca et al., 2015) (Fig. 3). These maps, however, are still incomplete being the available information highly heterogeneous due to the high variability in the mapping and monitoring efforts across the Mediterranean basin. This is especially true for the southern and the eastern coasts of the Mediterranean, where data are scarce, often patchy and can be difficultly found in literature. In data-poor regions, availability of high-quality mapping information on benthic habitat distribution is practically inexistent, due to limited resources. However, these low-resolution global maps can be very useful for an overall knowledge of the bottom areas covered by the plant, and to evaluate where surveys must be enforced in the future to collect missing data. Also, those maps are important to highlight specific areas subjected to a declining trend, where monitoring and management actions must be implemented to reverse the observed trend and to ensure proper conservation.

16. On the contrary, when smaller areas have to be mapped, a much higher precision and resolution level is required and is easily achievable thanks to the high-resolution mapping techniques available to date. However, obtaining detailed maps is time consuming and costly, thus practically impossible when time or resources are limited (Giakoumi et al., 2013). The minimum surface area can be lower or equal to 1 m^2 in local scale studies (Pergent et al., 1995a). These detailed maps provide accurate localisation of the habitat distribution and a precise definition of its extension limits and total habitat extent, all features necessary for future control and monitoring purposes over a defined period. These high-resolution scales are also used to select sites where monitoring actions must be concentrated. As highlighted by the EU projects, most of the environment management and marine spatial planning activities require a range of habitat maps between these two extremes.

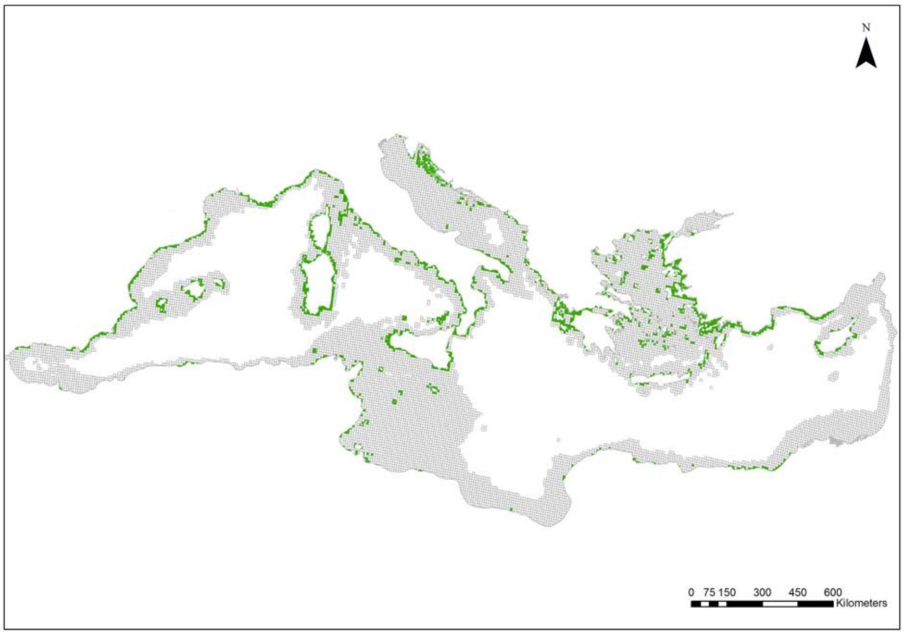


Figure 3: Distribution of *Posidonia oceanica* meadows in the Mediterranean Sea (green areas) (from Giakoumi et al., 2013).

Methods

17. Maps of seagrass distribution and extent can be obtained by using indirect instrumental mapping techniques and/or direct field visual surveys (Tab. 1). In the last 50 years the technology in benthic habitat mapping increased a lot, and several instrumental mapping techniques have been successfully applied to seagrass meadows (see synthesis in Pergent et al., 1995a; McKenzie et al., 2001; Dekker et al., 2006; Hossain et al., 2015; Rende et al., 2020; Rowan and Kalacska, 2021). To map shallow meadows (from 0 to about 10-15 m depth, depending on water transparency and weather conditions), it is possible to use optical sensors (e.g., satellite telemetry, multi or hyper spectral imaging, aerial photography, unmanned aerial vehicles). For meadows in deeper waters (down to 10-15 m depth), the acoustic techniques (e.g., side scan sonar, multi-beam echosounder) are recommended. Sampling methods involving blind grabs, dredges and box corers or direct field visual surveys by scuba diving observations (using transects or permanent square frames), Remotely Operated Vehicles (ROVs), and underwater video recordings allow to ground-truthing the remote sensing data and provide very high-resolution maps of meadows over small spatial scales (Montefalcone et al., 2006). All these techniques are, however, time consuming, expensive, and provide only sporadic information. The simultaneous use of two or more methods makes it possible to optimize the results being the information obtained complementary. Four parameters can be mapped from remote sensing data: presence/absence, percentage cover, species, and biomass. The selection of the most relevant parameter in the scientific literature depended on the area mapped, the availability of ground truth data, and the specific target of each study (Topouzelis et al., 2018).

18. The use of remote sensing allows characterising extensive coastal areas to assess the spatial patterns of seagrass meadows. Itsimultaneously can be used to reveal temporal patterns due to the high frequency of the observation. Remote sensing covers a variety of technologies from satellite telemetry, aerial photography, and unmanned aerial vehicles (UAVs), and acoustic vessel systems. The power of remote sensing techniques has been highlighted by Mumby et al. (2004), who showed that 20 s of airborne acquisition time would equal six days of field surveys. However, all indirect mapping techniques are intrinsically affected by uncertainties due to manual or automatic supervised classification of spectral or acoustic signatures of seagrass meadows on the images and sonogram, respectively. Errors in images or sonograms interpretation may arise when two habitat

types are not easily distinguished by the observer (e.g., shallow seagrass meadows or dense patch of canopy-forming macroalgae). Understanding of remote sensing data requires extensive field calibration and the ground-truthing process remains essential (Pergent et al., 2017). As the interpretation is also time-requiring, several image processing techniques were proposed to rapidly automate the interpretation of images and sonograms and make this interpretation more reliable (Montefalcone et al., 2013 and references therein; Rowan and Kalacska, 2021). These methods allow good discrimination between soft sediments and seagrass meadows, between continuous and patchy seagrass, between a dense seagrass meadow and one exhibiting only limited bottom cover. The human eye, however, always remains the final judge.

19. Satellite telemetry is a valuable tool providing high-resolution regional- to global-scale observations and repeat time-series sampling on seagrass distribution in shallow waters. However, satellite imagery has some disadvantages, such as its reliance on weather conditions, high cost per scene, the revisit period, and the scale of many ecological processes (Ventura et al., 2018). Landsat images have been used successfully for regional mapping of seagrass distribution in many Mediterranean countries. The vast area coverage of satellite imaging might reveal large-scale patterns; however, mapping seagrass meadows from space on a large scale cannot provide the same levels of accuracy and detail of a direct field visual survey. Thanks to emerging technologies, such as long-range transmitters, increasingly miniaturized components for positioning, and enhanced imaging sensors, the collection of images by unmanned aerial vehicles (UAVs), also known as “drones”, coupled with the structure-from-motion (SfM) photogrammetry, offers a rapid and inexpensive tool to produce high-resolution orthomosaic (Ventura et al., 2018). Coupling a high-resolution digital camera with side scan sonar for acquiring underwater videos in a continuous way has recently proved to be a non-destructive and cost-effective method for ground-truthing satellite images in seagrass habitats mapping (Pergent et al., 2017).

20. Airborne LIDAR bathymetry (ALB) or airborne light (lazer) detection and ranging (LIDAR) is a remote sensing technique for the bathymetry with an airborne scanning pulsed laser beam (Guenther, 1985). The technique is well suited to nearshore mapping because it provides the three-dimensional data needed to create an accurate digital terrain model (DTM) with 15-cm vertical accuracy (Irish et al., 2000). The LIDAR technology can measure depths up to three times Secchi depths, corresponding to about 60 m in very clear water (Guenther et al., 2000).

21. Once the surveying is completed, data collected needs to be organised to be used in the future by everyone and can be appropriately archived and easily consulted. The resulting dataset can be integrated with similar data from other sources, providing a clear definition of all metadata (MESH, 2007).

22. Despite the increasing number of studies on seagrass mapping with remote sensing instruments, datasets are not often available on digital geographic information system (GIS) platforms. As a final remark, only recently some modeling approaches have been developed to estimate the potential distribution of seagrass meadows in the Mediterranean. The probability of presence of a seagrass species in a given area has been modelled using: i) a binomial generalised linear model as a function of the bathymetry and water transparency, dissolved organic matter, sea surface temperature and salinity, mainly obtained from satellite data (Zucchetta et al., 2016); ii) morphodynamics features, i.e., wave, climate and seafloor morphology, to predict the seaward and landward boundaries of *Posidonia oceanica* meadows (Vacchi et al., 2012, 2014).

Table 1: Synthesis of the main survey tools used for defining the Common Indicator 1_Habitat distributional range and extent for seagrass meadows. When available, the depth range, the surface area mapped, the spatial resolution, the efficiency (expressed as area mapped in km^2 per hour), and the main advantages and limits of each tool are indicated, with some bibliographic references.

Survey tool	**Depth range**	**Surface area**	**Resolution**	**Efficiency**	**Advantages**	**Limits**	**References**
Satellite images	From 0 to 10-15 m	From few km^2 to large areas (over 400 km^2)	From 0.5 m	Over 100 km^2/hour	• A global and large-scale coverage of virtually all coastal areas • Availability of free digital images, usable without authorization, from the web (e.g., Google Earth) • High geometric resolution	• Limited to shallow waters characterization • Good weather conditions required (no clouds and no wind) • Possible errors in image interpretation among distinct habitats • Possible errors in image interpretation due to bathymetric variations • Not adequate for medium to small coastal dynamics	Kenny et al. (2003)
Multispectral and/or hyperspectral images	From 0 to 25 m, with an optimum up to 15 m	From 50 km^2 to 5000 km^2	From 1 m		• High resolution that allows distinguishing seagrass species • Possibility to collect data even during bad weather conditions	• Complex acquisition and processing procedures requiring the presence of specialists • Necessary to validate the observations with field data • Difficulty in habitat identification in the case of very patchy populations	Mumby and Edwards (2002); Mumby et al. (2004); Dekker et al. (2006); Gagnon et al. (2008)

Survey tool	Depth range	Surface area	Resolution	Efficiency	Advantages	Limits	References
Aerial images	From 0 to 10-15 m	Adapted to small areas (10 km²), but it can be used for areas over 100 km²	From 0.3 m	Over 10 km²/hour	• Very high resolution • Manual, direct and easy interpretation of the images • Availability of libraries with chronological series of images (often free) • Good identification of boundaries between populations • Fine-scale ecological studies	• Same limits as for satellite images • Difficulty in geometrical corrections and strong deformations if verticality is not respected or if image covers a small area (low altitude view) • Difficulty in obtaining authorizations for imaging in some countries • Expensive data aquisition	Frederiksen et al. (2004); Kenny et al. (2003); Diaz et al. (2004)
Drone images (UAVs)	From 0 to 10-15 m	Small areas (10 km²)	From 0.1 m	Less than 1km²/hour	• Very high resolution • Manual, direct, and easy interpretation of the images • Availability of automated approaches for data classification • Good identification of boundaries between populations • Low-cost	• Limited to shallow waters characterization • Require permissions to fly over specific areas • Optical refractive distortion effects created by the water surface	Ventura et al. (2017, 2018); Rende et al. (2020)
Side scan sonar	Below 8 m	From large to medium areas (50-100 km²)	From 0.1 m	0.8 to 3.5 km²/hour	• Very high resolution • Realistic representation of the seafloor • Good identification of boundaries between populations • Good identification between meadows of different density	• Small patches (smaller than 1 m²) or low-density meadows cannot be distinguished • Loss of definition at image edge, requiring adjustments between adjacent profiles • Possible errors in image interpretation due to large signal amplitude variations (levels of grey)	Paillard et al. (1993); Kenny et al. (2003); Clabaut et al. (2006)

					• Quick execution		
Survey tool	**Depth range**	**Surface area**	**Resolution**	**Efficiency**	**Advantages**	**Limits**	**References**
Single-beam acoustic sonar	Below 10 m		From 0.5 m	1.5km²/hour	• Good geo-referencing • Quick execution	• Low discrimination between habitats • Lower reliability compared to satellite techniques	Kenny et al. (2003); Riegl and Purkis (2005)
Multi-beam acoustic sonar	Below 2-8 m	From large (50-100 km²) to small areas (a few hundred square meters)	From 50 cm	0.2 km²/hour	• Possibility to obtain 3D image of a meadow • Data on biomass per surface area unit can be obtained • Huge amount of data collected	• Efficient computer systems for processing and archiving data are needed • Possible errors in image interpretation	Kenny et al. (2003); Komatsu et al. (2003)
Transect or permanent square frames (quadrates)	Depths easily accessible by scuba diving (0-40 m, according to local rules on scientific diving)	Small areas, usually between 25 m^2 to 100 m² for permanent square	From 0.1 m	0.01 km²/hour	• Very high resolution and detail in the information collected • Possibility to identify small structures (patches) and to localize population boundaries • Ground-truthing of the remote sensing data	• Many working hours • Small areas mapped • Necessity of numerous observers to cover larger areas	Pergent et al. (1995a); Montefalcone et al. (2006)

					• Possibility to do simultaneous monitoring		
Video camera (ROV or towed camera)	Whole bathymetric range of seagrass distribution	Small areas, usually under 1 km²	From 0.1 m	0.2 km²/hour	• Very high resolution • Easy to use • Possibility to record seafloor images for later interpretation	• Long time to gain and process data • Positioning errors due to gap between the vessel position and the camera when towed	Kenny et al. (2003); Diaz et al. (2004)

Survey tool	Depth range	Surface area	Resolution	Efficiency	Advantages	Limits	References
Laser-telemetry	Depths easily accessible by scuba diving (0-40 m, according to local rules on scientific diving)	Small areas, under 1 km²	Some centimetres	0.01 km²/hour	• Very accurate localization of population boundaries or remarkable structures • Possibility to do simultaneous monitoring	• Range limited to 100 m in relation to the base, and thus no possibility to work over large areas • Necessity of markers on the seafloor for positioning the base when monitoring over time is requested • Possible acoustic signal perturbation due to large variations in temperature or salinity • Specific training on the equipment is requested	Descamp et al. (2005)

GIB (GPS intelligent buoy)	Depths easily accessible by scuba diving (0-40 m, according to local rules on scientific diving)	Small areas, under 1 km²	Some centimetres		• Same characteristics as for laser-telemetry, but with a greater range (1.5 km)	• Quite difficult technique • Need of many related equipments, and of a team of divers	Descamp et al. (2005)

1) Optical data

23. Satellite images are gained from satellites in orbit around the earth. Data is obtained continuously and today it is possible to buy data (sometimes subscribe for free) that can reach a very high resolution (Tab. 2). It is also possible to ask for specific programming of the satellite (programmed to pass over an identified sector with particular requirements), but this will require much higher costs.

24. The rough data must undergo a prior geometrical correction to compensate for errors due to the methods the images are obtained (e.g., errors of parallax, inclination of the satellite) before it can be used. Images already geo-referenced can also be obtained even if their cost is much higher than the rough data. The use of satellite images for mapping seagrass meadows requires knowledge of satellite image analysis software (e.g., ENVI, ErdasGeomatica), mastery in the use of the water column correction algorithm (Lyzenga, 1978), and mastery with pixel-based remote sensing supervised classifiers, for example, the OBIA (Object-Based Image Analysis) classification algorithm.

Table 2: Types of satellites and resolution of the sensors used for mapping seagrass meadows.

Satellite	Resolution	References
LandSat 8	30 m	Dattola et al. (2018)
Sentinel 2A - 2B	10 m	Traganos and Reinartz (2018)
PLANET	3 m	Traganos et al. (2017)
SPOT 5	2.5 m	Pasqualini et al. (2005)
IKONOS (HR)	1.0 m	Fornes et al. (2006)
QuickBird	0.7 m	Lyons et al. (2007)
Geoeyes	0.5 m	Amran (2017)

25. Given the changes in the light spectrum depending on the depth, satellite telemetry can be used for mapping shallow meadows (see Tab. 1). In clear waters the maximum depths reached can be:

- With the blue channel up to approx. 20-25 m depth
- With the green channel up to 15-20 m
- With the red channel up to 5-7 m
- Channel close to the infra-red approx. from tens of centimetres up to 20 m.

26. Although the spatial resolution of satellite imagery has significantly improved in the last decade, the data collected is still not sufficient for medium to small coastal dynamics. The resolution of the LandSat-8 satellite is not adequate to reach high resolution mappings of seagrass meadows. However, the image LandSat-8 OLI represents a useful tool to estimate the presence/absence of broad seagrass meadows; moreover, LandSat has a historical series of images useful to perform a multitemporal study. For these reasons, it has been suggested to consider the Sentinel-2 satellites of the Copernicus program. The Sentinel-2 satellites have a 13-band multispectral sensor (between visible and near infrared), the spatial resolution varies between 10 and 60 m and the satellite revisiting time in the same area is 5 days (while is 18 days for LandSat). Specifically, for mapping *Posidonia oceanica* meadows, various application tests demonstrated the good applicability of the Sentinel-2 image, at 10 m resolution, for an effective evaluation of the meadows' extent (Dattola et al., 2018; Traganos and Reinartz, 2018). The use of Sentinel-2 images, at the Mediterranean scale, can allow measuring the extent of the *P. oceanica* meadows habitat and verify any possible variations over time. The Sentinel-2 images are also useful for the analysis of pressure and impact drivers.

27. Multispectral or hyperspectral imaging is based on images collected simultaneously and composed of numerous close and contiguous spectral bands (generally 100 or more). There is a wide variety of airborne sensors (e.g., CASI1[1], Deaedalus Airborne Thematic Mapper; Godet et al., 2009), which provide data in real time, also during unfavourable lighting conditions (Tab. 1). It is possible to create libraries with specific spectral responses to measure values compared to distinct component species and appraise the vegetation cover (Ciraolo et al., 2006; Dekker et al., 2006).

28. Aerial images obtained through various means (e.g., airplanes, ULM) may have different technical characteristics (e.g., shooting altitude, verticality, optical quality). Even though it is more expensive, shooting films from a plane, equipped with an altitude and verticality control system and using large size negatives (24 × 24), allows for high quality results (i.e., increase in the geometrical resolution). For example, on a photo at the scale 1/25000 the surface area covered is 5.7 km × 5.7 km (Denis et al., 2003). Given the progress made in the last few decades in terms of shooting (e.g., the quality of the film, filters, lens) and the following processing (e.g., digitalization, geo-referencing), aerial photographs represent today one of the most preferred surveying methods for mapping shallow seagrass meadows (Mc Kenzie et al., 2001).

29. Recent applications of very fine resolution Unmanned Aerial Vehicles (UAVs), usually referred to as “drones”, have shown effectiveness for mapping and for detecting changes in small patches and seascape features of seagrass meadows, at the scale and resolution that would not be possible with satellite or aerial photography (James et al., 2020). The application of UAVs for mapping and monitoring of seagrass habitats is limited by the optical characteristic of the water (e.g., turbidity) and environmental conditions (e.g., solar elevation angle, cloud cover, wind speed) during image acquisition (Rende et al., 2020 and references therein), and is therefore limited to shallow waters characterization. Imagery acquired by UAVs coupled with structure-from-motion (SfM) photogrammetry, has recently been extensively tested and validated for the mapping of the upper limits of seagrass meadows, as they offer a rapid and cost-effective tool to produce very high-resolution orthomosaics and maps of coastal habitats (Ventura et al., 2018).

2) Only recently the importance to integrate different methodological techniques (i.e., multispectral satellite, drone, multibeam echosounder, underwater towed video camera, autonomous surface vehicle) in a multi-scale approach for mapping seagrass meadows has been highlighted, as it allows for the acquisition of data with very high resolution and accuracy (Rende et al., 2020). An immediate advantage is related to the collection of large-scale remote sense data (with optic and acoustic methods), combined with images from underwater photogrammetry cameras for ground-truth, which ensures very high accuracy in both shallow and deep waters. At present, an integrated approach is the best option for seagrass mapping, as it offers a greater modularity in function of the spatial scales and allows optimizing costs, always maintaining the primary objective of high-resolution seafloor and habitat mapping, from the coastline to deeper water. *Acoustic data*

30. Sonar provides images of the seafloor through the emission and reception of ultrasounds. Among the main acoustic mapping techniques, Kenny et al. (2003) distinguishes: (1) wide acoustic beam systems like the Side Scan Sonar (SSS), (2) single-beam echosounder (3), multiple narrow beam bathymetric system, and (4) multi-beam echosounder.

31. Side Scan Sonar (SSS) tow-fish (transducer), with its fixed recorder, emits acoustic signals. The obtained images, or sonograms, visualize the distribution and the boundaries of the different entities over a surface area of 100 to 200 m along the pathway (Clabaut et al., 2006; Tab. 1). The resolution of the final map partly depends on the means of positioning used by the vessel (e.g., radio localisation or satellite positioning). The existence of a sonogram atlas (Clabaut et al., 2006) could help interpreting the data and differentiating among habitats or substrate typologies. Although this method has strong limitations in shallow waters (Tab. 1), a side scan sonar array able to efficiently map seagrass beds residing in 1 m or less of water has been recently developed (Greene et al., 2018).

[1]CASI: Compact Airborne Spectrographic Imager

32. Single-beam echosounder is based on the simultaneous emission of two frequencies separated by several octaves (38 kHz and 200 kHz) to obtain the seafloor characterisation and the bathymetric profile. The sounder's acoustic response is different depending on whether the sound wave is reflected by an area covered or not covered by vegetation.

33. Multi-beam echosounder may precisely and rapidly provide: (i) topographical images of the seafloor (bathymetry), (ii) sonar images representing the local reflectivity of the seafloor as a consequence of its nature (backscatter). The instrument simultaneously measures the depth in several directions, determined by the system's receiver beams. These beams are perpendicular to the axis of the ship. The seafloor can thus be explored over a wide band (5 to 7 times the depth) with a high degree of resolution. A high-resolution 3D structure of the seafloor is also obtained (the digital elevation model, DEM), where meadows can be visualized and the biomass can be evaluated (Komatsu et al., 2003). Other derived products can be slope, aspect, curvature, and terrain ruggedness maps. Multi-beam echosounders surveys are also limited in very shallow waters, and especially at depths lower than 5 m where vessel navigation might be difficult and dangerous and the swath coverage is very limited (generally, it is 3-4 times the depth of the seabed; Rende et al., 2020).

3) Samplings and visual surveys

34. Field samples and direct underwater observations provide discrete punctual data (sampling of distinct points regularly spread out in a study area). They are vital for ground-truthing the instrumental surveys, and for the validation of continuous information (i.e., having a complete coverage of surface areas) obtained through interpolation methods from data collected on limited portions of the study area or along the pathway. Field surveys must be sufficiently numerous and distributed appropriately to obtain the necessary precision, also in view of the heterogeneity of the habitats. In the case of meadows of *Cymodocea nodosa*, *Posidonia oceanica*, *Zostera marina* or *Zostera noltei*, destructive sampling (using dredger buckets, core samplers, trawls, dredgers) are forbidden given the protected character of these species (UNEP/MAP, 2009) and direct underwater samples (e.g., shoot samples) should be limited as much as possible.

35. Observations from the surface can be made by observers on a vessel using, for instance, a bathyscope, or underwater by using visual techniques such as photography and video recording. Video-photography plays a valuable role in seagrass research, as a non-destructive technique and especially in fine and meso-scale studies. Photographic equipment and video cameras can also be mounted on a platform structure (sleigh) or within the remotely operated vehicle (ROV). The camera on the platform is submerged at the back of the vessel and is towed by the vessel that advances very slowly (under 1 knot), allowing for the collection of long video transects; on the contrary the ROVs have their propulsion system and are remotely controlled from the surface and allow recording comparatively shorter video transects. Recent development in underwater photogrammetry and 2D photo mosaicing (i.e., merging several images of the same scene into a single and larger composite image photo mosaic by aligning and stitching photographs together) provided an ultrafine scaling methodology for micro-chartography and for monitoring activities in the short term to assess current regression/progression of individual meadows, such as using permanent squares or for monitoring the meadow boundaries (Rende et al., 2015). To acquire overlapping pictures, ensuring about 75% of shared coverage between two consecutive photos, the vessel needs to maintain a speed of about 1 knot/h. The use of towed video cameras (or ROVs) during surveys makes it possible to see the images on the screen in real time, to identify specific features of the habitat and to evaluate any changes in the habitat or any other characteristic element of the seafloor. This preliminary video survey may also be useful to locate sampling stations. Recorded images are then reviewed to obtain a cartographical restitution on a GIS platform for each of the areas surveyed. To facilitate and improve the results obtained with the camera, joint acquisition modules integrating the depth and images of the seafloor with geographical positioning have been developed (UNEP/MAP-RAC/SPA, 2015).

36. *In situ* direct underwater observations by scuba diving represent the most reliable, although time-consuming, surveying technique. Surveys can be done along lines (transects), or over

small surface areas (permanent square frames, i.e., quadrates) positioned on the seafloor and located to follow the habitat limits. The transect consists of a marked line wrapped on a rib and laid on the bottom from fixed points and in a precise direction, typically perpendicular or parallel to the coastline (Bianchi et al., 2004). Any changes in the habitat and in the substrate typology, within a belt at both sides of the line (considering a surface area of about 1-2 m per side), are recorded on underwater slates (Fig. 4). The information registered allows precise and detailed mapping of the sector studied (Tab. 1).

37. Marking the limits of a meadow also allows obtaining a distribution map. Laser-telemetry is a valuable technique for highly precise mapping surveying over small surface areas (Descamp et al., 2005). The GIB system (GPS Intelligent Buoys) consists of 4 surface buoys equipped with differential GPS receivers and submerged hydrophones. Each of the hydrophones receives the acoustic impulses emitted periodically by a synchronized pinger installed on-board the underwater platform and recorded their arrival times. Knowing the moment of emission of these signals and the sound propagation speed in the water, the distances between the pinger and the 4 buoys is directly calculated. The buoys communicate via radio with a central station (typically on-board a support vessel) where the position of the underwater target is computed and displayed. The depth is also indicated by the pressure sensor (Alcocer et al., 2006). To optimize meadows mapping operations, the pinger can also be fixed on a submarine scooter driven by a diver. The maximum distance of the pinger in relationship to the center of the polygon formed by the 4 buoys can be approx. 1500 m (UNEP/MAP-RAC/SPA, 2015).

38. Freediving monitoring with a differential GPS can also be envisaged to locate the upper limits of the meadows. The diver precisely follows the contours of the limits and the GPS continuously records the diver's geographical position. The mapping data is integrated on a GIS platform using the route followed. The acquisition speed is 2-3 km/hour, the sensor precision can be sub metric (UNEP/MAP-RAC/SPA, 2015).*In situ* direct underwater observations by scuba diving along a depth transect perpendicular to the coastline (© Monica Montefalcone).

Data interpretation

39. The recent EU projects on habitat mapping (MESH, 2007; Vasquez et al., 2021a, b) identified four essential stages to produce a habitat map:

- Processing, analysis and classification of the biological data, through a process of interpretation of acoustic and optical images, when available;
- Selecting the most appropriate physical layers (e.g., substrate, bathymetry, hydrodynamics);
- Integration of biological data and physical layers, and use of statistical modeling to predict seagrass distribution and interpolate information;
- The map produced must then be evaluated for its accuracy, i.e., its capacity to represent reality, and its reliability.

40. During the <u>processing, analysis and classification stage</u>, pixels in the image (obtained from both optical and acoustic methods) are given a thematic label as belonging to groups that have either been defined by the user or generated by algorithm models to automate the classification process (Rowan and Kalacska, 2021). Object-Based Image Analysis (OBIA) differs from traditional pixel-based classification methods (maximum likelihood classifiers) because these latter techniques group similar, neighboring pixels into distinct image objects within designated parameters. A typical OBIA workflow involves firstly image segmentation (sequence of processes that are executed in a defined order including segmentation parameters that create meaningful objects made up of multiple neighbouring pixels sharing similar spectral values) and secondly classification of the segmented data through a multiresolution segmentation algorithm that generates objects with similar information by using only the most important features identified (Rende et al., 2020). OBIA methodology allows classifying also underwater cover classes in a rapid, accurate and cost-effective

way, and represents to date an effective tool to obtain robust thematic maps of benthic communities. An automatic classification approach can also be applied to underwater photogrammetry (Marre et al., 2020). Images must be georeferenced and before performing the 3D processing, an image enhancement technique should be performed to minimize the effect of the water column on the underwater images. After the image enhancement step, a Structure-from-Motion (SfM) 3D reconstruction is performed using any commercial software available (Rende et al., 2020). Finally, a Multiview Stereo (MVS) algorithm can be used to produce a dense 3D point cloud from the refined intrinsic orientation and ground-referenced camera exterior orientation.

41. To label and classify benthic habitats on resulting maps, a standardised classification system must be used to ensure the uniformity and the readability of maps. The two recently updated lists of benthic marine habitat types should be consulted, which are: 1) the European Nature Information System (EUNIS) proposed for the European seas (available at https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification; Evans et al., 2016); and 2) the Barcelona Convention classification of marine benthic habitat types adopted for the Mediterranean region by the Contracting Parties (available at https://www.rac-spa.org/sites/default/files/doc_fsd/habitats_list_en.pdf; SPA/RAC-UN Environment/MAP, 2019a, b; Montefalcone et al., 2021). As seagrass assemblages are often small, they can only be identified with high (metric) precision mapping. The updated lists identify the specific "seagrass meadow" habitats that are also listed in the annex of the Habitats Directive (Directive 92/43/EEC), and which must be taken into consideration within the framework of the NATURA 2000 programs. The first original description of habitat types for the Mediterranean has been revised in 2015 (UNEP/MAP-RAC/SPA, 2015b), but a newly updated interpretation manual of all the updated reference habitat types for the Mediterranean region is under elaboration, which also provides the criteria for their identification. Habitats dominated by seagrass species listed in the updated Barcelona Convention classification system are the following (SPA/RAC-UN Environment/MAP, 2019a, b):

LITTORAL

MA3.5 Littoral coarse sediment

- MA3.52 Midlittoral coarse sediment
  - MA3.521 Association with indigenous marine angiosperms
  - MA3.522 Association with *Halophila stipulacea*

MA4.5 Littoral mixed sediment

- MA4.52 Midlittoral mixed sediment
  - MA4.521 Association with indigenous marine angiosperms
  - MA4.522 Association with *Halophila stipulacea*

MA5.5 Littoral sand

- MA5.52 Midlittoral sand
  - MA5.521 Association with indigenous marine angiosperms
  - MA5.522 Association with *Halophila stipulacea*

MA6.5 Littoral mud

- MA6.52 Midlittoral mud
  - MA6.52a Habitats of transitional waters (estuaries and lagoons)
  - MA6.521a Association with halophytes or marine angiosperms

INFRALITTORAL

MB1.5 Infralittoral rock

MB1.54 Habitats of transitional waters (estuaries and lagoons)

MB1.541 Association with marine angiosperms or other halophytes

MB2.5 Infralittoral biogenic habitat

MB2.54 *Posidonia oceanica* meadow

MB2.541 *Posidonia oceanica* meadow on rock

MB2.542 *Posidonia oceanica* meadow on matte

MB2.543 *Posidonia oceanica* meadow on sand, coarse or mixed sediment

MB2.544 Dead matte of *Posidonia oceanica*

MB2.545 Natural monuments/Ecomorphoses of *Posidonia oceanica* (fringing reef, barrier reef, stripped meadow, atoll)

MB2.546 Association of *Posidonia oceanica* with *Cymodocea nodosa* or *Caulerpa* spp.

MB2.547 Association of *Cymodocea nodosa* or *Caulerpa* spp. with dead matte of *Posidonia oceanica*

MB5.5 Infralittoral sand

MB5.52 Well sorted fine sand

MB5.521 Association with indigenous marine angiosperms

MB5.522 Association with *Halophila stipulacea*

MB5.53 Fine sand in sheltered waters

MB5.531 Association with indigenous marine angiosperms

MB5.532 Association with *Halophila stipulacea*

MB5.54 Habitats of transitional waters (estuaries and lagoons)

MB5.541 Association with marine angiosperms or other halophytes

MB6.5 Infralittoral mud sediment

MB6.51 Habitats of transitional waters (estuaries and lagoons)

MB6.511 Association with marine angiosperms or other halophytes

42. The selection of physical layers to be shown on maps and to be used for following predictive statistical analyses may be an interesting approach within the general framework of mapping seagrass habitats, and it would reduce the processing time, but it is still of little use for the Mediterranean meadows as only few of the classical physical parameters (e.g., substrate type, depth, salinity) are able to clearly predict the distribution of species (Fig. 5).

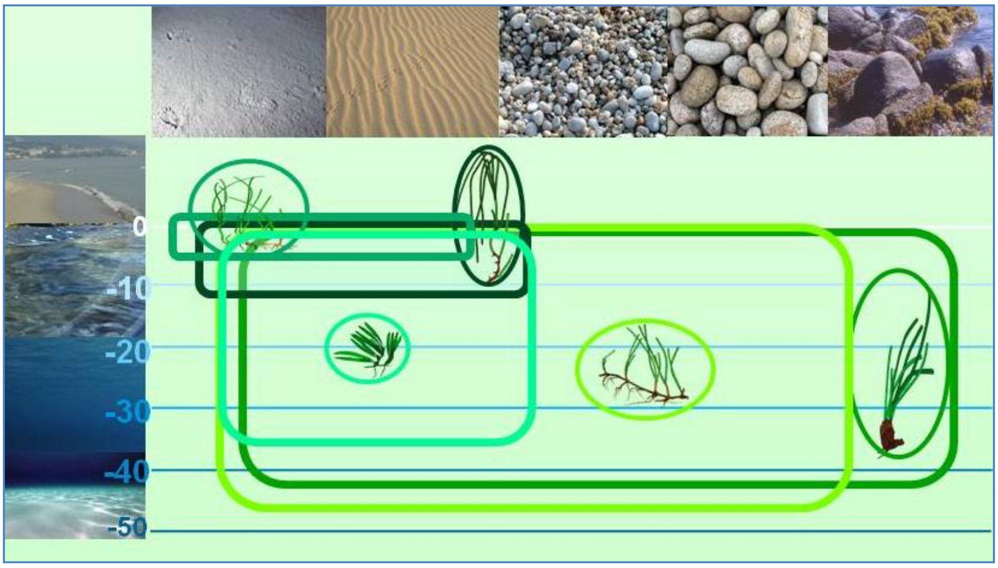


Figure 5: Distribution of seagrass species depending on the nature of the substrate and the depth in the Mediterranean (from UNEP/MAP-RAC/SPA, 2015a).

43. The data integration and modeling stage will differ depending on the survey tools and acquisition strategy used. Due to its acquisition rapidity, aerial techniques usually allow for a complete coverage of the littoral and shallow infralittoral zones and this dramatically reduces interpolation of data. On the contrary, surveys from vessels are often limited because of time and costs involved, and only rarely allow obtaining a complete coverage of the area. Coverage under 100% automatically means that it is impossible to get high resolution maps and therefore interpolation procedures must be used, so that from partial surveys a lower resolution map can be obtained (MESH, 2007; Fig. 6). Spatial interpolation is a geostatistical procedure for estimating data values at unsampled sites between actual data collection locations. Elaborating the final meadow distribution map on a GIS platform allows using different spatial interpolation tools and algorithms (e.g., Inverse Distance Weighted, Kriging) provided by the software. Even though this is rarely mentioned, it is important to provide information on the number and the percentage of data acquired on the field and the percentage of interpolations.An "overlapping" survey strategy combining a partial coverage of a large surface area and a more detailed coverage of smaller zones of particular interest could be an interesting compromise. Sometimes it might be enough to have a precise and detailed map only of the boundaries (upper and lower limits) of the meadow. The description between these two limits could be reduced to occasional field investigations leaving the interpolation to play its part (Pasqualini et al., 1998).

44. The processing and digital analysis of data (optical or acoustic) on GIS allow creating charts where each tonality of grey is associated with a specific texture representing a type of population/habitat, also based on *in situ* observations and sampling for ground-truthing. A final map is thus created, where it is possible to identify the bare substrate, hard substrate and seagrass meadows. Specific processing (e.g., analysis of the roughness, filtering, and thresholding) makes additional information accessible, such as the seagrass cover or the presence of anthropogenic signs (Pasqualini et al., 1999).

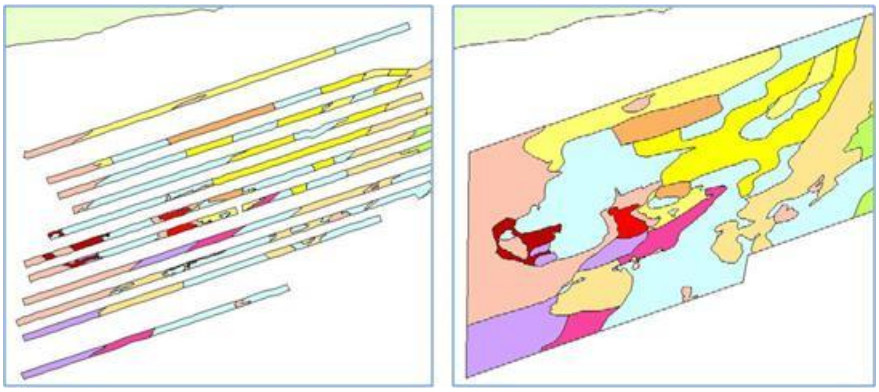


Figure 6: Example of partial coverage survey (left) and the output of the final map produced through interpolation (right). The area surveyed is about 20 km wide (from UNEP/MAP-RAC/SPA, 2015a).

45. To facilitate comparison among maps, standardized symbols and colors should be used for the graphic representation of the main seagrass assemblages (Meinesz and Laurent, 1978; Fig. 7). According to the newly updated classification of marine benthic habitat types for the Mediterranean region adopted by the Contracting Parties of the Barcelona Convention (available at https://www.rac-spa.org/sites/default/files/doc_fsd/habitats_list_en.pdf; SPA/RAC-UN Environment/MAP, 2019a, b; Montefalcone et al., 2021), all the habitats dominated by seagrass can be represented on maps using specific symbols and/or colors that can be labeled in the legend using their relative codes (e.g., code MB2.54: *Posidonia oceanica* meadow; code MB5.531: Association with indigenous marine angiosperms on fine sand in sheltered waters). When the cartographical detail is good enough, it is possible also to represent discontinuous meadows that are characterised by a cover below 50%, or the two main species that constitute a mixed meadow (the color of the patches allows identification of the species concerned). To represent some typical forms of *Posidonia oceanica* meadows (e.g., striped, atolls) no specific symbols are available being these forms (bands and circular structures, respectively) easily identifiable on the map.

46. On the resulting maps the seagrass habitat distributional range and its total extent (expressed in square meters or hectares) can be defined. These maps can also be compared with previous historical available data from the literature to evaluate any changes experienced by meadow over time (Mc Kenzie et al., 2001). Using the overlay vector methods on GIS, a diachronic analysis can be done, where temporal changes are measured in terms of percentage gained or lost in the meadow extension, through the creation of concordance and discordance maps (Barsanti et al., 2007).

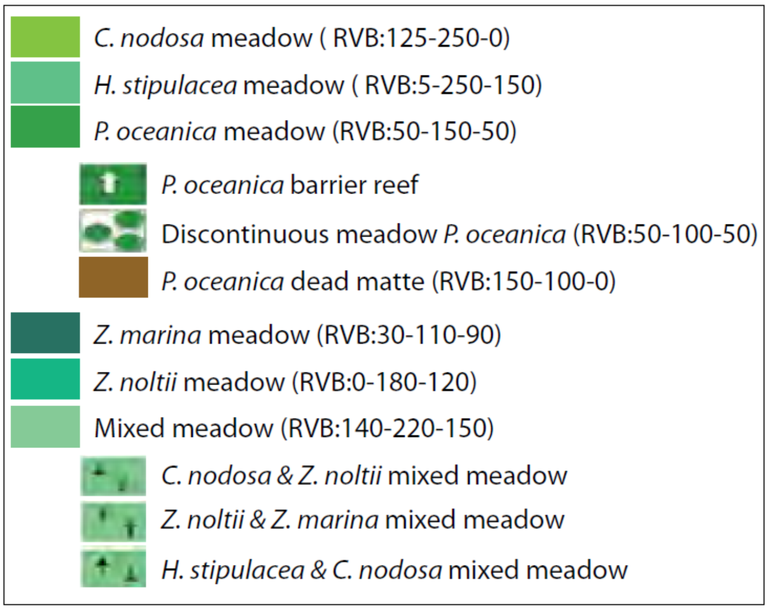


Figure 7: Examples of symbols and colours used for the graphic representation of the main seagrass assemblages. RVB: values in red, green, and blue for each type of meadow (from UNEP/MAP-RAC/SPA, 2015a).

47. The reliability of the map produced should also be evaluated. Several evaluation scales for reliability have already been proposed and may be helpful for seagrass meadows. Pasqualini (1997) proposed a reliability scale about the image processing of the aerial photos, which can also be applied to satellite images, or another scale in relation to the processing of sonograms (UNEP/MAP-RAC/SPA, 2015a). Reliability lower than or equal to 50% means that the author should try to improve the reliability of the data (for example increasing the number of segments during image processing) or maybe that the restitution scale needs to be adapted.

48. Denis et al. (2003) proposed a reliability index for the cartographic data based on the map scale (scale of 5), the positioning system (scale of 5) and the acquisition method (scale of 10) (UNEP/MAP-RAC/SPA, 2015a). The reliability index ranges from 0 to 20 and can vary from one point to another on the map, depending on the bathymetry and the survey technique used.

49. Leriche et al. (2001) proposed a reliability index rated from 0 to 50, which weighs three parameters: (i) the initial scale of the map (source map) and the working scale (target map), (ii) the method of data acquisition (e.g., dredges, grabs, aerial photography, side scan sonar, scuba diving), and (iii) the method of data georeferencing.

b) COMMON INDICATOR 2: Condition of the habitat's typical species and communities

Approach

50. Seagrasses are used as biological indicators of the water quality according to the European Water Framework Directive (WFD, 2000/60/EC), and as indicators of the environmental quality (i.e., condition of the habitat) according to the Marine Strategy Framework Directive (MSFD, 2008/56/EC) and the IMAP CI2related to EO1 "biodiversity". The CI2 is aimed at providing information about the condition (i.e., ecological status) of seagrass meadows.

51. Monitoring the ecological status of seagrass meadows is today mandatory and is even an obligation for numerous Mediterranean countries since:

- Four out of the five species present in the Mediterranean (*Cymodocea nodosa*, *Posidonia oceanica*, *Zostera marina*, and *Z. noltei*) are listed in the Annex II (list of endangered or threatened species) of the Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD protocol, Decision of the 16th Ordinary meeting of the Contracting Parties, Marrakech, 3-5 November 2009; UNEP/MAP, 2009);
- Three species (*C. nodosa, P. oceanica*, and *Z. marina*) are listed in the Annex I (strictly protected flora species) of the Bern Convention concerning the Mediterranean geographical region;
- Seagrass meadows are defined as priority natural habitats by the European Directive No. 92/43 (EEC, 1992).

52. This regulatory "recognition" also means that efficient management measures and conservation practices are required to ensure that these priority habitats, their constituent species, and their associated communities are and remain in a satisfactory ecological status. The good state of health of seagrass will then reflect the Good Environmental Status (GES) pursued by the Contracting Parties to the Barcelona Convention under the Ecosystem Approach (EcAp) and under the Marine Strategy Framework Directive (MSFD).

53. Defined and standardized procedures for monitoring the status of seagrass meadows, comparable to those provided for their mapping, should follow these three main steps:

1. Initial planning;
2. Setting-up the monitoring system;
3. Monitoring over time and analysis.

54. The <u>initial planning</u> is required to define the objective(s), determine the duration, identify the sites to be monitored, choose the descriptors to be evaluated with their acquisition modalities (i.e., the sampling strategy), and evaluate the human, technical and financial needs to ensure implementation and sustainability. This initial phase is therefore very important.

55. The <u>setting-up phase</u> is the concrete operational phase, when the monitoring program is set-up (e.g., positioning fixed markers) and realised. This phase may turn out to be the most expensive, including costs for going out to sea during field activities, equipment for sampling, and human resources, especially under difficult weather conditions. Field activities should be planned during a favourable season, also because some of the parameters chosen for monitoring purposes must be collected during the same period due to the seasonality in seagrass growth. This phase might be quite long, especially if numerous sites have to be monitored.

56. <u>Monitoring over time and data analysis</u> phase seems to be easy being the data acquisition a routinary operation, with no major difficulties if the previous two phases had been carried out correctly. Data analysis needs clear scientific competence. Duration of the monitoring, to be useful, must be medium time at least. This phase often constitutes the key element of the monitoring system as it makes possible to:

- Interpret the acquired data;
- Demonstrate its validity and interest;
- Check that the monitoring objectives have been attained.

57. Monitoring of seagrass meadows is linked with the conservation targets and with their use as ecological indicators of the quality of marine environment. The main aims of seagrass monitoring are generally:

- Preserve and conserve the heritage of marine priority habitats, with the aim of ensuring that seagrass meadows are in a satisfactory ecological status (GES) and to identify as early as possible any degradation of these priority habitats or any change in their distributional range and extent. Assessment of the ecological status of meadows allows measuring the effectiveness of local or regional environmental policies in terms of management of the coastal environment;
- Build and implement a regional integrated monitoring system of the quality of the environment, as requested by the IMAP during the implementation of the EcAp in the framework of the Mediterranean Action Plan. The main goal of IMAP is to gather reliable quantitative and updated data on the status of marine and coastal Mediterranean environments;
- Evaluate effects of any coastal activity and construction likely to impact seagrass meadows during environmental impact assessment (EIA) procedures. This particular kind of monitoring aims to establish the condition of the habitat at the time “zero” (i.e., before the beginning of activities), then the state of health of the meadow is monitored during the development of the work phase or at the end of the phase, to check for any impact on the environment evaluated as changes in the meadow state of health. The EIA procedure is not intended as a typical monitoring activity, although it provides the state of the system at the “zero” time, which can be very useful in the time series obtained during a monitoring programme. Unfortunately, most of the EIA studies are qualitative and are often performed by environmental consultants without specialized personnel, using unspecific guidelines and without following any standardised procedure, which prevent their use in effective monitoring programs.

58. The objective(s) of the monitoring system will influence the choices in the following steps (e.g., duration, sites to be monitored, descriptors, sampling methods; Tab. 3). In general, and irrespective of the objective advocated, it is judicious to focus initially on a small number of sites that are easily accessible and that can be regularly monitored after short intervals of time (Pergent and Pergent-Martini, 1995; Boudouresque et al., 2000). The sites chosen must be: i) representative of the portion of the coastal area investigated (e.g., nature of the substrate), ii) cover most of the possible range of environmental situations, and iii) include sensitive zones, stable zones, or reference zones. Then, with the experience gained by the surveyors and the means (funds) available, this network could be extended to a larger number of sites.

59. To ensure the sustainability of the monitoring system, the following final remarks must be taken into account:

- Identify the partners, competences and means available;
- Planning the partnership modalities (who is doing what? when? and how?);
- Ensure training for the stakeholders so that they can set up standardized procedures to guarantee the validity of the results, and so that comparisons can be made for a given site and among sites;
- Individuate a regional or national coordinator depending on the number of sites concerned for monitoring and their geographical distribution;

- Evaluate the minimum budget necessary for running the monitoring network (e.g., costs for permanent operators, temporary contracts, equipment, data acquisition, processing, and analysis).

Table 3: Monitoring criteria depending on the objectives.

Monitoring objective	Sites to be monitored	Descriptors	Monitoring duration and interval
Heritage conservation	Sites with low anthropogenic pressures or reference sites (i.e., MPAs, Sites of Community Interest) to get information on the natural evolution of the environment	• Extent of the meadow and depth of its upper and lower limits • Descriptors of the state of health of meadow (e.g., cover, shoot density)	• Medium and long term (min. 10 years) • Data acquisition at least annually for non-persistent species and every 2-3 years for perennial species
Monitoring environmental quality	Identify the main anthropogenic pressures likely to affect the quality of the environment and initiate monitoring in at least 3 sites, 2 reference/control sites and 1 impact site, all representative of the coastal area	• Physical descriptors of the quality of environment (e.g., water turbidity, enhancement in nutrients, nitrogen content of leaves and rhizomes, chemical contamination, trace metals in plant) • Descriptors of the state of health of meadow (e.g., cover, shoot density, lower limit depth)	• Medium term (5 to 8 years) • Data acquisition is variable depending on the species concerned (every 1-3 years)
Environmental impact assessment (EIA)	The site subject to coastal development or interventions. The selection of 2 reference/control sites might be also useful for comparison	• Specific descriptors to be defined depending on the possible effects of human activities on seagrass	• Short term (generally 1-2 years) • Initiate before the impact (“zero” time), it can be continued during, or just after the conclusion. A further control can be made one year after the conclusion

Methods

60. Descriptors basically provide information on the state of health of a meadow. A great number of descriptors has been proposed to assess the ecological status of seagrass meadow (e.g., Pergent-Martini et al., 2005; Foden and Brazier, 2007; Montefalcone, 2009; Orfanidis et al., 2010). Some of the most common descriptors (Tab. 4) use a standardized sampling method, especially for *P. oceanica* (Pergent-Martini et al., 2005), but there are still many disparities among data acquisition methods despite efforts to propose a common approach (Short and Coles, 2001; Buia et al., 2004; Lopez y Royo et al., 2010a). For each descriptor listed in Table 4, some bibliographic references are provided, where a detailed description of the sampling tools and methodologies can be found.

61. The many descriptors available for monitoring seagrass habitat (see Table 4) work at different ecological complexity levels (Montefalcone, 2009), which are from the highest to the lowest: the seascape (i.e., the whole habitat), the ecosystem, the associated community (e.g., leaf

epiphytes), the population (i.e., the meadow), the species (i.e., the plant), the cellular or physiological/biochemical level. At each ecological level, a pool of different descriptors and indices can be selected. The selection of the most appropriate descriptor/index should be made considering the specificity of the monitoring program and of its objectives, the means (also funds) available, and the duration of the activities. The best choice would be to combine two or more descriptors/indices to capture the various responses of the system to environmental conditions and to accurately define the health status of seagrass (Oprandi et al., 2019). Some ecological indices (see next section) working at the highest ecological levels have been recently developed. At the seascape level there are, for instance, the Conservation Index (Moreno et al., 2001), the Substitution Index and the Phase Shift Index (Montefalcone et al., 2007), and the Patchiness Index (Montefalcone et al., 2007); at the ecosystem level there is the EBQI (Personnic et al., 2014), while other ecological indices integrate different ecological levels, such as for instance the PREI (Gobert et al., 2009), the BiPo (Lopez y Royo et al., 2009), and the POMI (Romero et al., 2007).

62. Descriptors listed in Table 4 can be obtained using different methodologies and sampling approaches: i) on maps resulting from remote sensing surveys or visual inspections (e.g., meadow extent and depth of the limits); ii) *in situ* observations and measures by scuba diving (e.g., lower limit type, cover, rhizome baring, and shoot density); iii) direct sampling of plants (e.g., phenological descriptors). All methods requiring the direct sampling of plants for subsequent laboratory analyses are destructive, and thus the impact of the sampling procedure must be considered during the initial planning phase (Buia et al., 2004). Not-destructive procedures should be always preferred, especially in the case of protected species (e.g., *Posidonia oceanica*) and when the monitoring is carried out inside MPAs. However, when the monitoring objective is the assessment of environmental quality, descriptors capable to link the influence of pressures with the health status of the plants are necessary, which usually require the collection of shoots (e.g., descriptors working at the physiological/biochemical level). An effective monitoring should be done at intervals over a fixed period, even if it would mean a reduced number of sites and a reduced number of descriptors being monitored. Number of adopted descriptors should be adequate to avoid errors of interpretation, but sufficiently reduced to ensure permanent monitoring. Simultaneous application of various descriptors working at different ecological complexity levels is the best choice to understand most of the possible responses of the system to environmental alterations (Montefalcone, 2009; Oprandi et al., 2019). The nature of the descriptor is less important than its reproducibility, reliability and the precision of the method used for its acquisition.

63. *In situ* observations and samples must be done over defined and, possibly, standardized surface areas, and the number of replicates must be adequate for the descriptor involved and high enough to catch the heterogeneity of the habitat. The analyses at the species (the plant), cellular or physiological/biochemical level, and most of the analyses at the community level (i.e., the associated organisms of leaves and rhizomes) require collection of shoots. For *Posidonia oceanica*, the mean number of sampled shoots ranges between a minimum of 9 to a maximum of 18-21 shoots collected at each sampling station (Pergent-Martini et al., 2005). At each station, an equal number of shoots should be collected in three distinct areas tens of meters apart (e.g., 3 to 6 shoots per area, for a total of 9 to 18 shoots per station).

64. Among all the descriptors listed in Table 4, the shoot density is the most adopted, standardized and not-destructive descriptor in the *P. oceanica* monitoring programs (Pergent-Martini et al., 2005) (Fig. 8), because it provides important information about vitality and dynamic of the meadow and proved effective in revealing environmental alterations (Montefalcone, 2009). Meadow seascape is often patchy (at large spatial scale), but the meadow distribution within patches (medium to small spatial scales) can also be highly heterogeneous (Bacci et al., 2015). The size of the quadrate and the criteria used for randomly placing it on the bottom are crucial to standardize the method to measure shoot density. For measuring *P. oceanica* shoot density, two sizes of the quadrate are usually adopted: 40 cm × 40 cm and 20 cm × 20 cm. The use of a larger surface area (1600 cm^2) incorporate the small-scale meadow heterogeneity, increasing the variability between replicates and thus decreasing the sensibility of statistical test to detect differences between stations. The use of the

20 cm × 20 cm quadrate (400 cm^2) can reduce this small-scale variability increasing the probability to detect clear spatial patterns. The overall time required for data acquisition increases according to the quadrate size: counting shoots in a 40 cm × 40 cm quadrate is at least four times more time-consuming than in a 20 cm × 20 cm one (Bacci et al., 2015). Smaller quadrates are also easier to use and counting errors are less likely to happen. On the other hand, smaller quadrates require a larger number of replicates to catch the natural shoot density variability. Many studies showed that the use of the 20 cm × 20 cm quadrate is more effective than the use of the 40 cm × 40 cm or larger quadrates, as it allows reaching a better accuracy level given the same sampling effort (Charbonnel et al., 2000; Bacci et al., 2015). To speed the count of shoot density in very dense *P. oceanica* meadows (as usually occur in correspondence of the upper limit), as well as in very sparse meadows (in correspondence of the lower limits), the use of the smaller quadrate 20 cm × 20 cm is recommended. Similarly, the 20 cm × 20 cm quadrate is generally used to measure shoot density of other smaller seagrass species (e.g., *Cymodocea nodosa*, *Zostera noltei*). A minimum of 3 independent replicated counts should be done in each of the three distinct areas tens of meters apart, totalising 9 counts per station that are enough to catch the natural within patches variability. The 3 replicated quadrates in each area must be randomly located within homogeneous seagrass patches with maximum coverage. On the contrary, in the case of a patchy meadow, quadrates must be positioned randomly using a stratified sampling procedure on the vegetated patches, and the number of replicates can be increased with 6 replicated quadrates in each area, totalising 18 mesurements per sampling station.

65. Measuring the depth and defining the typology of both the upper and the lower limits of the meadow (Fig. 8), as well as monitoring over time their bathymetrical position with permanent marks (i.e., *balises*) are other commonly adopted procedures to assess the evolution of the meadow in term of stability, improvement or regression that is linked to water transparency, water movement, sedimentary balance, and human activities along the coastline.

66. An adequate number of sampling stations must be localised randomly within the meadow according to its extent, and usually in correspondence of the meadow upper limit, the meadow lower limit and at intermediate depth. As stated before, at each depth (i.e., station) 3 sampling areas must be selected, tens of meters apart. To assess the overall ecological condition of the meadow and to reduce the number of sampled shoots, shoots can be collected only at the intermediate depth of the meadow, which is usually located at about 15 m depth, where the meadow is expected to find the optimal conditions for its development (Buia et al., 2004). When the aim of the monitoring program includes biochemical measurements, a sampling station in the deepest portion of the meadow should also be included, since many sources of pressure are usually displaced to deep areas (e.g., wastewater treatment plants, fish farms). Due to the seasonality of most of the descriptors (especially for those linked with leaves growth), sampling activities should be carried out during the late spring or early summer season (Gobert et al., 2009).

67. Following the requirements of the WFD and the MSFD in the European countries, the ecological quality of the environment must be defined according to classification scales. For *P. oceanica* shoot density the absolute scale proposed for its classification (Pergent-Martini et al., 2005) has been adapted with the creation of five classes of ecological quality (bad, poor, moderate, good, and high; Annex 1) and can be used at the Mediterranean wide spatial scale, although it has been elaborated using data from *P. oceanica* meadows of France and Corsica. The absolute classification scale for the lower limit depth (Annex 1) is another valid tool to assess the meadow ecological status. Although all the existing absolute scales proposed for *P. oceanica* represent important standardized tools to classify the ecological status of meadows in the frame of the IMAP procedure and allow for the comparisons among regions, they could require some adaptations according to the specific geographical area and the morphodynamics setting of the site. It is more than likely that the threshold values fixed between classes are not valid at the whole Mediterranean scale: regional and even more local sub-regional scales should be defined (Montefalcone et al., 2007), providing the same methodologies and intercalibration procedures. For instance, in many *P. oceanica* meadows of the Ligurian Sea (NW Mediterranean), along the Spanish coast (NW Mediterranean), and of the North Aegean Sea (NE Mediterranean) (Marbà et al., 2014; Oprandi et al., 2019; Gerakaris

et al., 2021), the lower limit rarely reaches depths greater than 20-25 m, due to natural constrains (e.g., substrate typology, seafloor topography). Adopting the absolute scale proposed for the lower limit depth, all these meadows would be classified from moderate to bad ecological status, even in the case of low human pressure. Also the nitrogen (N) content in leaves is highly variable within meadows and shows a high natural variability among meadows in the Mediterranean. Each country/region is thus suggested to define proper local regional scales for the classification of each descriptor, which should also be compared with the absolute scales for the Mediterranean Sea to point out geographical patterns (Annex 1)

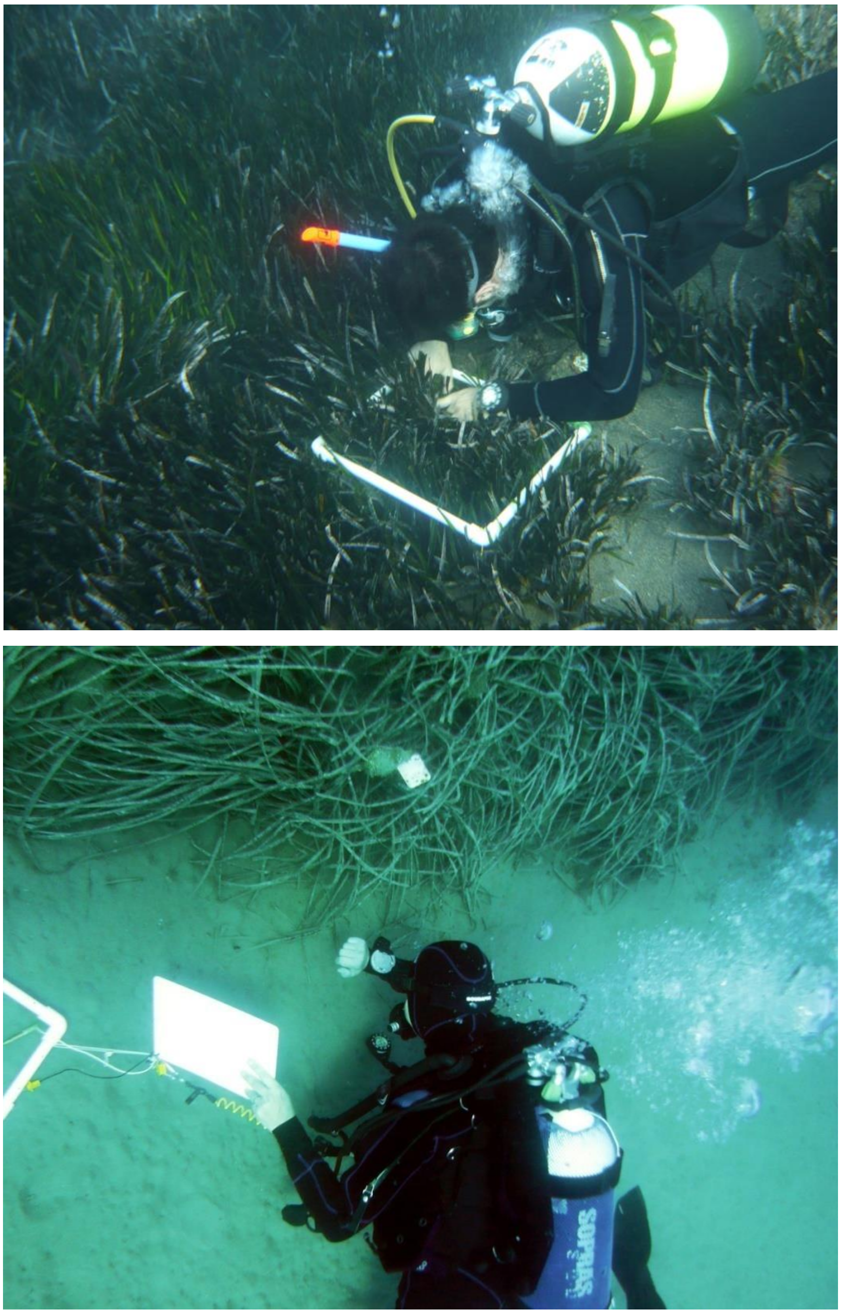


Figure 8: *In situ* measurement of *Posidonia oceanica* shoot density using a quadrate of 40 cm × 40 cm (upper panel, © Monica Montefalcone) and monitoring over time of the meadow lower limit position with permanent marks (lower panel, © Annalisa Azzola).

Table 4: Synthesis of main descriptors used in seagrass monitoring for defining the Common Indicator 2_Condition of the habitat. When available, the measuring/sampling method, the expected response in case of increased human pressure and the main factors likely to affect the response of the descriptor, the destructive nature of the method (Destr), the target species, the advantages and limits, and some bibliographic references are provided. The target species are: Cn = *Cymodocea nodosa*, Hs = *Halophila stipulacea*, Po = *Posidonia oceanica*, Zm = *Zostera marina*, Zn = *Zostera noltei*. The ecological complexity level at which each descriptor works is also indicated (i.e., seascape, population, species, cell, community).

Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Seascape level							
Meadow extent (i.e. surface area)	Mapping (Cf. Part "a" of this document) and/or definition of the meadow boundaries	• Reduction of the total meadow extent • Coastal development, turbidity, mechanical impacts	No	All	• Informative of many aspects of the meadow • Usable everywhere in view of the many techniques available • Cover the whole depth range of meadow distribution	• For slow growing species (Po) needs of pre-positioning markers to evaluate change in meadow extent, and long response time (several years) • Sampling must be done during the season of maximum distribution for species with marked seasonal growth (generally in summer)	Foden and Brazier (2007)
Population (meadow) level							
Bathymetric position of the meadow upper limit (in m) and its morphology	A detailed mapping of the seagrass upper limit landward (Cf. Part "a" of this document) or placing fixed markers (e.g., permanent blocks, acoustic system)	• Shift of the upper limit at greatest depths • Coastal development and direct destruction	No	All	• Easily measured (also by scuba diving) • Morphology of this limit may reflect environmental conditions	• For Cn, Hs and Zn, strong seasonal variability, requiring periodical monitoring or observations during the same season on all sites • Fixed markers (*balises*) might disappear if the	Pergent et al. (1995); Montefalcone (2009)

						site is strongly frequented	
Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Bathymetric position of the meadow lower limit (in m)	A detailed mapping of the seagrass lower limit seaward (Cf. Part "a" of this document) or placing fixed markers (e.g., permanent blocks, acoustic system)	• Shift of the lower limit landward at shallower depths • Water turbidity	No	All	• Easily measured (also by scuba diving) • Absolute classification scale available for Po	• For Cn, Hs and Zn, strong seasonal variability, requiring periodical monitoring or observations during the same season on all sites • Beyond 30 m depth, underwater surveys are difficult and costly (limited diving time, need for experienced divers, numerous dives requested) • Fixed markers (*balises*) might disappear (e.g., by trawling) • For slow growing species (Po) long time required to see any progress (several years)	Pergent et al. (2008); Annex 1

Meadow lower limit morphology	*In situ* visual observations	• Change in morphology • Water turbidity, mechanical damages (e.g., trawling)	No	Po	• Well known descriptor • Several morphologies described • Absolute classification scale for Po	• Good knowledge of Po meadows necessary to identify some of the morphologies • Beyond 30 m depth, underwater surveys are difficult and costly (limited diving time, need for experienced divers, numerous dives requested)	Boudouresque and Meinesz (1982); Pergent et al. (1995); Montefalcone (2009); Annex 1
Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Presence of inter-matte channels and dead matte areas	High resolution and detailed mapping of the area (Cf. Part "a" of this document, permanent square frames) and/or *in situ* observations	• Increase in the extent • Mechanical damages (e.g., anchoring, fishing gear)	No	Po	• Surface areas can be easily measured on maps	• Dead matte areas are natural components intrinsic in some typologies of meadows (e.g., striped meadows) and do not reflect systematically human influence	Boudouresque et al. (2006)
Density (shoots · m^{-2})	No. of shoots counted underwater within a square frame (a quadrate of fixed dimension) by divers. The square size depends on the seagrass species and on the meadow density. For *P. oceanica* the most adopted sizes are 40 cm × 40 cm and 20 cm × 20 cm	• Reduction • Water turbidity, mechanical damages (e.g., anchoring)	No	All	• Easily measured • Low-cost • Can be measured at all depths that can be safely reached by scuba diving • Absolute classification scale available for Po	• Strong variability with depth • Long acquisition time for densities over 800 shoots per square meter • Many replicates necessary to evaluate meadow heterogeneity • Considerable risk of error if: a) the surveyor is inexperienced; b) high	Duarte and Kirkman (2001); Pergent-Martini et al. (2005); Pergent et al. (2008); Bacci et al. (2015); Annex 1

						density; c) small sized species. In this latter case *in situ* counting can be replaced by sampling over a given area and the counting can be done in the laboratory (but becoming a destructive technique)	
Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Cover (in %)	Average percentage of the surface area occupied (in vertical projection) by meadow in relation to the surface area observed. Various methods to visual estimate the cover *in situ* by divers or in laboratory (from photos or video). Variable observation surface area (0.16 to 625 m²), visualised by a quadrate or a transparent plate	• Reduction • Water turbidity, mechanical damages	No	All	• Rapid • On photos, possibility of comparison over time and less errors due to subjectivity • All depths • Estimated also from aerial images or sonograms at large spatial scale	• Strong seasonal and bathymetric variability • Comparison of data obtained using different methods and different observation surface areas is not always reliable due to the fractal nature of cover • Sampling strategy and design must include proper spatial variability • High subjectivity of *in situ* estimations	Buia et al. (2004); Pergent-Martini et al. (2005); Boudouresque et al. (2006); Romero et al. (2007); Montefalcone (2009)

Percentage of plagiotropic rhizomes	Counting of plagiotropic rhizomes on a defined surface area (e.g., 20 cm × 20 cm, which can be visualised by a quadrate)	• Increase • Mechanical damages (e.g., anchoring, fishing gear)	No	Cn, Po	• Easy, rapid, and low-cost • Absolute classification scale available for Po	• Mainly used at shallow depths (0-20 m)	Boudouresque et al. (2006); Annex 1
Species (plant) level							
Leaves surface area (cm² · shoot), and other phenological measures	Counting and measuring the length and width of the different types of leaves in each shoot (9 to 18-20 shoots according to the sampling design)	• Reduction of leaves surface area (Po) for overgrazing and human impacts • Increase in the length of leaves (Po, Cn) for nutrients enhancement	Yes	All	• Easy and low-cost • Possibility to measure the length of adult leaves (the most external leaves) *in situ* to avoid sampling • Absolute classification scale available for Po	• Strong seasonal variability • Strong individual variability and necessity to measure (and sample) an adequate number of shoots • Destructive sampling	Giraud (1977, 1979); Lopez y Royo et al. (2010b); Orfanidis et al. (2010); Annex 1
Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Necrosis on leaves (in %)	Percentage of leaves with necrosis, through observation in laboratory	• Increase • Increased contaminants concentration	Yes	Po	• Easy, rapid, and low-cost	• Necrosis is very rare in some sectors of the Mediterranean (e.g., Corsica littoral) • Destructive sampling	Romero et al. (2007)
State of the apex	Percentage of leaves with broken apex	• Increase • Overgrazing, mechanical impacts (e.g., anchoring)	No	Po	• Easy, rapid, and low-cost • Specific marks left by the bit of some animals are easily recognizable	• Not informative on the grazing pressure in the case of strong water movement and on old leaves	Boudoresque and Meinesz (1982)
Foliar production	For Po possibility, thanks to lepidochronology, to	• Reduction • Nutrients deficit, increase in	Yes (Po)	All	• For Po lepidochronology allows assessments at all depths	• Long time to analyse	Pergent (1990) ; Gaeckle et al.

(in mg dry weight · shoot^{-1} yr^{-1})	reconstruct number of leaves produced in one year, at present or in the past. For other species, measuring leaves through marking or by using the relationship bases length/leaves growth (Zm)	interspecific competition	No (Zm)		• Absolute classification scale available • For Zm the relationship bases length/leaves growth allows *in situ* non destructive measuring	• Monthly monitoring, or at least every season, is necessary • Destructive sampling for Po	(2006) ; Pergent et al. (2008)
Rhizome production (in mg dry weight · shoot^{-1} yr^{-1}) or elongation (in mm yr^{-1})	For Po possibility, thanks to lepidochronology, to reconstruct rate of growth or biomass per year	• Increase • Accumulation of sediments due to coastal development	Yes	Po	• Independent from season • Absolute classification scale available for Po	• Increase in the rhizome production can also be observed in reference sites in the absence of human impacts • Destructive sampling	Pergent et al. (2008); Annex 1
Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Burial or baring of the rhizomes (in mm)	Measuring the degree of burial or baring of rhizomes *in situ*, or the percentage of buried or bared shoots on a given surface area	• Increase in burial for increased sedimentation (e.g., coastal development, dredging) • Increase in baring for deficit in the sediment load	No	All	• Easily measured *in situ* • Not destructive and low-cost • Independent from the season		Boudoresque et al. (2006)
Cellular or physiological/biochemical level							
Nitrogen and phosphorus content (in %	Dosage through mass spectrometry and plasma torch in	• Increase • Nutriments enhancement	Yes	All	• Short response time to environmental changes	• Very expensive	Romero et al. (2007); Annex 1

dry weight) in plant tissues	different plant tissues (both leaves and rhizomes) after acid mineralisation (e.g., in rhizome for Po)				• Absolute classification scale for Po	• Analytical equipment and specific competence necessary • Destructive sampling	
Carbohydrate content (in % dry weight) in plant tissues and sediments	Dosage through spectrophotometry after alcohol extraction in different plant tissues (e.g., in rhizome for Po)	• Reduction • Human impacts	Yes	All	• Short response time to environmental changes • Absolute classification scale for Po	• Very expensive • Analytical equipment and specific competence necessary • Destructive sampling	Alcoverro et al. (1999, 2001); Romero et al. (2007); Annex 1
Trace metal content (in µg · g^{-1})	Dosage through spectrometry in different plant tissues (both leaves and rhizomes) after acid mineralisation	• Increase • Increased concentration of metallic contaminants	Yes	All	• Short response time to environmental changes • Absolute classification scale for Po	• Very expensive • Analytical equipment and specific competence necessary • Destructive sampling	Salivas-Decaux (2009); Annex 1
Descriptor	**Method**	**Expected response/factors**	**Destr**	**Target species**	**Advantages**	**Limits**	**References**
Nitrogen isotopic relationship (d^{15}N in ‰)	Dosage through mass spectrometer in different plant tissues after acid mineralisation (e.g., in rhizomes for Po)	• Increase for nutriments enhancement from farms and urban effluents • Reduction for nutriments enhancement from fertilizers	Yes	Po	• Short response time to environmental changes	• Very expensive • Analytical equipment and specific competence necessary • Destructive sampling	Romero et al. (2007)
Sulphur isotopic relationship (d^{34}S in ‰)	Dosage through mass spectrometer in different plant tissues (e.g., rhizomes of Po)	• Reduction • Human impacts	Yes	Po	• Short response time to environmental changes	• Very expensive • Analytical equipment and specific competence necessary	Romero et al. (2007)

						• Destructive sampling	
Community							
Epiphytes biomass (in mg dry weight · $shoots^{-1}$ or % dry weight · $shoots^{-1}$) and epiphytes cover (in %) on the leaves	Measure of biomass (µg · $shoots^{-1}$) after scraping, drying and weighing; estimate the epiphytes cover on leaves under a binocular; indirect estimation of biomass from epiphytes cover	• Increase • Nutriments enhancement from rivers, high touristic frequentation	Yes	All	• Easily measured • Low-cost (biomass and cover) • Absolute classification scale available for Po • Early-warning indicator	• Time-consuming • Strong seasonal and spatial variability • Specific analytical equipment (nitrogen content) necessary • Destructive sampling	Morri (1991); Pergent-Martini et al. (2005); Romero et al. (2007); Fernandez-Torquemada et al. (2008); Giovannetti et al. (2008, 2015)

68. The setting-up phase is the concrete operational phase of the monitoring program that starts with data acquisition. The observations and samplings during the acquisition phase or data validation of the cartographical surveys may also constitute an output of the monitoring system (Kenny et al., 2003), and cartography could also represent a monitoring tool (Tab. 4; Boudouresque et al., 2006).

69. At the regional spatial scale, two main monitoring systems have been developed: 1) the seagrass monitoring system (SeagrassNet), which has been established at a worldwide scale at the beginning of the year 2000 and covers all the seagrass species (Short et al., 2002); and 2) the "Posidonia" monitoring network started at the beginning of the 1980s in the Mediterranean (Boudouresque et al., 2006), which is specific to *Posidonia oceanica* but can be adapted to other Mediterranean species and for the genus *Posidonia* worldwide. The "Posidonia" monitoring network is still used today, with a certain degree of variability from one country to another and even more from a region to another, in at least nine Mediterranean countries and over 350 sites (Buia et al., 2004; Boudouresque et al., 2006; Romero et al., 2007; Fernandez-Torquemada et al., 2008; Lopez y Royo et al., 2010a). After the work carried out within the framework of the Interreg IIIB MEDOCC programme "Coherence, development, harmonization and validation of evaluation methods of the quality of the littoral environment by monitoring the *Posidonia oceanica* meadows", and the "MedPosidonia" programme set up by RAC/SPA, an updated and standardized approach for the *P. oceanica* monitoring network has been tested and validated (UNEP/MAP-RAC/SPA, 2009). The main differences between the two monitoring systems are:

- Within the framework of SeagrassNet, monitoring is done along three permanent transects, laid parallel to the coastline and positioned respectively (i) in the most superficial part of the meadow, (ii) in the deepest part, and (iii) at an intermediate depth between these two positions. The descriptors chosen (Short et al., 2002; Tab. 5) are measured at fixed points along each transect and every three months.
- Within the framework of the "Posidonia" monitoring network, measurements are taken (i) in correspondence of fixed markers placed along the lower limit of the meadow, (ii) at the upper limit, and (iii) at the intermediate and fixed depth of 15 m. The descriptors (Tab. 5) are measured every three years only if, after visual surveys, no visible changes in the geographical position of the limits are observed.

70. SeagrassNet allows compare the data obtained in the Mediterranean with the data obtained in other regions of the world, having a world-wide coverage on over 80 sites distributed in 26 countries (available at www.seagrassnet.org). However, this monitoring system is not suitable for large-size species (such as *Posidonia* genus) and for meadows where the lower limit is located beyond 25 m depth. This monitoring system has been set up only for one site in the Mediterranean (Pergent et al., 2007). The "Posidonia" monitoring network, in view of the multiplicity of descriptors identified (Tab. 5), allows comparing different meadows in the Mediterranean, and evaluating the plant's vitality and the quality of the environment where it grows. Other monitoring system, such as permanent transects with seasonal monitoring, or acoustic surveys, can be used in specific situations like the monitoring of lagoons (Pasqualini et al., 2006) or for the study of relict meadows (Descamp et al., 2009).

71. The sampling technique and the chosen descriptors define the nature of the monitoring (e.g., monitoring of chemical contamination in the environment, discharge into the sea from a treatment plant, effects of beach nourishments, general evaluation of the meadow state of health) (Tab. 4). There are no ideal methods for mapping or universal descriptors for monitoring seagrass meadows, but rather a great diversity of efficient and complementary tools. They must be chosen depending on the objectives, the species present and the local context. Independently from the descriptors selected, particular attention must be paid to the validity of the measurements made (acquisition protocol, precision of the measurements, reproducibility; Lopez y Royo et al., 2010a). The following data processing and interpretation phase is thus fundamental to ensure the good quality of the monitoring programme.

Table 5: Descriptors measured within the framework of the SeagrassNet, the “Posidonia” monitoring Network, and the MedPosidonia monitoring programs (Pergent et al., 2007).

Descriptors	SeagrassNet	“Posidonia” monitoring Network	MedPosidonia
Light	×		
Temperature	×		×
Salinity	×		
Lower limit	Depth	Depth, type, and cartography	Depth, type, and cartography
Upper limit	Depth	Depth, type, and cartography	Cartography
Density	12 measurements along each transect	Measurement at each of the 11 markers	Measurement at each of the 11 markers
% plagiotropic rhizomes		Measurement at each of the 11 markers	Measurement at each of 11 markers
Baring of rhizomes		Measurement at each of the 11 markers	Measurement at each of the 11 markers
Cover	12 measures along transect	At each marker using video (50 m)	Measurement at each of the 11 markers
Phenological analysis	12 measures along transect	20 shoots	20 shoots
Lepidochronological analysis		10 shoots	10 shoots
State of the apex		20 shoots	20 shoots
Biomass (g DW)	Leaves		
Necromass	Rhizome and scales		
Granulometry of sediments		1 measurement	1 measurement
% organic material in sediment		1 measurement	1 measurement
Trace-metal content			Ag and Hg

72. As a final remark, the IMAP should also consider the long-term organic carbon stored in seagrass sediments from both *in situ* production by photosynthetic activity and sedimentation of particulate carbon from the water column, known as “Blue Carbon” (Nellemann et al., 2009). The estimation of the Blue Carbon should consider above and below ground living and dead biomass and soil fine and coarse carbon. Recent findings, however, suggested clearly that most of the carbon stored in seagrass is in the soil, being the fractions stored as living tissue virtually negligible. Hence, soil stocks rather than biomass stocks should be the focus of assessment in Mediterranean seagrass. International guidelines had been provided for this estimation from the Blue Carbon Initiative and IUCN (Howard et al., 2014, IUCN, 2021). Following this, soil carbon is determined by soil depth, bulk density and % of organic carbon in the first meter of the soil. Advanced techniques for large scale Blue Carbon inventories using high resolution sub-bottom profilers have been recently developed in the Mediterranean (Monnier et al., 2020). In the case additional carbon sequestration would like to be estimated, the methodology proposed by lepidochronology (i.e., the ‘retro-datation’ of *Posidonia* rhizomes) will provide estimations on the plant growth and accretion rates over a short timescale (although it is often very variable). The sequestration rate calculated using the accretion rate should be determined using C^{14} to date the age at which soil was laid down. The following parameters are useful for the estimation of carbon contents in plant tissues:

- Leaf Biomass Index (Leaf Standing Crop) (dry weight · m^{-2}): it is calculated by multiplying the average leaf biomass per shoot by the density of the meadow reported per square meter;
- Leaf Surface Index (Leaf Area Index) ($m^2 \cdot m^{-2}$): it is calculated by multiplying the average leaf area per shoot by the density of the meadow reported per square meter;
- Height of the leaf canopy to be estimated by means of acoustic, optical, and *in situ* measurements.

73. Monitoring activities should also be planned on key typical species associated to seagrass meadows, such as for instance the bivalves *Pinna* spp. Given the critical situation of *P. nobilis* in the Mediterranean and the apparent incipient expansion of *P. rudis* within *P. oceanica* meadows, visual censuses of these species in monitored meadows should be seriously considered.

Data processing and interpretation

74. Measurements made *in situ* must be analysed and archived. Samples collected during field activities must be properly stored for following laboratory analyses. Data interpretation needs expert judgment and evaluation and can be made by comparing the measured data with the data available in the literature, either directly or through classification scales. Checking that the results obtained respond to the monitoring objectives (reliability and reproducibility of the results, valid interpretations and coherence with the observations made) is another important step to validate monitoring effectiveness.

75. The huge increase of studies on *Posidonia oceanica* (over 2700 publications indexed in the Web of Science on April 2021) means that in the last few decades a growing number of interpretation scales have been set up for the most widely used descriptors for monitoring this species (e.g., Giraud, 1977; Meinesz and Laurent, 1978; Pergent et al., 1995b; Pergent-Martini et al., 2005; Montefalcone et al., 2006, 2007; Montefalcone, 2009; Salivas-Decaux et al., 2010; Tab. 4).

76. As for cartography, an integration of the monitoring data into a geo-referenced information system (GIS), which can be freely consulted (like MedGIS implemented by RAC/SPA and the “Seagrass Atlas of Spain” available at http://www.ieo.es/es/atlas-praderas-marinas), is to be recommended and should be encouraged, so that the data acquired becomes available to the wider public and can be of benefit to the maximum number of users.

Ecological indices

77. Ecological synthetic indices are today widespread for measuring the ecological status of ecosystems given the Good Environmental Status (GES) achievement or maintenance. Ecological indices succeed in “capturing the complexities of the ecosystem yet remaining simple enough to be easily and routinely monitored” and may therefore be considered “user-friendly” (Montefalcone, 2009 and references therein). They are anticipatory, integrative, and sensitive to stress and disturbance. Many ecological indices had been employed in seagrass monitoring programs in the past, e.g., the Leaf Area Index (Buia et al., 2004), the Epiphytic Index (Morri, 1991). Following the requirements of the WFD, the MSFD, and the EcAp in the European countries, many synthetic indices have been set up to provide, based on a panel of different descriptors, a global evaluation of the environmental quality based on the “seagrass” biological quality element. The most adopted indices in the regional/national monitoring programs are the following (Tab. 6):

- POSWARE (Buia et al., 2005)
- POMI (Romero et al., 2007)
- POSID (Pergent et al., 2008)

- Valencian CS (Fernandez-Torquemada et al., 2008)
- PREI (Gobert et al., 2009)
- BiPo (Lopez y Royo et al., 2009)
- Conservation Index (CI) (Moreno et al., 2001)
- Substitution Index (SI) (Montefalcone et al., 2007)
- Phase Shift Index (PSI) (Montefalcone et al., 2007)
- Patchiness Index (PI) (Montefalcone et al., 2010)
- EBQI (Personnic et al., 2014)

78. Most of the ecological indices integrate different ecological levels (Tab. 6). The POSWARE index is based on 6 descriptors working at the population and species levels. The multivariate POMI index is based on a total of 14 structural and functional descriptors of *Posidonia oceanica,* from cellular to community level. The POSID index is based on 8 descriptors working at the community, population, species and cellular levels. Some of the descriptors working at the cellular level and used for computing the POMI and the POSID index are very time-consuming (such as the chemical and biochemical composition and the contaminants in plant tissues), thus showing little usage in the *P. oceanica* monitoring programs (Pergent-Martini et al., 2005). The Valencian CS index integrates 9 descriptors from species to community level. The PREI index is based on 5 descriptors working at the population, species and community levels. The BiPo index is based only on 4 non-destructive descriptors at the population and species levels and is particularly well suited for the monitoring of protected species or within MPAs.

79. Some not-destructive ecological indices have been developed to work at the seascape ecological level, such as the Conservation Index (CI; Moreno et al., 2001), the Substitution Index and the Phase Shift Index (SI and PSI, respectively; Montefalcone et al., 2007), and the Patchiness Index (PI; Montefalcone et al., 2010). The CI measures the proportional abundance of dead matte relative to living *P. oceanica* and can be used as a perturbation index (Boudouresque et al., 2006), although dead matte areas may also originate from natural causes (e.g., water movement). The SI has been proposed for measuring the amount of replacement of *P. oceanica* by the other common native Mediterranean seagrass *Cymodocea nodosa* and by the three species of green algae genus *Caulerpa*: the native *Caulerpa prolifera* and the two alien invaders *C. taxifolia* and *C. cylindracea*. The SI, applied repeatedly in the same meadow, can objectively measure whether the substitution is permanent or progressive or, as hypothesized by Molinier and Picard (1952), will in the long term facilitate the reinstallation of *P. oceanica*. While the application of the CI is obviously limited to those seagrass species that form a matte, the SI can be applied to all cases of substitution between two different seagrass species and between an alga and a seagrass. The PSI is another synthetic ecological index that identifies and measures the intensity of the phase shift occurring within the seagrass ecosystem; it provides a synthetic evaluation of the irreversibility of changes undergone by a regressed meadow. The biological characteristics and the reproductive processes of *P. oceanica* are not conducive to a rapid re-colonisation of dead matte (Meinesz et al., 1991). If a potentiality of recovery still exists in a meadow showing few and small dead matte areas, a large-scale regression of *P. oceanica* meadow must therefore be considered almost irreversible on human-life time scales. The PI has been developed to evaluate the degree of fragmentation of the habitat and uses the number of patches for measuring the fragmentation of seagrass meadows. All these seascape indices are useful tools for assessing the quality of coastal environments in their whole (as requested by the MSFD), not only for assessing the quality of the water bodies (as requested by the WFD).

80. One of the most recently proposed indices works at the ecosystem level (EBQI; Personnic et al., 2014). This index has been developed based on a simplified conceptual model of the *P. oceanica* ecosystem, where a set of 17 representative functional compartments have been

identified. The quality of each functional compartment is then evaluated by selecting one or two specific descriptors (most of them not destructive) and the final index value integrates all compartment scores. Being an ecosystem-based index, it complies with the MSFD and the EcAp requirements. However, its complete but also complex formulation makes this index more time-consuming when compared to other indices.

81. Intercalibration trials between the POMI and the POSID indices have shown that there is coherence in the classification of the sites studied (Pergent et al., 2008). Applying the BIPO index to 9 Catalonia sites yielded an identical classification to that obtained with the POMI index (Lopez y Royo et al., 2010c). Concurrent application of the POMI, PREI, BiPo, and Valencian CS in the Eastern Mediterranean Sea showed high comparability among indices (Gerakaris et al., 2017). Finally, using both the POSID and the BiPo indices within the framework of the “MedPosidonia” program, similar classifications of the meadows studied were found (Pergent et al., 2008). A recent exercise to compare several descriptors and ecological indices working at different ecological levels (species, population, community, and seascape) in 13 *P. oceanica* meadows of the Ligurian Sea (NW Mediterranean) showed a low consistency among the four levels, and especially between the plant (e.g., leaves surface) and the meadows (e.g., shoot density, lower limit depth) descriptors. Also, the PREI index showed inconsistency with most of the compared descriptors (Karayali, 2017; Oprandi et al., 2019). In view of this result, a concurrent use of more descriptors and indices, covering different levels of ecological complexity, should be preferred in any monitoring programme.

82. At the present state of knowledge, it is difficult to prefer one or another of these synthetic indices, as it has not yet been possible to compare all of them over several sites and to start wide intercalibration processes. As a general comment, those indices based on a high number of descriptors imply excessive costs in terms of acquisition time and budget required (Fernandez-Torquemada et al., 2008), although the use of a comparatively lower number of descriptors can lead to an oversimplification, particularly in those situations where specific pressures should be linked to the meadow state of health.

Table 6: Descriptors used in the mostly adopted synthetic ecological indices in the regional/national monitoring programs to evaluate the environmental quality based on the "seagrass" biological quality element. The ecological complexity level at which each descriptor works is also indicated (i.e., cellular, species, population, community, ecosystem, seascape).

Index	Cellular	Species	Population	Community	Ecosystem	Seascape
POSWARE		Width of the intermediate leaves; leaves production; rhizomes production and elongation	Shoot density; meadow cover			
POMI	P, N and sucrose content in rhizomes; $\delta^{15}N$ and $\delta^{34}S$ isotopic ratio in rhizomes; Cu, Pb, and Zn content in rhizomes	Leaf surface; percentage foliar necrosis	Shoot density; meadow cover; percentage of plagiotropic rhizomes	N content in epiphytes		
POSID	Ag, Cd, Pb, and Hg content in leaves	Leaf surface; Coefficient A; rhizomes elongation	Shoot density; meadow cover; percentage of plagiotropic rhizomes; depth of the lower limit	Epiphytes biomass		
Valencian CS		Leaf surface; percentage of foliar necrosis	Shoot density; meadow and dead matte cover; percentage of plagiotropic rhizomes; rhizome baring/burial	Herbivore pressure; leaf epiphyte's biomass		
PREI		Leaf surface; leaf biomass	Shoot density; lower limit depth and type	Leaf epiphytes biomass		
BiPo		Leaf surface	Shoot density; lower limit depth and type			
CI			Meadow and dead matte cover			Relative proportion between *Posidonia oceanica* and dead matte
SI			Meadow cover	Substitutes cover		Relative proportion between *P. oceanica* and substitutes

Index	**Cellular**	**Species**	**Population**	**Community**	**Ecosystem**	**Seascape**
PSI			Meadow and dead matte cover	Substitutes cover		Relative proportion of *P. oceanica*, dead matte and substitutes
PI						Number of seagrass patches
EBQI		Growth rate of vertical rhizomes	Shoot density; meadow cover		Biomass, density, and species diversity in all the compartments; grazing index	

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Annex 1

Absolute classification scales of the ecological status available in literature for some descriptors of *Posidonia oceanica* meadow

Meadow (population level)

Type of the lower limit (UNEP/MAP-RAC/SPA, 2009)

	High	Good	Moderate	Poor	Bad
Lower limit	Progressive	Sharp HC	Sharp LC	Sparse	Regressive

Type of the limit	**Main characteristics**
Progressive	Plagiotropic rhizome beyond the limit
Sharp – High cover (HC)	Sharp limit with cover higher than 25%
Sharp – Low cover (LC)	Sharp limit with cover lower than 25%
Sparse	Shoot density lower than 100 shoots · m^{-2}, cover lower than 15%
Regressive	Dead matte beyond the limit

Depth of the lower limit (in m) (UNEP/MAP-RAC/SPA, 2009)

	High	Good	Moderate	Poor	Bad
Lower limit	> 34.2	34.2 to 30.4	30.4 to 26.6	26.6 to 22.8	< 22.8

Meadow cover at the lower limit (in percentage) (UNEP/MAP-RAC/SPA, 2009)

	High	Good	Moderate	Poor	Bad
Lower limit	> 35%	35% to 25%	25% to 15%	15% to 5%8	< 5%

Shoot density (number of shoots · m^2) (Pergent-Martini et al., 2005)

Depth (m)	High	Good	Moderate	Poor	Bad
1	> 1133	1133 to 930	930 to 727	727 to 524	< 524
2	> 1067	1067 to 863	863 to 659	659 to 456	< 456
3	> 1005	1005 to 808	808 to 612	612 to 415	< 415
4	> 947	947 to 757	757 to 567	567 to 377	< 377
5	> 892	892 to 709	709 to 526	526 to 343	< 343
6	> 841	841 to 665	665 to 489	489 to 312	< 312
7	> 792	792 to 623	623 to 454	454 to 284	< 284
8	> 746	746 to 584	584 to 421	421 to 259	< 259
9	> 703	703 to 547	547 to 391	391 to 235	< 235
10	> 662	662 to 513	513 to 364	364 to 214	< 214
11	> 624	624 to 481	481 to 338	338 to 195	< 195
12	> 588	588 to 451	451 to 314	314 to 177	< 177
13	> 554	554 to 423	423 to 292	292 to 161	< 161
14	> 522	522 to 397	397 to 272	272 to 147	< 147
15	> 492	492 to 372	372 to 253	253 to 134	< 134
16	> 463	463 to 349	349 to 236	236 to 122	< 122
17	> 436	436 to 328	328 to 219	219 to 111	< 111
18	> 411	411 to 308	308 to 204	204 to 101	< 101
19	> 387	387 to 289	289 to 190	190 to 92	< 92
20	> 365	365 to 271	271 to 177	177 to 83	< 83
21	> 344	344 to 255	255 to 165	165 to 76	< 76
22	> 324	324 to 239	239 to 154	154 to 69	< 69
23	> 305	305 to 224	224 to 144	144 to 63	< 63
24	> 288	288 to 211	211 to 134	134 to 57	< 57
25	> 271	271 to 198	198 to 125	125 to 52	< 52
26	> 255	255 to 186	186 to 117	117 to 47	< 47
27	> 240	240 to 175	175 to 109	109 to 43	< 43
28	> 227	227 to 164	164 to 102	102 to 39	< 39
29	> 213	213 to 154	154 to 95	95 to 36	< 36
30	> 201	201 to 145	145 to 89	89 to 32	< 32
31	> 189	189 to 136	136 to 83	83 to 30	< 30
32	> 179	179 to 128	128 to 77	77 to 27	< 27
33	> 168	168 to 120	120 to 72	72 to 24	< 24
34	> 158	158 to 113	113 to 68	68 to 22	< 22
35	> 149	149 to 106	106 to 63	< 63	
36	> 141	141 to 100	100 to 59	< 59	
37	> 133	133 to 94	94 to 55	< 55	
38	> 125	125 to 88	88 to 52	< 52	
39	> 118	118 to 83	83 to 48	< 48	
40	> 111	111 to 78	78 to 45	< 45	

Plagiotropic rhizome at the lower limit (in percentage) (UNEP/MAP-RAC/SPA, 2009)

	High	Good	Moderate	Poor	Bad
Lower limit	> 70%	70% to 30%	< 30%		

Plant (species level)

Foliar surface (in cm² per shoot), between June and July (UNEP/MAP-RAC/SPA, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	> 362	362 to 292	292 to 221	221 to 150	< 150

Number of leaves produced per year (UNEP/MAP-RAC/SPA, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	> 8.0	8.0 to 7.5	7.5 to 7.0	7.0 to 6.5	< 6.5

Rhizome elongation (in mm per year) (UNEP/MAP-RAC/SPA, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	> 11	11 to 8	8 to 5	5 to 2	< 2

Cell (physiological/biochemical level): environment eutrophication

Nitrogen concentration in adult leaves (in percentage), between June and July (UNEP/MAP-RAC/SPA, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	< 1.9%	1.9% to 2.4%	2.4% to 3.0%	3.0% to 3.5%	> 3.5%

Organic matter in the sediment (in percentage, fraction 0.063 mm) (UNEP/MAP-RAC/SPA, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	< 2.5%	2.5% to 3.5%	3.5% to 4.6%	4.6% to 5.6%	> 5.6%

<u>Cell (physiological/biochemical level): environment contamination</u>

Argent concentration (mg per g DW), blade of adult leaves, between June and July (Salivas-Decaux, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	< 0.08	0.08 to 0.22	0.23 to 0.36	0.37 to 0.45	> 0.45

Cadmium concentration (mg per g DW), blade of adult leaves, between June and July (Salivas-Decaux, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	< 1.88	1.88 to 2.01	2.02 to 2.44	2.45 to 2.84	> 2.84

Mercury concentration (mg per g DW), blade of adult leaves, between June and July (Salivas-Decaux, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	< 0.051	0.051 to 0.064	0.065 to 0.075	0.075 to 0.088	> 0.088

Plumb concentration (mg per g DW), blade of adult leaves, between June and July (Salivas-Decaux, 2009)

Depth (m)	High	Good	Moderate	Poor	Bad
15 m	< 1.17	1.17 to 1.43	1.44 to 1.80	1.81 to 3.23	> 3.23

2. Guidelines for monitoring coralligenous and other calcareous bioconstructions in the upper circalittoral Mediterranean zone

Introduction

1. The calcareous formations of biogenic origin in the Mediterranean Sea are represented by coralligenous reefs, vermetid reefs, reefs of *Sabellaria* spp., serpulid reefs, cold water corals reefs in deep waters, encrusting Corallinales concretions/trottoirs made by *Lithophyllum byssoides*, *Titanoderma trochanter*, and *Tenarea tortuosa*, banks formed by the corals *Cladocora caespitosa*, *Astroides calycularis*, *Phyllangia americana mouchezii*, *Polycyathus muellerae,* reefs formed by the stylasteridae *Errina aspera*, bryozoan nodules and biostalactites within semi-dark and dark caves, and rhodoliths seabeds. Among all, coralligenous reefs (Fig. 1) and rhodoliths seabeds (Fig. 2) are the two most typical and abundant bioconstructed habitats that develop in the Mediterranean upper circalittoral zone (sometimes also in the lower littoral zone), built-up by coralline algal frameworks that grow in dim light conditions, for which inventorying and mapping methods, as well as monitoring protocols, still lack of homogeneity and standardization.

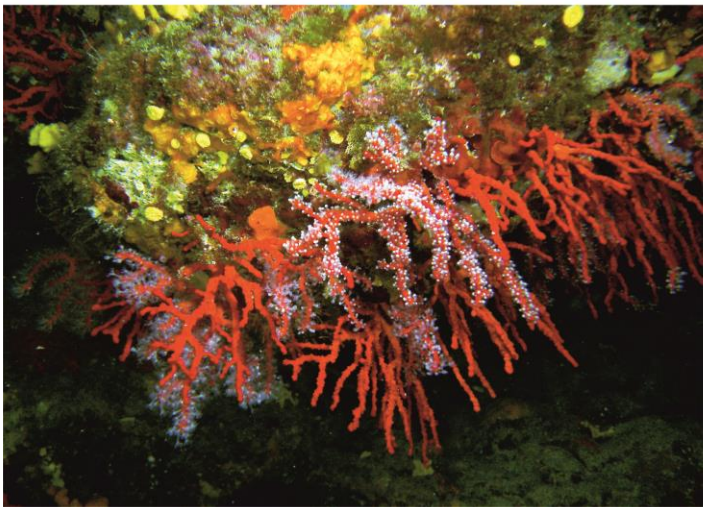

Figure 1: Coralligenous habitat dominated by the gorgonian *Paramuricea clavata* (upper panel © Simone Musumeci), and facies with *Corallium rubrum* in enclave in the coralligenous (lower panel © Monica Montefalcone).

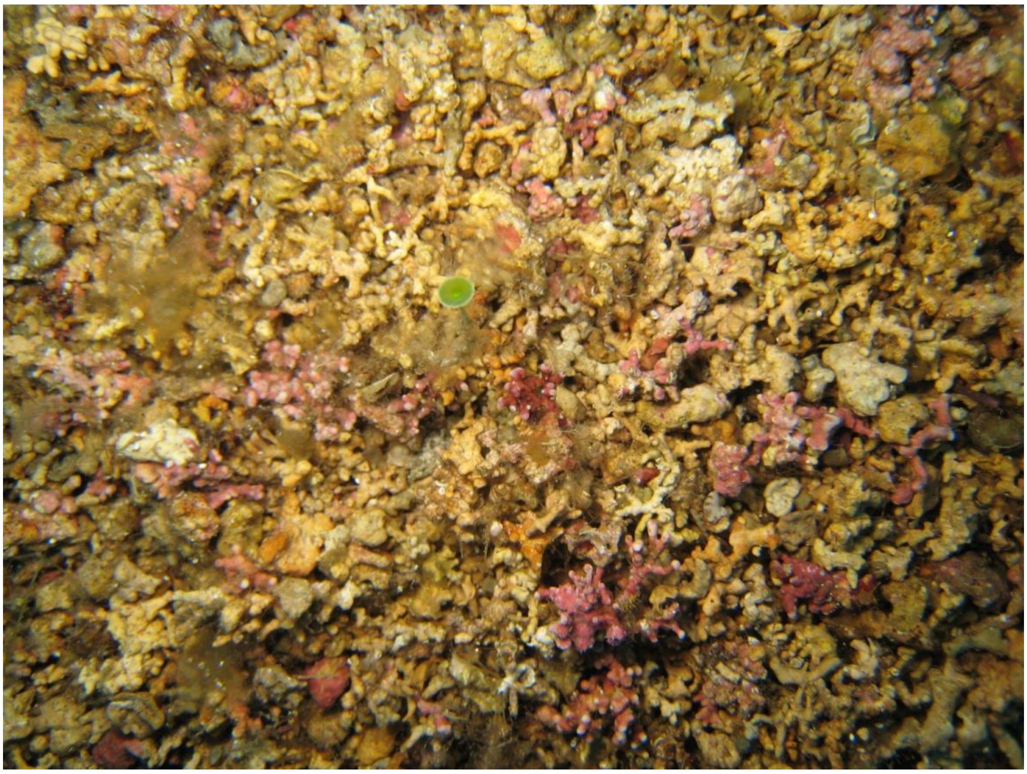

Figure 2: Rhodoliths habitat (photo from UNEP/MAP-RAC/SPA, 2015).

2. The most important and widespread bioconstruction in the Mediterranean Sea is represented by coralligenous reefs (UNEP/MAP-RAC/SPA, 2008), an endemic and characteristic habitat considered as the climax biocoenosis in the upper circalittoral zone (Pérès and Picard, 1964). Coralligenous is characterised by high species richness, biomass, and carbonate deposition values comparable to tropical coral reefs (Bianchi, 2001), and with high economic values (Cánovas-Molina et al., 2014). Construction of coralligenous reefs started during the post-Würm transgression, about 15000 years ago, and developed on rocky and biodetritic bottoms in relatively stable conditions of temperature, currents, and salinity.

3. Coralligenous reefs are distributed both on rocky and soft bottoms, developing different morphologies: i) coralligenous developing on the upper circalittoral rocks and at the entrance of caves with cliffs, outcrops, banks, rims, atolls; and ii) coralligenous developing over circalittoral soft/detritic bottoms creating biogenic platforms (Bonacorsi et al., 2012; Piazzi et al., 2019b). Coralligenous habitat results from the dynamic equilibrium between bioconstruction, mainly made by encrusting calcified Rhodophyta belonging to Corallinales and Peyssonneliales (such as species belonging to the genera *Lithophyllum*, *Lithothamnion*, *Mesophyllum*, *Neogoniolithon*, and *Peyssonnelia*), with an accessory contribution by serpulid polychaetes, bryozoans and scleractinian corals, and destruction processes (by borers and physical abrasion), which create a morphologically complex habitat where highly diverse benthic assemblages develop (Ballesteros, 2006). Light represents the main factor limiting bioconstruction, and coralligenous reefs can develop in dim light conditions (<3% of the surface irradiance), from about 20 m down to 120 m depth. Also, the upper mesophotic zone (where the light is still present, from 40 m to about 120 m depth), embracing the continental shelf, is shaped by extremely rich and diverse coralligenous assemblages dominated by animal forests that grow over biogenic rocky reefs.

4. Rhodoliths beds are composed by a variable thickness of free-living aggregations of live and dead thalli of calcareous red algae (mostly Corallinales, but also Peyssonneliales) and their fragments. They create a biogenic, unstable, three-dimensional habitat typically exposed to bottom currents, which harbors greater biodiversity compared to surrounding bottoms, and thus are viewed as biodiversity hotspots. Rhodoliths beds mainly occur on coastal detritic bottoms in the upper circalittoral zone, between 40-60 m depth (Basso et al., 2016). Rhodoliths are made by slow growing organisms and can be long-lived (>100 years) (Riosmena-Rodríguez and Nelson, 2017). These algae can display a branching or a laminar appearance, can sometimes grow as nodules that cover all the seafloor, or accumulate within ripple marks. In the literature, the terms rhodoliths and maërl are often used as synonyms (UNEP/MAP-RAC/SPA, 2009). Maërl is the original Atlantic term to identify deposits of calcified non-nucleated algae mostly composed of *Phymatolithon calcareum* and *Lithothamnion corallioides*. Rhodoliths are intended as unattached nodules formed by calcareous red algae and their growths, showing a continuous spectrum of forms with size spanning from 2 to 250 mm of mean diameter. Thus, rhodoliths beds also include maërl and calcareous *Peyssonnelia* beds, but the opposite is not true (Basso et al., 2016). Rhodoliths bed is recommended as a generic name to indicate those sedimentary bottoms characterised by any morphology and species of unattached non-geniculate calcareous red algae with >10% of live cover (Basso et al., 2016). The name maërl should be restricted to those rhodoliths beds that are composed of non-nucleated, unattached growths of branching, twig-like coralline algae.

5. Coralligenous reefs provide different ecosystem services to humans (Paoli et al., 2017), such as provisional (food, materials, habitat), regulating (carbon sequestration, nutrient recycling), and cultural services. They are vulnerable to global and local pressures. Coralligenous is threatened by direct human activities, such as trawling, pleasure diving, illegal exploitation of protected species, artisanal and recreational fishery, aquaculture, and is also vulnerable to the indirect effects of climate change and global warming (e.g., positive thermal anomalies and ocean acidification) (UNEP/MAP-RAC/SPA, 2008). Some invasive algal species (e.g., *Womersleyella setacea*, *Acrothamnion preissii*, *Caulerpa cylindracea*) can also pose a severe threat to these communities, by forming dense carpets or by increasing sedimentation rate.

6. Despite the occurrence of many species with high ecological value (some of which are also legally protected, e.g., *Savalia savaglia*, *Spongia (Spongia) officinalis*), coralligenous reefs were not listed among the priority habitats defined by the EU Habitat Directive (92/43/EEC), even if they can be included under the habitat “1170 Reefs” of this Directive, and appear also in the Bern Convention. This implies that the most important Mediterranean bioconstruction remains without formal protection as it is not included within the list of Special Areas of Conservation (SACs). Few years after the adoption of the Habitat Directive, coralligenous reefs were listed among the “special habitat types” needing rigorous protection by the protocol concerning the Special Protected Areas and Biological Diversity (SPA/BD Protocol) of the Barcelona Convention (1995). Only recently, in the frame of the “Action Plan for the Conservation of Coralligenous and other Mediterranean bio-constructions” (UNEP/MAP-RAC/SPA, 2008) adopted by Contracting Parties to Barcelona Convention in 2008 and updated in 2016, the legal conservation of coralligenous assemblages has been encouraged by the establishment of marine protected areas and the need for standardized programs for its monitoring has been emphasized. Coralligenous has also been included in the European Red List of marine habitats by IUCN, where the lower infralittoral coralligenous bioconcretions (code A5.6x) are classified as “near-threatened”, and the circalittoral coralligenous bioconcretions (code A5.6y) as “data deficient” (Gubbay et al., 2016), thus demonstrating the urgent need for thorough investigations and accurate monitoring plans. In the same year, the Marine Strategy Framework Directive (MSFD, 2008/56/EC) included “seafloor integrity” as one of the descriptors to be evaluated for assessing the Good Environmental Status of the marine environment. Biogenic structures, such as coralligenous reefs, have thus been recognized as important biological indicators of environmental quality.

7. Similarly, rhodolith seabeds are expected to be damaged by dredging, heavy anchors and mooring chains, and trawling and are adversely affected by rising temperatures and ocean

acidification. Two maërl forming species, *Phymatolithon calcareum* and *Lithothamnion corallioides*, are protected under the EU Habitats Directive (92/43/EEC) in the Annex V and, in some locations, maërl is also a key habitat within the Annex I list of priority habitats of the Directive and therefore is given protection through the designation of Special Areas of Conservation (SACs). Moreover, a special plan for the legal protection of Mediterranean rhodoliths beds has been adopted within the framework of the "Action Plan for the Conservation of Coralligenous and other Mediterranean bio-constructions" (UNEP/MAP-SPA/RAC, 2017). Rhodolith seabeds have also been included in the Natura 2000 sites and in the Red List of Mediterranean threatened habitats by IUCN.

8. The Action Plan (UNEP/MAP-SPA/RAC, 2017) identified many priority actions for these two benthic habitats, which mainly concern:

(i) Increase the knowledge on the distribution (compiling existing information, carrying out field activities in new sites or in sites of particular interest) and on the composition (list of species) of these habitats;

(ii) Set up a standardized spatial-temporal monitoring protocol for coralligenous and rhodoliths habitats.

9. Detailed information on habitat geographical distribution and bathymetrical ranges is prerequisite for the sustainable use of marine coastal areas. Coralligenous and rhodoliths distribution maps are a fundamental prerequisite to any conservation action on these habitats and their associated species (Azzola et al., 2021). The scientific knowledge concerning several aspects of biogenic concretions (e.g., taxonomy, processes, functioning, biotic relationships, and dynamics) is currently increasing. However, it is still far away from the knowledge we have on other coastal ecosystems, such as seagrass meadows, shallow coastal rocky reefs, etc. One of the major gaps concerning the current state of knowledge on coralligenous and rhodoliths habitats is the limited spatial-temporal studies on their geographical and depth distribution both at regional level and basin-wide scale. This information is essential to know the real extent of these habitats in the Mediterranean Sea and to implement appropriate management measures to guarantee their conservation (UNEP/MAP-SPA/RAC, 2017). Inventory and monitoring of coralligenous and rhodoliths raise several problems, due to their large bathymetric distribution and the consequent sampling constraints, the often-limited accessibility, heterogeneity, and the lack of standardized protocols used by different teams working in this field. The operational restrictions imposed by scuba diving (Gatti et al., 2012 and references therein) reduce the amount of collected data during each dive and increase the sampling effort. If some protocols for the inventory and monitoring of coralligenous habitat exist, common methods for monitoring rhodoliths are comparatively less documented.

10. Responding to the need of practical guides aimed at harmonising existing methods for monitoring bioconstructed habitats and for subsequent comparison of results obtained by different countries, the Contracting Parties asked the Specially Protected Areas Regional Activity Centre (SPA/RAC) to improve the existing inventory tools and to propose a standardization of the mapping and monitoring techniques for coralligenous and rhodoliths. Thus, the main methods used in the Mediterranean for inventory and monitoring the coralligenous habitat and other bioconstructions were summarised in the "Standard Methods for Inventorying and Monitoring Coralligenous and Rhodoliths Assemblages" (UNEP/MAP-RAC/SPA, 2015). These monitoring guidelines have been the basis for the updating and harmonization process undertaken in this document.

11. For mapping coralligenous and other bioconstructed habitats, the previous Guidelines (UNEP/MAP-RAC/SPA, 2015) highlighted the following main findings:

- If underwater scuba diving is recommended for mapping and monitoring at small spatial scales and at shallower depths, it becomes unsuitable when the study area and/or the depth increase (usually at depths >40 m);

Acoustic survey methods (side scan sonar or multibeam echosounder) coupled with underwater visual observation systems (ROV, towed camera), which provide ground-truth data, becomes then dispensable at depths greater than 40 m.

12. For monitoring the condition of coralligenous and other bioconstructed habitats, the previous guidelines (UNEP/MAP-RAC/SPA, 2015) highlighted the following main findings:

- Assessment of the condition of the populations is heavily dependent on the working scale and the resolution requested. Monitoring activities rely mainly on underwater scuba diving activities but given the above listed constraints, using other tools of investigation (e.g., ROV, towed camera) should be also considered because they allow monitoring on larger areas and at greater depths;
- Although the use of underwater photography or videorecording may be relevant, the presence of specialists in taxonomy with a good experience in surveying methods is often essential given the complexity of these habitats. Abundance or coverage of specific taxa can be visually estimated underwater on defined surfaces or along transects through standardized indices. The presence of broken individuals and of areas of necrosis are other factors to be considered;
- Monitoring of coralligenous habitat starts with the realisation of micro-mapping and then applying descriptors and/or ecological indices. However, these descriptors vary widely from one team to another, as well as their measurement protocols;
- Monitoring of rhodolith habitats can be done by underwater scuba diving and visual inspection using ROVs or towed cameras and collecting samples using dredges, grabs, and box corers. At present, there is not any standardized method yet that has been widely accepted for monitoring rhodoliths, also because the action of water movement may cause a shift of these habitats on the seabed making their inventory rather difficult.

13. In the framework of the Barcelona Convention Ecosystem Approach (EcAp) implementation and based on the recommendations raised during the meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON), Biodiversity and Fisheries (Madrid, Spain, 28 February - 1 March 2017), the Contracting Parties requested SPA/RAC to develop standardized monitoring protocols to be used in the context of the Integrated Monitoring and Assessment Programme (IMAP), to ease the task for the countries when implementing their monitoring programmes. The two guidelines published by SPA/RAC, the ‘Standard methods for inventorying and monitoring coralligenous and rhodoliths assemblages’ (UNEP/MAP-RAC/SPA, 2015) and the ‘Guidelines for inventorying and monitoring of dark habitats in the Mediterranean Sea’ (SPA/RAC-UN Environment/MAP, OCEANA, 2017), have been considered in the elaboration of this document. A reviewing process on the available scientific literature, considering the latest techniques and the recent works carried out by the scientific community at the international level, has been also carried out. If standardized protocols for seagrass mapping and monitoring exist and are well-implemented, and several ecological indices have already been validated and inter-calibrated among different regions, this is not the case for coralligenous and rhodoliths habitats. In this document some of the most adopted descriptors for inventorying and monitoring the coralligenous and rhodoliths in the Mediterranean are described, with the relative advantages, restrictions, and conditions for their use. Some of the monitoring methods for coralligenous have already been compared or cross-calibrated and results are briefly reported here. A standardized procedure recently proposed for coralligenous monitoring is also described.

Monitoring methods

a) COMMON INDICATOR 1: Habitat distributional range and extent

Approach

14. The CI1 aims to provide information about the geographical area in which coralligenous and rhodoliths habitats occur in the Mediterranean and the total extent of surfaces covered. Following the overall procedure suggested for mapping seagrass meadows in the Mediterranean, three main

steps can be identified also for mapping bioconstructions (refer to the “Guidelines for monitoring marine vegetation in the Mediterranean” for major details):

1) Initial planning, which includes the definition of the objectives to select the minimum surface to be mapped and the necessary resolution, tools, and equipment;

2) Ground survey is the practical phase for data collection, it is the costliest phase as it generally requires field activities;

3) Processing and data interpretation requires knowledge and experience to ensure that data collected are usable and reliable.

Resolution

15. Measures of the total habitat extent may be subjected to high variability, as the final value is influenced by the methods used to obtain maps and by the resolution during both data acquisition and final cartographic restitution. Selecting an appropriate scale is critical in the initial planning phase (Mc Kenzie et al., 2001). When large surface areas have to be mapped and global investigations carried out, an average precision and a lower detail can be accepted, which means that the habitat distribution and the definition of its boundaries are often only indicative. When smaller areas have to be mapped, much higher precision and resolution are required and it is easily achievable thanks to the high-resolution mapping techniques (e.g., multibeam echosounder) available to date. However, obtaining detailed maps is costly, thus practically impossible when time or resources are limited (Giakoumi et al., 2013). These detailed maps provide accurate localisation of the habitat distribution and a precise definition of its boundaries and total habitat extent, all features necessary for future control and monitoring purposes over time. These high-resolution scales are also used to select remarkable sites where monitoring actions must be concentrated.

16. A scale of 1:10000 is the best choice for mapping rhodoliths beds at regional level. On this scale, it is possible to delimit areas down to about 500 m^2, which is a good compromise between precise rhodoliths beds delimitation and study effort on a regional basis. Conversely, a scale equal to 1:1000 (or larger) is suggested for detailed monitoring studies of selected rhodoliths beds, where the areal definition and the rhodoliths boundaries should be more accurately located and monitored through time. Two adjacent rhodoliths beds are considered separate if, at any point along their limits, a minimum distance of 200 m occurs (Basso et al., 2016).

17. Although we have an overall knowledge about the composition and occurrence of coralligenous and rhodoliths habitats in the Mediterranean (Ballesteros, 2006; Relini, 2009; Relini and Giaccone, 2009; UNEP-MAP-RAC/SPA, 2009), the scarceness of fine-scale cartographic data on the geographical distribution of these habitats is one of the greatest lacunae from the conservation point of view. A first summary by Agnesi et al. (2008) highlighted the scarcity of available cartographic data, with less than 50 cartographies listed for the Mediterranean basin in that period. Most of the available maps are recent (less than ten years old) and are geographically disparate, mostly concerning the north-western Mediterranean basin. Another recent review (Martin et al., 2014) evidenced the occurrence of few datasets on coralligenous reefs and rhodoliths seabeds distribution, coming from 17 Mediterranean countries, and most of them being heterogeneous and with un-standardized legends, even within the same country. Updated data have also been collected in the last few years in some countries, thanks to the new monitoring activities afferent to the MSFD, and this information will become available in the coming years (see for instance Aguilar et al., 2018; SPA/RAC-UNEP/MAP, 2020).

18. Two global maps showing the distribution of coralligenous (Giakoumi et al., 2013) (Fig. 3) and maërl habitats (Martin et al., 2014) (Fig. 4) in the Mediterranean were produced based on the review of available information. Coralligenous habitats cover a surface area of about 2763 km^2 in 16 Mediterranean countries, i.e. Albania, Algeria, Croatia, Cyprus, France, Greece, Italy, Israel, Lebanon, Libya, Malta, Monaco, Morocco, Spain, Tunisia, and Turkey. All other ecoregions presented lower coverage, with the Alboran Sea having the lowest. Very limited data were found on the presence of coralligenous formations in the southern and the eastern coasts of the Levantine Sea,

although recent information has become available from Lebanon (Aguilar et al., 2018; SPA/RAC-UNEP/MAP, 2020). Information was substantially greater for the northern than the southern part of the Mediterranean. The Adriatic and Aegean Seas presented the highest coverage in terms of presence of coralligenous formations, followed by the Tyrrhenian Sea and the Algero-Provencal Basin. This uneven distribution of data on coralligenous distribution in the Mediterranean is not only a matter of invested research effort or data availability, but also depends on the geomorphologic heterogeneity of the Mediterranean coastline and seafloor: the northern basin encompasses 92.3% of the Mediterranean rocky coastline, while the southern and the extreme south-eastern areas are dominated by sandy coasts (Giakoumi et al., 2013 and references therein). Hence, the extensive distribution of coralligenous in the Adriatic, Aegean, and Tyrrhenian Seas is highly related to the presence of extensive rocky coasts in these areas, with Italy, Greece, and Croatia covering 74% of the Mediterranean's rocky coasts.

19. Knowledge on rhodoliths/maërl seabeds was somewhat limited compared to what is available for coralligenous. Rhodoliths habitats cover a surface area of about 1654 km^2. Only sporadic and punctual information are available, mainly from the North Adriatic, the Aegean Sea, and the Tyrrhenian Sea. Datasets are available for Greece, France (Corsica), Cyprus, Turkey, Spain, Lebanon, and Italy. Malta and Corsica have significant datasets on this habitat, as highlighted by fine-scale surveys in targeted areas (Martin et al., 2014).

20. These low-resolution global maps on coralligenous and rhodoliths distribution are still incomplete being the available information highly heterogeneous due to the high variability in mapping and monitoring efforts across the Mediterranean basin; further mapping is thus required to determine the full extent of these highly variable habitats at the Mediterranean spatial scale. However, these global maps can be very useful for an overall knowledge of the bottom areas covered by coralligenous and rhodoliths, and to evaluate where surveys must be enforced in the future to collect missing data.

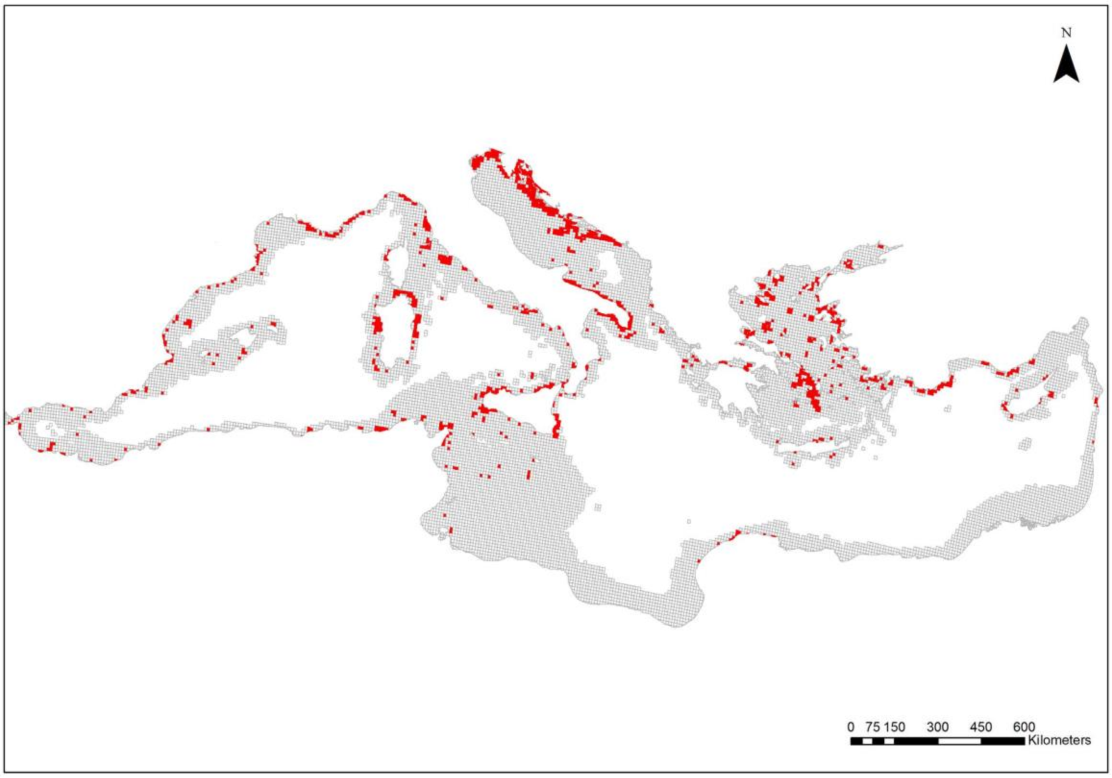

Figure 3: Global scale distribution of coralligenous habitat in the Mediterranean Sea (red areas) (from Giakoumi et al., 2013).

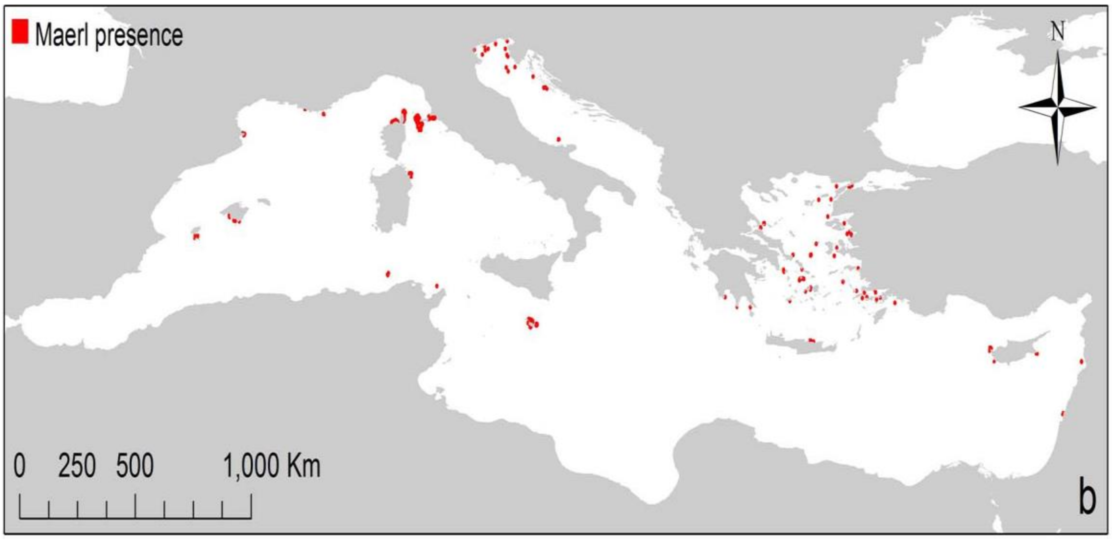

Figure 4: Global scale distribution of rhodoliths/maërl habitat in the Mediterranean Sea (red areas) (from Martin et al., 2014).

Methods

21. Definition of distributional boundaries and extent of coralligenous and rhodolith habitats requires "traditional" habitat mapping techniques, like those used for seagrass meadows in deep waters (Tab. 1). Remote sensing mapping techniques and/or underwater visual surveys must be used and are often integrated. The simultaneous use of two or more mapping methods makes it possible to optimise the results being the information obtained complementary. The strategy to be adopted will depend on the study's aim and the area concerned, means, and time available.

<u>Underwater observations and sampling methods</u>

22. Although underwater direct observation by scuba diving (e.g., visual assessments along transects) is often used for mapping small areas, this method of investigation quickly shows its limits when the study area and depth increase significantly, even if the assessment can be improved through the integration with video transects. Direct underwater observations provide discrete punctual data that are vital for ground-truthing the instrumental surveys, and for the validation of modelled/interpolated continuous information (i.e., complete coverage of surface areas) obtained from data on limited portions of the study area or along the pathway. Field surveys must be sufficiently numerous and distributed appropriately to obtain the necessary precision, and especially in view of the high heterogeneity of the coralligenous and rhodoliths habitats.

23. *In situ* underwater observations represent the most reliable, although time-consuming, mapping technique of coralligenous habitat up to 30-40 m depth, according to local rules for safe scientific diving (Tab. 1). Surveys can be done along lines (transects) or over small surface areas (permanent quadrates) positioned on the seafloor and located to follow the limits of the habitat. A transect consists of a marked line wrapped on a rib and laid on the bottom from fixed points and in a precise direction, typically perpendicular or parallel to the coastline (Bianchi et al., 2004a). Any change in the habitat and the substrate typology, within a belt at both sides of the line (considering a surface area of about 1-2 m per side), is recorded on underwater slates. The information registered allows precise and detailed mapping of the sector studied (Tab. 1).

24. Scuba diving is also suggested as a safe and cost-effective tool to obtain a visual description and sampling of shallow rhodoliths beds up to 30-40 m depth, according to local rules for scientific diving (Tab. 1). Underwater observations are effective for a first characterisation of the aboveground facies of this habitat, while describing the belowground community samples on the

bottom become necessary. The surface of a living rhodoliths bed is naturally composed of a variable amount of live thalli and their fragments, lying on a varying thickness of dead material and finer sediment. There is no literature data about the required minimum spatial extent for a portion of the seafloor to be defined as a rhodoliths bed. A rhodoliths bed is defined as a habitat that is distinguished from the surrounding seafloor by having >10% of the mobile substrate covered by live calcareous coralline algae as unattached branches and/or nodules (Basso et al., 2016). Live rhodoliths beds are naturally accompanied by a variable quantity of dead rhodoliths and their fragments; thus, a threshold of >50% of the surface covered by dead rhodoliths and their fragments is defined as the condition to identify a dead rhodoliths bed. A seafloor covered by incomplete algal coatings of lithic pebbles and shell remains should not be considered as a rhodoliths bed. The mandatory information needed for a first description of rhodoliths beds includes depth ranges, areal extent, occurrence of sedimentary structures on the seafloor (such as ripples, mega-ripples, and underwater dunes), thickness of live layer, mean percentage cover of live thalli, live/dead rhodoliths ratio, dominant morphologies of rhodoliths(see Fig. 5).

25. Recently an innovative tool, namely the BioCube, a 1 m high device that enables the acquisition of 80 cm × 80 cm frame photo-quadrates, has been implemented to charecterise the aboveground detritic and rhodoliths seabottoms without scuba diving (Astruch et al., 2019). Photo-quadrates were made with a digital video camera with 30 second-time lapse triggering. Another camera linked to a screen at the surface is fixed to the BioCube to control the workflow and the position of the frame in real time. During the data acquisition, a third camera is filming the surrounding seascape for complementary information on demersal fish and extent of assemblages.

26. Sampling methods from vessel involving blind grabs, dredges, and box corers in a number of randomly selected points within a study area can be used to check for the occurrence of deep rhodoliths beds (to ground-truth the acoustic data) and for a complete taxonomical and structural description of the habitat (Tab. 1). The thickness of the live cover could be measured through the transparent or removable side of a box-corer. Alternatively, a sub-sample could be taken from the recovered box-core using a Plexiglas core of about 10 cm in diameter and at least 20 cm long. Box-coring with a cross-section ≥0.16 m^2 is recommended because it has the advantage of preserving the original substrate stratification. The use of destructive sampling methods from vessel for characterizing rhodoliths beds should be, however, as much as possible discouraged, in order to minimize the impact of the investigation.

27. The potential contribution of citizen science networks for mapping and monitoring coralligenous habitat should be mentioned (Gerovasileiou et al., 2017), especially for assessing mass mortality events linked with global warming and heat waves (Garrabou et al., 2019). See for instance the initiatives available at http://cs.cigesmed.eu/en and https://t-mednet.org/mass-mortality/mass-mortality-events). The CIGESMED protocol, in particular, has already been applied in different parts of the Mediterranean (David et al., 2014; Çinar et al., 2020).

Remote sensing surveys

28. Being the biogenic coralligenous and rhodoliths habitats mainly distributed down to 30 m depth, the remote sensing acoustic techniques (side scan sonar and multibeam echosounder) and the underwater video recording (through ROVs and towed cameras) are usually recommended (Georgiadis et al., 2009). The use of remote sensing allows characterising extensive coastal areas to define the overall spatial patterns of coralligenous and rhodoliths habitats. From maps obtained through remote sensing surveys, the presence/absence of the habitat, its bathymetrical ranges, its boundaries, and the total habitat extent can be obtained. Acoustic methods are presently the most convenient technique for mapping rhodoliths beds, associated with ground-truthing by ROV and/or box-coring. The percentage cover of live thalli over a wide area can also be assessed from a ROV survey. Using acoustic techniques, associated with a good geolocation system, allows monitoring change in the extent of rhodoliths habitat over time (Bonacorsi et al., 2010).

29. Visual observations from the surface can be made by using imagery techniques such as photography and videorecording. Photographic equipment and cameras can be mounted on a vertical structure (sleigh or platform) or within remotely operated vehicles (ROVs). The camera on a vertical structure is submerged at the back of the vessel and is towed by the vessel that advances very slowly (under 1 knot), while the ROVs have their own propulsion system and are remotely controlled from the surface. The use of towed video cameras (or ROVs) during surveys makes it possible to see the images on the screen in real time, identify specific features of the habitat, and evaluate any change in the habitat or in other characteristic elements of the seafloor. This preliminary video survey may be also useful to locate specific monitoring stations. Recorded images are then reviewed to obtain a cartographical restitution on a GIS platform for each area surveyed. To facilitate and improve the results obtained with the camera, joint acquisition modules integrating the depth, images of the seafloor, and geographical positioning have been developed (UNEP/MAP-RAC/SPA, 2015).

30. Sonar provides images of the seafloor through the emission and reception of ultrasounds. Amongst the main acoustic mapping techniques available (Kenny et al., 2003), wide acoustic beam systems like the side scan sonar (SSS) and the multibeam echosounder are usually employed in mapping coralligenous and rhodoliths habitats. All the acoustic mapping techniques are intrinsically affected by uncertainties due to manual classification of the different acoustic signatures associated with substrate types on sonograms. Errors in sonogram interpretation may arise when two substrate types are not easily distinguished by the observer. Interpretation of remote sensing data requires extensive field calibration and the ground-truthing process remains essential. As the interpretation of sonograms is time-requiring, several automatic supervised processing techniques have been recently proposed to rapidly automate the interpretation and the classification of acoustic signatures and to make this interpretation more reliable (Montefalcone et al., 2013 and references therein; Viala et al., 2021), also considering that current technology provides systems of neural networks and artificial intelligence to support these operations. These classification methods allow for good discrimination between soft sediments and rocky reefs. Human eye, however, always remains the final judge.

Modelling

31. Modelling techniques can be used to fill the gaps in the knowledge of the spatial distribution of habitats by predicting the areas that are likely to be suitable for a community to live. Models are usually based on physical and environmental variables (e.g., water temperature, salinity, depth, water movement, nutrient concentrations, seabed types), which are typically easier to record and map at regional and global scales, in contrast to data on species and habitats. A recent study showed the correlation between wind-wave energy at the bottom and the rhodoliths bed presence (Agnesi et al., 2020). It also provided the confidence interval of this environmental variable associated with the probability of rhodoliths beds to occur, therefore informing on the wave energy values required for the modelling in the off-shore continental shelf. Despite inherent limitations and associated uncertainties, predictive modelling is a cost-effective alternative to field surveys as it can help identifying and mapping areas where sensitive marine ecosystems may occur. Based on the spatial datasets available for coralligenous and rhodoliths populations, a predictive modelling was carried out to produce two continuous maps of these two habitats across the Mediterranean Sea (Martin et al., 2014). For coralligenous, bathymetry, slope of the seafloor, and nutrient input were the three main contributors to the model. Predicted areas with suitable conditions for the occurrence of coralligenous habitat have been defined in the North African coast, where there are no available cartographic data to date. For rhodoliths, phosphate concentration, geostrophic velocity of sea surface current, silicate concentration, and bathymetry were the four main contributors to the model. Given the lack of occurrence data for this habitat across the Mediterranean, and especially in the North African coast and the southern Levantine coast, the model output is relatively informative in highlighting several suitable areas where no cartographic data are available to date.

32. A recent application of predictive spatial modelling was done starting from a complete acoustic coverage of the seafloor combined with sea-truthing underwater observations made by scuba

diving (Vassallo et al., 2018). This approach was applied to the coralligenous reefs of the Marine Protected Area of Tavolara - Punta Coda Cavallo (NE Sardinia, Italy), through a fuzzy clustering on a set of *in situ* observations. The model allowed recognising and mapping the coralligenous habitat within the MPA and showed that the distribution of the habitat was mainly driven by the distance from coast, the depth, and the lithotypes. Other examples of habitat predictions can be found in Zapata-Ramírez et al. (2016) and Rossi et al. (2021).

Table 1: Synthesis of the survey tools used for defining the Common Indicator 1_Habitat distributional range and extent for coralligenous and rhodoliths habitats. When available, the depth range, the surface area mapped, the spatial resolution, the efficiency (expressed as area mapped in km^2 per hour), the main advantages or limits of each tool are indicated, with some bibliographic references.

Survey tool	Depth range	Surface area	Resolution	Efficiency	Advantages	Limits	References
Underwater diving and visual surveys	0 m up to 40 m, according to local rules on safe scientific diving	Small areas, less than 250 m^2	From 0.1 m	0.0001 to 0.001 km^2/hour	• Very great precision in the identification (taxonomy) and distribution of species (micro-mapping) • Non-destructive • Low cost, easy to implement	• Small area inventoried • Very time-consuming • Limited operational depth • Highly qualified scientific divers required (safety constraints) • Variable geo-referencing of the dive site	Piazzi et al. (2019a, and references therein)
Sampling from vessels with blind grabs, dredges, or box corers	0 m to about 50 m (until the lower limit of the rhodoliths bed)	Intermediate areas (a few km^2)	From 1 to 10 m	0.025 to 0.01 km^2/hour	• Very great precision for the identification (taxonomy) and distribution of species (micro-mapping) • All species identified • Possibility of *a posteriori* identification • Low cost, easy to implement	• Destructive method • Small area inventoried • Need of sampling materials • Analyses on samples very time-consuming • Limited operational depth • Difficulty in collecting representative samples	UNEP/MAP-RAC/SPA (2015)

Side scan sonar	8 m to over 120 m (until the lower limit of the coralligenous habitat)	From intermediate to large areas (50-100 km²)	<1 m	1 to 4 km²/hour	• Wide bathymetric range • Realistic representation of the seafloor • Good identification of the nature of the bottom and of assemblages (rhodoliths) • Quick execution • Very big mass of data • Non-destructive	• Flat (2D) picture to represent 3D complex habitats • Possible errors in sonograms interpretation • Acquisition of field data necessary to validate sonograms • High cost • Not effective for mapping vertical slopes	Cánovas-Molina et al. (2016b)
Survey tool	**Depth range**	**Surface area**	**Resolution**	**Efficiency**	**Advantages**	**Limits**	**References**
Multibeam echosounder	2 m to over 120 m (until the lower limit of the coralligenous habitat)	From small areas (a few hundred square meters) to large areas (50-100 km²)	From 50 cm (linear) and lower than few centimetres	0.5 to 6 km²/hour	• Possibility to obtain 3D representation of the seafloor • Double information collected (bathymetry and seafloor image) • Very precise and wide bathymetric range • Quick execution • Very big mass of data • Non-destructive	• Less precise recognition of the nature of the seabed than side scan sonar • Acquisition of field data necessary to validate the interpretation of acoustic data • High cost	Cánovas-Molina et al. (2016b)
Remote Operating Vehicle (ROV)	2 m to over 120 m (until the lower limit of the coralligenous habitat)	Small-intermediate areas (a few km²)	From 1 m to 10 m	0.025 to 0.01 km²/hour	• Non-destructive • Possibility to collect pictures • Good identification of habitat and conspicuous species • Wide bathymetric range	• High cost	Cánovas-Molina et al. (2016a); Enrichetti et al. (2019)

Towed camera	2 m to over 120 m (until the lower limit of the coralligenous habitat)	Intermediate-large areas (some km^2)	From 1 m to 10 m	0.025 to 1 km^2/hour	• Easy to implement and possibility to collect pictures • Good identification of habitat and conspicuous species • Non-destructive • Large area covered	• Limited to homogeneous and horizontal bottoms • Slow recording and processing of information • Variable positioning (georeferencing) • Water transparency • Hard to handle in the case of heavy nautical traffic	UNEP/MAP-RAC/SPA (2015)

Data interpretation

33. Once the surveying is completed, data collected need to be organized in order to be used in the future by everyone and can be appropriately archived and easily consulted. A clear definition of all metadata must be provided with the dataset to ensure future integration with similar data from other sources. To produce a habitat map, four important steps must be followed:

a. Processing, analysis and classification of biological data and their correct and precise geolocation, through a process of interpretation of acoustic images when available;

b. Selecting the most appropriate physical layers (e.g., substrate, bathymetry, hydrodynamics);

c. Integration of biological data and physical layers, and use of statistical modelling to predict habitat distribution and interpolate punctual information;

d. The map produced must then be evaluated for its accuracy, i.e. its capacity to represent reality, and its reliability.

34. During the first processing analysis and classification step, a standardised classification system must be used to label and classify benthic habitats on resulting maps and to ensure the uniformity and the readability of the final maps. The two recently updated lists of benthic marine habitat types should be consulted, which are: 1) the EUropean Nature Information System (EUNIS) proposed for the European seas (available at http://eunis.eea.europa.eu; Evans et al., 2016); and 2) the Barcelona Convention classification of marine benthic habitat types adopted for the Mediterranean region by the Contracting Parties (available at https://www.rac-spa.org/sites/default/files/doc_fsd/habitats_list_en.pdf; SPA/RAC-UN Environment/MAP, 2019a, b; Montefalcone et al., 2021). The two updated lists identify the specific coralligenous and rhodolith habitats that may be found from the infralittoral zone to the circalittoral zone, with their main characteristic associations and facies. The first original description of habitat types for the Mediterranean has been revised in 2015 (UNEP/MAP-RAC/SPA, 2015b), but a new updated interpretation manual of all the updated reference habitat types for the Mediterranean region is under elaboration, which also provides the criteria for their identification. Habitats of coralligenous and rhodoliths listed in the updated Barcelona Convention classification system are the following (SPA/RAC-UN Environment/MAP, 2019a, b):

INFRALITTORAL

MB1.5 Infralittoral rock

MB1.55 Coralligenous (enclave of circalittoral)

CIRCALITTORAL

MC1.5 Circalittoral rock

MC1.51 Coralligenous cliffs

MC1.51a Algal-dominated coralligenous

MC1.511a Association with encrusting Corallinales

MC1.512a Association with Fucales or Laminariales

MC1.513a Association with sciaphilic algae (except Fucales, Laminariales, encrusting Corallinales, and Caulerpales)

MC1.514a Association with non-indigenous Mediterranean *Caulerpa* spp.

MC1.51b Invertebrate-dominated coralligenous

MC1.511b Facies with small sponges

MC1.512b Facies with large and erect sponges

MC1.513b Facies with Hydrozoa

MC1.514b Facies with Alcyonacea

MC1.515b Facies with Ceriantharia

MC1.516b Facies with Zoantharia

MC1.517b Facies with Scleractinia

MC1.518b Facies with Vermetidae and/or Serpulidae

MC1.519b Facies with Bryozoa

MC1.51Ab Facies with Ascidiacea

MC1.51c Invertebrate-dominated coralligenous covered by sediment

See MC1.51b for examples of facies

MC1.52 Continental shelf rock

MC1.52a Coralligenous outcrops

MC1.521a Facies with small sponges

MC1.522a Facies with Hydrozoa

MC1.523a Facies with Alcyonacea

MC1.524a Facies with Antipatharia

MC1.525a Facies with Scleractinia

MC1.526a Facies with Bryozoa

MC1.527a Facies with Polychaeta

MC1.528a Facies with Bivalvia

MC1.529a Facies with Brachiopoda

MC1.52b Coralligenous outcrops covered by sediment

See MC1.52a for examples of facies

MC1.52c Deep banks

MC1.521c Facies with Antipatharia

MC1.522c Facies with Alcyonacea

MC1.523c Facies with Scleractinia

MC2.5 Circalittoral biogenic habitat

MC2.51 Coralligenous platforms

MC2.511 Association with encrusting Corallinales

MC2.512 Association with Fucales

MC2.513 Association with non-indigenous Mediterranean Caulerpa spp.

MC2.514 Facies with small sponges

MC2.515 Facies with large and erect sponges

MC2.516 Facies with Hydrozoa

MC2.517 Facies with Alcyonacea

MC2.518 Facies with Zoantharia

MC2.519 Facies with Scleractinia

MC2.51A Facies with Vermetidae and/or Serpulidae

MC2.51B Facies with Bryozoa

MC2.51C Facies with Ascidiacea

MC3.5 Circalittoral coarse sediment

MC3.51 Coastal detritic bottoms

MC3.511 Association with Laminariales

MC3.512 Facies with large and erect sponges

MC3.513 Facies with Hydrozoa

MC3.514 Facies with Alcyonacea

MC3.515 Facies with Pennatulacea

MC3.516 Facies with Polychaeta (*Salmacina-Filograna* complex included)

MC3.517 Facies with Bivalvia

MC3.518 Facies with Bryozoa

MC3.519 Facies with Crinoidea

MC3.51A Facies with Ophiuroidea

MC3.51B Facies with Echinoidea

MC3.51C Facies with Ascidiacea

MC3.52 Coastal detritic bottoms with rhodoliths

MC3.521 Association with maërl

MC3.522 Association with Peyssonnelia spp.

MC3.523 Association with Laminariales

MC3.524 Facies with large and erect sponges

MC3.525 Facies with Hydrozoa

MC3.526 Facies with Alcyonacea

MC3.527 Facies with Pennatulacea

MC3.528 Facies with Zoantharia

MC3.529 Facies with Ascidiacea

35. The selection of physical layers to be shown on maps and to be used for following predictive statistical analyses may be an interesting approach within the general framework of mapping coralligenous and rhodolith habitats, reducing the processing time. However, it is still of

little use as only few physical parameters are able to clearly predict the distribution of these two habitats, e.g., bathymetry, slope of the seafloor, nutrient input and phosphate concentration for coralligenous, geostrophic velocity of sea surface current, silicate concentration, and bathymetry for rhodoliths (Martin et al., 2014).

36. The data integration and modelling are often necessary because indirect visual or remote sensing surveys from vessel are limited due to time and costs involved, and only rarely allow obtaining a complete coverage of the study area. Coverage under 100% automatically means that it is impossible to get high resolution maps and therefore interpolation procedures must be used, so that from partial surveys a lower resolution map can be obtained. Spatial interpolation is a statistical procedure for estimating data values at unsampled sites between locations where data have been collected. For elaborating the final distribution map of benthic habitats on a GIS platform, different spatial interpolation tools (e.g., Inverse Distance Weighted, Kriging) can be used and are provided by the GIS software. Even though this is rarely mentioned, it is important to provide information on the number and the percentage of data acquired on field and the percentage of interpolations run.

37. The processing and digital analysis of acoustic data on GIS allow creating charts where each tonality of grey is associated with a specific texture representing a type of habitat or substrate, also on the basis of the *in situ* observations. Although remote sensing data must be always integrated by a great amount of field visual inspections for ground-truthing, especially given the 3D distribution and complexity of the coralligenous seascape developing over hard substrate, high quality bathymetric data often constitutes an indispensable and appreciated element.

38. To facilitate the comparison among maps, the standardized red colour is generally used for the graphic representation of coralligenous and rhodolith habitats. On the resulting map the habitat distributional range (its boundaries and bathymetric limits) and its total extent (expressed in square meters or hectares) can be defined. This map could also be compared with historical available data from literature to evaluate any change experienced by benthic habitats over time (Giakoumi et al., 2013). Using the overlay vector methods on GIS, a diachronic analysis can be done, where temporal changes are measured in terms of percentage gain or loss of the habitat extension, through the creation of concordance and discordance maps (Canessa et al., 2017).

39. Finally, reliability of the map produced should be evaluated. No evaluation scales of reliability have been proposed for coralligenous and rhodoliths habitat mapping; however, scales of reliability evaluation available for seagrass meadows can be adapted also for these two habitats (see the "Guidelines for monitoring marine vegetation in the Mediterranean" for further details). These scales usually consider the processing of sonograms, the scale of data acquisition and restitution, the methods adopted, and the positioning system.

b) COMMON INDICATOR 2: Condition of the habitat's typical species and communities

Approach

40. Monitoring is necessary for conservation purposes, which require efficient management measures to ensure that marine benthic habitats, their constituent species, and their associated communities are and remain in a good ecological status. The good state of health of both coralligenous and rhodolith habitats will then reflect the Good Environmental Status (GES) pursued by the Contracting Parties to the Barcelona Convention under the Ecosystem Approach (EcAp) and under the Marine Strategy Framework Directive (MSFD).

41. Monitoring the condition (i.e., the ecological status) of coralligenous and rhodolith habitats is today mandatory also because:

- Two maërl forming species, *Phymatolithon calcareum* and *Lithothamnion corallioides*, are protected under the EU Habitats Directive (92/43/ EEC) in the Annex V;
- Coralligenous reefs and rhodolith seabeds are listed among the "special habitat types" needing rigorous protection by the protocol concerning the Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) of the Barcelona Convention.

42. According to the EcAp, the CI2 fixed by the Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP) guidelines and related to "biodiversity" (EO1) is aimed at providing information about the condition (i.e., ecological status) of coralligenous and rhodolith habitats, as they represent two hotspots of biodiversity in the Mediterranean (UNEP/MAP, 2008). The MSFD (2008/56/EC) included both "biological diversity" (D1) and "seafloor integrity" (D6) as descriptors to be evaluated for assessing the GES of the marine environment. In this regard, biogenic structures, such as coralligenous reefs and rhodolith seabeds, have been recognized as important biological indicators of environmental quality.

43. A defined and standardized procedure for monitoring the status of coralligenous and rhodolith habitats, comparable to that provided for their mapping, should follow these three main steps:

a. Initial planning, to define objective(s), duration, sites to be monitored, descriptors to be evaluated, sampling strategy, human, technical and financial needs;

b. Setting-up the monitoring system and realisation of the monitoring program. This phase includes costs for going out to sea during field activities, equipment for sampling, and human resources. To ensure effectiveness of the program, field activities should be planned during a favourable season, and it would be preferred to repeat monitoring during the same season;

c. Monitoring over time and data analysis. During these activities, robust scientific competences are needed because the acquired data must be interpreted. Duration of the monitoring, to be useful, must be medium time at least.

44. The objectives of the monitoring are primarily linked with the conservation of biogenic habitats, but they also answer to the necessity of using them as ecological indicators of the marine environment quality. The main aims of the monitoring programs are generally:

- Preserve and conserve the heritage of bioconstructions, to ensure that coralligenous and rhodolith habitats are in a good ecological status (GES), and identify as early as possible any degradation of these habitats or any change in their distributional range and extent. Assessment of the ecological status of these habitats allows measuring the effectiveness of local or regional policies in terms of management of the coastal environment;
- Build and implement a regional integrated monitoring system of the quality of the environment, as requested by the IMAP during the implementation of the EcAp in the framework of the Mediterranean Action Plan (UNEP/MAP, 2008). The main goal of IMAP

is to gather reliable quantitative and updated data on the status of marine and coastal Mediterranean environment.

45. Evaluate effects of any coastal activity and construction likely to impact coralligenous and rhodolith habitats during environmental impact assessment (EIA) procedures. This specific kind of monitoring aims to establish the condition of the habitat at the time “zero” (i.e., before the beginning of activities), then the state of health of the habitat is monitored during the development of the work phase or at the end of the phase, to check for any impact on the environment evaluated as changes in the habitat state of health. The EIA procedure is not intended as a typical monitoring activity, although it provides the state of the system at the “zero” time, which can be very useful in the time series obtained during a monitoring programme. Unfortunately, most of the EIA studies are qualitative and are often performed by environmental consultants without specialized personnel, using unspecific guidelines and without following any standardised procedure, which prevent their use in effective monitoring programs.

46. The objective(s) of the monitoring system will influence the choices in the following steps (e.g., duration, sites to be monitored, descriptors, and sampling methods; Tab. 2). The duration of the monitoring should be at least medium-long term (minimum 5-10 years long) for heritage conservation and for monitoring environmental quality. The interval of data acquisition could be annual, as most of the typical species belonging to coralligenous assemblages and to rhodolith beds display slow grow rates and long generation times. In general, and irrespective of the objective advocated, it is judicious to focus initially on a small number of sites that are easily accessible and that can be regularly monitored after short intervals of time. The sites chosen must be: i) representative of the portion of the coastal area investigated, ii) cover most of the possible range of environmental situations (e.g., depth range, slope, substrate type), and iii) include sensitive zones, stable zones, or reference zones with low anthropogenic pressures (i.e., MPAs) and possibly also areas with high pressure related to human activities for comparison. Then, with the experience gained by the surveyors and the means (funds) available, this network could be extended to a larger number of sites. For environmental impact assessment, short term monitoring (generally 1-2 years) is recommended and should be initiated before the interventions (“zero” time), and possibly continued during, or just after the conclusion of the works. A further monitoring can be made one year after the conclusion. The ecological status of the site subjected to coastal interventions (i.e., the impact site) must be contrasted with the status of at least 2 reference/control sites.

47. To ensure the sustainability of the monitoring system, the following final remarks must be considered:

- Identify the partners, competences and means available;
- Planning the partnership modalities (who is doing what? when? and how?);
- Ensure training for the stakeholders so that they can set up standardized procedures to guarantee the validity of the results, and so that comparisons can be made for a given site and among sites;
- Individuate a regional or national coordinator depending on the number of sites concerned for monitoring and their geographical distribution;
- Evaluate the minimum budget necessary for running the monitoring network (e.g., costs for permanent operators, temporary contracts, equipment, data acquisition, processing, and analysis).

Methods

48. Following the preliminary definition of the distributional range and extent of coralligenous and rhodolith habitats (the previous CI1), the assessment of the condition of the two

habitats starts with an overall descriptive characterisation of the typical species and assemblages occurring within each habitat. Monitoring of these two habitats relies on underwater diving activities, although this technique gives rise to many operational constraints due to the conditions of the environment in which these habitats develop (e.g., great depths, weak luminosity, low temperatures, presence of currents, etc.). Underwater surveys must be done by confirmed and expert scientific divers (for safety), within a limited range of depths (from the surface down to the maximum depths of 30-40 m, according to local rules on safe scientific diving), and over a limited underwater time (Bianchi et al., 2004b; Tetzaff and Thorsen, 2005). Adopting alternative visual investigation tools (e.g., ROVs) allows for a less precise assessment but over larger spatial scales. A first characterisation of the habitat (e.g., species present, abundance, vitality, etc.) can be done by direct visual underwater inspections, indirect ROVs or towed camera video recordings, or sampling procedures with dredges, grabs or box corers in the case of rhodolith seabeds. The acoustic methods described above are totally inoperative for detailed characterisations of these habitats, especially for coralligenous. The survey method depends greatly on the scale of the work and the spatial resolution requested (Tab. 2). The complementarity of these techniques must be considered when planning an operational strategy (Cánovas-Molina et al., 2016b). A list of the main conspicuous species/taxa or morphological groups recognisable underwater, or on images, in the two habitats is presented in the Annex 1. This list is not exhaustive but includes species/taxa frequently reported from coralligenous and rhodoliths at the Mediterranean scale. Each Contracting Party can regularly improve these lists and chose the most appropriate species/taxa according to its geographical situation.

49. The use of ROVs or towed cameras can be useful to optimise information obtained and sampling effort (in term of working time) and become essential for monitoring deep coralligenous assemblages and rhodolith seabeds that develop in the upper mesophotic zone (down to 40 m depth), where scuba diving procedures are usually not recommended. High quality videos and photographs recorded by ROV or towed camera will be analysed in laboratory (also with the help of taxonomists) to list the main conspicuous species/taxa or morphological groups recognisable on images and to evaluate their abundance (coverage or surface area in cm^2). Videos and photographs can then be archived to create temporal datasets.

50. At shallower depths (up to about 30-40 m, and according to local rules for scientific diving), direct underwater visual surveys by scuba diving are strongly recommended. Good experience in underwater diving is requested to operate an effective work at these depths. Scientific divers annotate on their slates the list of the main conspicuous species/taxa characterising the assemblages. Given the complexity of the coralligenous habitat (3D structure and high biodiversity), divers must be specialists in taxonomy of the main coralligenous species to ensure the validity of the information recorded underwater. Photographs or video collected with underwater cameras can be usefully integrated into visual survey to speed the work (Gatti et al., 2015a). The use of operational taxonomical units (OTUs), or taxonomic surrogates such as morphological groups (lumping species, genera or higher taxa displaying similar morphological features; Parravicini et al., 2010), may represent a useful compromise when a consistent species distinction is not possible (either underwater or on photographs) or to reduce the surveying/analysis time.

51. For a rough and rapid characterisation of coralligenous assemblages, semi-quantitative evaluations often give sufficient information (Bianchi et al., 2004b): it is possible to estimate the abundance (usually expressed as % cover) by standardized indices directly *in situ* or using photographs (UNEP/MAP-RAC/SPA, 2008). However, a high-quality and fine characterisation of the assemblages often requires square frames (quadrates) of defined surface or transects (with or without photographs; Piazzi et al., 2018) to collect quantitative data on the assemblages composition. The sampling by scraping of all the organisms present over a given area and further laboratory analyses (Bianchi et al., 2004b) represents an alternative destructive procedure, which should be avoided to preserve coralligenous habitat. *In situ* observation and sample must be done over defined and, possibly, standardized surface areas (Piazzi et al., 2018), and the number of replicates must be adequate and high enough to catch the heterogeneity of the habitat.

52. As well as the presence and abundance of a given species, assessing its vitality seems a particularly interesting parameter. The presence of broken individuals (especially of branching colonies occurring in the intermediate and upper layers of coralligenous, such as bryozoans and gorgonians) and of signs of necrosis and bleaching are important elements to be taken into consideration to assess specific pressures, such as mechanical damages or effects of thermal anomalies (Garrabou et al., 1998, 2001, 2019; Gatti et al., 2012). Finally, the nature of the substrate (silted up, roughness, interstices, exposure, slope), the temperature of the water, the vagile fauna associated, the coverage by epibiont, and the presence of invasive species must also be considered to give a clear characterisation of bioconstructed habitats (Harmelin, 1990; Gatti et al., 2012).

Table 2: Synthesis of the main methods used to characterise coralligenous and rhodolith habitats in the Mediterranean, as the first necessary step for defining the Common Indicator 2_Condition of the habitat's typical species and communities. When available, the depth range, the surface area surveyed, the spatial resolution, the efficiency (expressed as area surveyed in km^2 per hour), the main advantages and the limits of each tool are indicated, with some bibliographic references.

Methods	Depth range	Surface area	Resolution	Efficiency	Advantages	Limits	References
Remote Operating Vehicle (ROV) or towed camera	From 2 m to over 120 m	Small-Intermediate areas of about 1 km^2 (larger areas in the case of towed camera)	From 1 m to 10 m	0.025 to 0.01 km^2/hour	• Non-destructive method • Possibility of collecting pictures • Wide bathymetric range • Good identification of facies and associations • Possibility of semi-quantitative/quantitative evaluation • Possibility to collect samples (for ROV)	• High cost, major means out at sea • Difficulty of observation and access according to the complexity of the habitat (multilayer assemblages) • Quali-quantitative assessments only on conspicuous species/taxa	Cánovas-Molina et al. (2016a); Enrichetti et al. (2019); Piazzi et al. (2019b)
Underwater visual observation	0 m up to 40 m, according to local rules for scientific diving	Small areas (less than 250 m^2)	From 1 m	0.0001 to 0.001 km^2/hour	• Non-destructive • Good precision in the identification (taxonomy) and characterisation of the habitat (also its 3D) • Low cost, easy to implement • Possibility to collect samples • Data already available after dive	• Small area inventoried • Very time-consuming underwater activities • Limited operational depths • Highly qualified scientific divers required • Subjectivity of the observer • Quali-quantitative assessments only on conspicuous species/taxa	Gatti et al. (2012, 2015a); Piazzi et al. (2019a)

Methods	Depth range	Surface area	Resolution	Efficiency	Advantages	Limits	References
Underwater sampling by scraping or collection	0 m up to 40 m, according to local rules for scientific diving	Small areas (less than 10 m^2)	From 1 m	0.0001 to 0.001 km²/hour	• Very good precision in the identification (taxonomy) and characterisation of the habitat • All species identified • *A posteriori* identification • Easy to implement	• Destructive method, usually not recommended • Very small area inventoried • Sampling material needed • Limited operational depths • Highly qualified scientific divers required • Very time-consuming underwater activities • Analysis of samples in laboratory very time-consuming • Involvement of many taxonomists	Bianchi et al. (2004b)
Underwater photography or video recording	0 m up to 40 m, according to local rules for scientific diving	Small areas (less than 250 m^2)	From 0.1 m	0.0001 to 0.001 km²/hour	• Non-destructive • Good precision in the identification (taxonomy) and characterisation of the habitat • *A posteriori* identification possible • Low cost, easy to implement • Possibility to collect samples • Possibility to create archives	• Small area inventoried • Photograph and video analysis very time-consuming • Limited operational depths • Highly qualified scientific divers required • Tools to collect photo/video necessary • Quali-quantitative assessments only on conspicuous species/taxa Only 2D observation	Gatti et al. (2015b); Montefalcone et al. (2017); Piazzi et al. (2017a, 2019a); Çinar et al. (2020)

Methods	Depth range	Surface area	Resolution	Efficiency	Advantages	Limits	References
Sampling from vessel with blind grabs, dredges, or box corers	0 m to about 120 m (until the lower limit of the rhodolith habitat)	Intermediate areas (a few km^2)	From 1 to 10 m	0.025 to 0.01 km^2/hour	• Very good precision in the identification (taxonomy) and characterisation of the habitat • All species identified • *A posteriori* identification • Easy to implement	• Destructive method, usually not recommended • Small area inventoried • Sampling material needed • Samples analysis in laboratory very time-consuming and costly • Difficulty in collecting representative samples	UNEP/MAP-RAC/SPA (2015a)

53. Effective monitoring should be done at defined intervals over time, even if it could mean fewer sites being monitored. The reference “zero-state” will be contrasted with data coming from subsequent monitoring periods, always assuring reproducibility of data over time. Thus, the experimental design and protocol have capital importance. The geographical position of surveys and sampling stations must be located with precision (using buoys on the surface and recording their coordinates with a GPS), and it often requires the use of marks underwater (with fixed pickets into the rock) for positioning the quadrates or transects in the exact original position (García-Gómez et al., 2020). Finally, even if it cannot be denied that there are logistical constraints linked to the underwater observation of coralligenous and rhodolith habitats, their long generation time enables sampling to be done at long intervals of time (> 1 year) to monitor them in the long term (Garrabou et al., 2002).

54. Although destructive methods (scraping of the substrate with all the organisms present over a given area, dredges, grabs, or box-corers) have long been used and recognized as the most suitable approach to describe the structure of assemblages and an irreplaceable method for exhaustive species lists, they are not desirable for long-term regular monitoring (UNEP/MAP-RAC/SPA, 2008), and especially within MPAs. Moreover, identification of all organisms needs great taxonomic expertise and a long time to analyse samples, making it difficult to process the large number of replicates required for ecological studies and monitoring surveys. It is more suitable to favor non-destructive methods, like photographic sampling, ROV survey, or direct underwater observation in given areas (using quadrates or transects) to collect quali-quantitative data. These methods do not require sampling of organisms and are therefore appropriate for long-term monitoring. The different methods can be used either separately or together, according to the objective of the study, the area inventoried, and means available (Tab. 3). Non-destructive methods have been increasingly used and, mainly for video and photographic sampling, enjoy significant technological advances.

Table 3: Comparison among three traditional methods used to monitor coralligenous and other bioconstructions (Bianchi et al., 2004b).

***In situ* sampling**	
Advantages	Taxonomical precision, objective evaluation, reference samples
Limits	High cost, slow laborious work, intervention of specialists, limited area inventoried, destructive method, depth-limitations when done by divers
Use	Studies integrating a strong taxonomical element
Video or photography	
Advantages	Objective evaluation, can be reproduced, reference samples, can be automated, speedy diving work, large area inventoried, non-destructive method, no depth-limitations
Limits	Low taxonomical precision, problem of *a posteriori* interpretation of pictures
Use	Studies on the biological cycle or over-time monitoring, large depth-range investigated
Underwater visual observation	
Advantages	Low cost, results immediately available, large area inventoried, can be reproduced, non-destructive method
Limits	Risk of taxonomic subjectivity, slow diving work, depth-limitations
Use	Exploratory studies, monitoring of populations, bionomic studies

55. Differently from seagrass, the descriptors used to evaluate the status of coralligenous assemblages vary greatly from one team to another and from one region to another, as well as their measuring protocols (Piazzi et al., 2019a and references therein). A first standardized sheet for coralligenous monitoring was created in the context of the Natura 2000 programs, which solved only partially the issues about comparability among data (Fig. 5). However, methods and descriptors

considered must be the subject of a standardized protocol. Although many disparities among data acquisition methods still occur, an integrated and standardized procedure named STAR (STAndaRdized coralligenous evaluation procedure) for monitoring the condition of coralligenous reefs has recently been proposed (Piazzi et al., 2019a; Gennaro et al., 2020).

Natura 2000 - Fiche Coralligène – ANTONIOLI 2010 – GIS Posidonie

- Date : …………………. - Observateur :……………………. - N° de plongée & site :………..………..

- **Type de faciès :** *Cystoseira zosteroides* ☐ *Eunicella singularis* ☐ *Eunicella cavolinii* ☐ *Lophogorgia sarmentosa* ☐ *Paramuricea clavata* ☐ Autre : ………………… ☐

- **Gorgone :**

Non → Oui

	- -	-	+	+ +
Toutes les classes de taille				
Nécrose				
Gorgone arrachée				
Epibiontes				
Recrutement (<3cm)				

Gorgonaire	**Espèce :**……………
…………….cm	……………..cm
…………….cm	……………..cm
……………..cm	……………..cm
……………..cm	……………..cm
……………..cm	……………..cm
……………..cm	……………..cm

- **Aspect général :**

Non → Oui

	- -	-	+	+ +
Sédimentation / vase				
Voiles algaux				
Impression de diversité (très coloré)				
Faune cryptique riche				

Filet ☐
Ancrage ☐
Fil ☐
Déchet ☐

Profondeur d'observation des gorgonaires :
- Max :
- Min :

- **Inventaire :**

Macrophytes	
Lithophyllum & Mesophyllum en 3D	
Couverture de *Lithophyllum incrusans* sans relief	
Taches blanches sur Lithophyllum ou Mesophyllum	
Présence d'espèces dressées *Halimeda*, *Udotea* ; *Cystoseira*…	

Ichtyofaune	
Présence d'espèces-cibles avec grands individus	
Poissons benthiques ou nectobenthiques	

Spongiaire & Bryozoaire	
Eponges perforantes (Clione)	
Espèces dressées (*Axinella sp.*, *Spongia agaricina*,…)	
Grands bryozoaires branchus	

- **Observation :**

Photos quadrats et paysagères à réaliser

Figure 5: Example of a standardized sheet for coralligenous monitoring created in the context of the Natura 2000 programmes by GIS Posidonie (Antonioli, 2010).

A standardized protocol for monitoring shallow water (up to 40 m depth) coralligenous reefs

56. The protocol STAR (STAndaRdized coralligenous evaluation procedure) (Piazzi et al., 2019a; Gennaro et al., 2020) has been proposed for monitoring the ecological status of coralligenous reefs to obtain information about most of the descriptors adopted in the different ecological indices

that have been developed to date, through a single sampling effort and data analysis. The CIGESMED protocol, applied in different parts of the Mediterranean (David et al., 2014; Çinar et al., 2020), should also be mentioned.

57. Monitoring plans should at first distinguish between the two major bathymetrical ranges where coralligenous reefs develop, i.e., the shallow and the deep reefs, within and deeper than about 40 m depth respectively (UNEP/MAP-RAC/SPA, 2008). In fact, shallow and deep coralligenous habitats can show different structure of assemblages, and they are usually subject to different types of anthropogenic pressures. Shallow reefs can be effectively surveyed by scuba diving, allowing obtaining information about descriptors that cannot be evaluated or measured through any other instrumental methods (Gatti et al., 2012, 2015a). Deep coralligenous reefs can be surveyed only by means of ROV inspections.

58. Season: coralligenous assemblages comprise mostly organisms with long life cycles that are subjected to less evident seasonal changes (mainly in water temperature) than shallower assemblages. In contrast, several temporal changes throughout the year have been observed for macroalgal assemblages, and some seasonal erect algae and filamentous species constituting turfs decrease in cover during the cold season. In addition, coralligenous assemblages are often subjected to the invasion of alien macroalgae and most of the invasive macroalgae display seasonal dynamics, thus contributing to modify the structure of coralligenous assemblages. The most widespread invasive species on coralligenous reefs are the turf-forming Rhodophyta *Womersleyella setacea* and the Chlorophyta *Caulerpa cylindracea*. These two species reach their highest abundance between the end of summer and autumn. The seasonal dynamics of native and invasive macroalgae thus suggest planning monitoring activities between April and June, and no more than once per year.

59. Depth and slope: the depth range where coralligenous reefs can develop changes with latitude and characteristics of the water. Moreover, different kinds of assemblages may develop within the depth range of shallow coralligenous reefs. The slope of the rocky substrate is also important to determine the structure of coralligenous assemblages. To define a standardized sampling procedure suitable to collect comparable data, the range of sampling depth and substrate inclination must be fixed. In this context, a depth of around 35 m on a vertical substrate (i.e., slope 85-90°) can be considered as optimal to ensure the presence of coralligenous assemblages in most of the Mediterranean Sea, including the southern areas in oligotrophic waters. Vertical rocky substrates at about 35 m depth can also be easily found near the coast, which is in the zone mostly subjected to anthropogenic impacts.

60. Sampling design, sampling surface, and number of replicates: Coralligenous assemblages show a homogeneous structure when subjected to similar environmental conditions, at least within the same geographic area. They are thus characterised by low variability at spatial scales between hundreds of metres to kilometres, while variability at smaller spatial scales (from metres to tens of metres) is usually high (Abbiati et al., 2009; Ferdeghini et al., 2000; Piazzi et al., 2016). These findings suggest planning sampling designs focusing on high replication at small scales (i.e., tens of metres), whereas intermediate or large scales (i.e., hundreds of metres to kilometres respectively) will require fewer replicates.

61. The sampling surface is related to the number of replicates and represents an important factor to be considered. A minimum surface suitable to sample coralligenous assemblages has never been established unambiguously, so different replicated sampling surfaces have been proposed depending on the methods adopted (Piazzi et al., 2018 and references therein). Researchers agree that the replicated sampling surface must be larger than that utilized for shallow Mediterranean rocky habitats (i.e., ≥400 cm^2; Boudouresque, 1971), since the abundance of large colonial animals that characterise coralligenous assemblages could be underestimated when using small sampling areas (Bianchi et al., 2004b). Independent of the number of replicates, most of the proposed approaches suggest a total sampling area ranging between 5.6 and 9 m^2. Parravicini et al. (2009) reported that a sufficiently large sampling surface is more important than the specific method (e.g., visual quadrates or photography) to measure human impacts on Mediterranean rocky reef communities. Larger

sampling areas with a lower number of replicates are used for seascape approaches (Gatti et al., 2012). On the contrary, most of the proposed sampling techniques for biocenotic approaches consider a greater number of replicates with a comparatively smaller sampling area, usually disposed along horizontal transects (Kipson et al., 2011, 2014; Deter et al., 2012; Teixidó et al., 2013; Cecchi et al., 2014; Piazzi et al., 2015; Sartoretto et al., 2017) or in a square design (3 × 3 square structure) (Çinar et al., 2020). A comparison between these two sampling designs tested in the field showed no significant differences (Piazzi et al., 2019a), suggesting that both approaches can be usefully employed. Thus, three areas of 4 m^2 located tens of metres apart should be sampled, and a minimum of 10 replicated photographic samples of 0.2 m^2 each should be collected in each area by scientific divers, for a total sampling surface area of 6 m^2. This design can be repeated depending on the size of the study site and allows for the analysis of data through both seascape and biocenotic approaches (see the 'Ecological Indices' paragraph below).

62. Sampling techniques: coralligenous assemblages have been usually studied by destructive methods employing the total scraping of the substrate, by photographic methods associated with determination of taxa and/or morphological groups and by visual census techniques. The best results can be obtained integrating photographic sampling and *in situ* visual observations. The former is the most cost-effective method that requires less time spent underwater and allows collecting the large number of samples required for community analysis in a habitat with high spatial variability at small spatial scales. The latter method, using frames enclosing a standard area of the substrate, has been shown equally effective, but requires longer working time underwater (Parravicini et al., 2010), which may represent a limiting factor at depths where coralligenous assemblages thrive. A rapid visual assessment (RVA) method has been proposed for a seascape approach (Gatti et al., 2012, 2015a). RVA allows capturing additional information compared to the photographic technique, such as the size of colonies of erect species and the thickness and consistency of the calcareous accretion (see the 'Descriptors' paragraph below). A combination of photographic and visual approaches, using photographic sampling to assess the structure of assemblages and integrating information by collecting a reduced amount of data with the RVA method (i.e., the size of colonies of erect species and the thickness and consistency of the calcareous accretion) is thus suggested.

63. Photographic samples analysis: the analysis of photographic samples can be performed by different methods (Piazzi et al., 2019a and reference therein); the use of a very dense grid (e.g., 400 cells) or the manual contouring techniques through appropriate software may be useful to reduce the subjectivity of the operator's estimate.

64. Descriptors:

- *Sediment load.* Coralligenous reefs are particularly exposed to sediment deposition, especially of fine sediments. Both correlative and experimental studies have demonstrated that the increase of sedimentation rate can lead to changes in the structure of coralligenous assemblages, facilitating the spread of more tolerant and opportunistic species and causing the reduction of both α- and β-diversity. Increased sedimentation may affect coralligenous assemblages by covering sessile organisms, clogging filtering apparatus and inhibiting the rate of recruitment, growth, and metabolic processes. Moreover, sediment re-suspension can increase water turbidity, limiting algal production, and can cause death and removal of sessile organisms through burial and scouring. Thus, the amount of sediment deposited on coralligenous reefs has been considered by several researchers (Deter et al., 2012; Gatti et al., 2012, 2015a) and represents a valuable information, together with biotic descriptors, to assess the ecological quality of a study area. The amount of sediment may be indirectly evaluated as percentage cover on photographic samples, as this method showed consistent results with those obtained through underwater measurements of the sediment deposition (i.e., by a suction pump).

- *Calcareous accretion*. The calcareous accretion of coralligenous reefs may be impaired by human-induced impacts. The growth of the calcareous organisms that deposit calcium carbonate on coralligenous reefs is a slow process that can be easily disrupted by environmental alterations. Thus, the thickness and consistency of the calcareous deposit can be considered an effective indicator of the occurrence of a positive balance in the bioconstruction process (Gatti et al., 2012, 2015a). The thickness and consistency of the calcareous deposit can be measured underwater through a hand-held penetrometer, with six replicated measures in each of the three areas of about 4 m^2 and located tens of metres apart. For each measure, the hand-held penetrometer marked with a millimetric scale must be pushed into the carbonate layer, allowing the direct measurement of the calcareous thickness. By definition, a penetrometer measures the penetration of a device (a thin blade in this case) into a substrate, and the penetration will depend on the force exerted and on the strength of the material. In the case of a hand-held penetrometer, the force is that of the diver, and thus cannot be measured properly and provides a semi-quantitative estimate only. Supposing that the diver always exerts approximately the same force, the measure of the penetration will provide a rough estimate of the thickness of the material penetrated. A null penetration is indicative of a hard rock and suggests that the biogenic substrate is absent or the bioconstruction process is no longer active; a millimetric penetration indicates the presence of active bioconstruction resulting in a calcareous biogenic substrate; and a centimetric penetration reveals a still unconsolidated bioconstruction.

- *Erect anthozoans*. The long-living erect anthozoans, such as gorgonians, are considered key species in coralligenous reefs, as they contribute to the typical three-dimensional structure of coralligenous assemblages, providing biomass and biogenic substrates and contributing greatly to the aesthetic value of the Mediterranean sublittoral seascape. However, presence and abundance of these organisms may not necessarily be related to environmental quality, but rather to specific natural factors acting at the local scale (Piazzi et al., 2017a). Accordingly, coralligenous reefs without erect anthozoans may anyway possess a good ecological quality status. Most erect species are, however, affected by local or global physical and climatic factors, such as global warming, ocean acidification and increased water turbidity, independent of local measures of protection. Several human activities acting locally, such as fishing, anchoring or scuba diving, may also damage erect species. Thus, where erect anthozoans are structuring elements of coralligenous assemblages, they can be usefully adopted as ecological indicators through the measure of different variables. The size (mean height) and the percentage of necrosis and epibiosis of erect anthozoans should be assessed through the RVA visual approach, measuring the height of the tallest colony for each erect species, and estimating the percentage cover of the colonies showing necrosis and epibiosis signs in each of the three areas of about 4 m^2 and located tens of metres apart.

- *Structure of assemblages*. Coralligenous assemblages are considered very sensitive to human induced pressures (Piazzi et al., 2019a and references therein). Correlative and experimental studies highlighted severe shifts in the structure of coralligenous assemblages subjected to several kinds of stressors. The most effective bioindicators used to assess the ecological quality of coralligenous reefs are erect bryozoans, erect anthozoans, and sensitive macroalgae, such as Udoteaceae, Fucales, and erect Rhodophyta. On the other hand, the dominance of algal turfs, hydroids and encrusting sponges seems to indicate degraded conditions. Thus, the presence and abundance of some taxa/morphological groups may be considered as an effective indicator of the ecological status of coralligenous assemblages. A value of sensitivity level (SL) has been assigned to each taxon/morphological group based on its abundance in areas subjected to different levels of anthropogenic stress, with SL values varying within a numerical scale from 1 to 10, where low values correspond to the most tolerant organisms and high values to the most sensitive ones (Piazzi et al., 2017a; Fig. 6). Recently, a method has been proposed to distinguish and measure sensitivity to disturbance (DSL) and sensitivity to stress (SSL), the former causing mortality or physical damage and the latter physiological alteration, of the sessile organisms thriving in coralligenous assemblages (Montefalcone et al., 2017). Discriminate effects of stress from effects of disturbance may allow a better understanding of the impacts of human and natural pressures on coralligenous reefs.

The percentage cover of the conspicuous taxa/morphological groups can be evaluated on each photographic sample. The cover values (in %) of each taxon/morphological group are then classified in eight classes of abundance (Boudouresque, 1971): (1) 0 to ≤0.01%; (2) 0.01 to ≤0.1%; (3) 0.1 to ≤1%; (4) 1 to ≤5%; (5) 5 to ≤25%; (6) 25 to ≤50%; (7) 50 to ≤75%; (8) 75 to ≤100%). The overall SL of a sample is then calculated by multiplying the value of the SL of each taxon/group (Fig. 6) for its class of abundance and then summing up all the final values. Coralligenous assemblages are characterised by high biodiversity that is mostly related to the heterogeneity of the biogenic substrate, which increases the occurrence of microhabitats and exhibits distinct patterns at various temporal and spatial scales. A decrease in species richness (i.e., α-diversity) in stressed conditions has been widely described for coralligenous reefs (Balata et al., 2007), but also the number of taxa/morphological groups per sample can be considered a further effective indicator of ecological quality. Thus, the richness (α-diversity, i.e., the mean number of the taxa/groups per photographic sample) should be computed.

Taxon/group	SL
Algal turf	1
Hydrozoans (e.g. *Eudendrium* spp.)	2
Pseudochlorodesmis furcellata	2
Perforating sponges (e.g. *Cliona* spp.)	2
Dyctiotales	3
Encrusting sponges	3
Encrusting bryozoans	3
Encrusting ascidians (also epibiontic)	3
Encrusting Corallinales, articulated Corallinales	4
Peyssonnelia spp.	4
Valonia spp., *Codium* spp.	4
Sponges prostrate (e.g. *Chondrosia reniformis*, *Petrosia ficiformis*)	5
Large serpulids (e.g. *Protula tubularia*, *Serpula vermicularis*)	5
Parazoanthus axinellae	5
Leptogorgia sarmentosa	5
Flabellia petiolata	6
Erect corticated terete Ochrophyta (e.g. *Sporochnus pedunculatus*)	6
Encrusting Ochrophyta (e.g. *Zanardinia typus*)	6
Azooxantellate individual scleractinians (e.g. *Leptopsammia pruvoti*)	6
Ramified bryozoans (e.g. *Caberea boryi*, *Cellaria fistulosa*)	6
Palmophyllum crassum	7
Arborescent and massive sponges (e.g. *Axinella polypoides*)	7
Salmacina-Filograna complex	7
Myriapora truncata	7
Erect corticated terete Rodophyta (e.g. *Osmundea pelagosae*)	8
Bushy sponges (e.g. *Axinella damicornis*, *Acanthella acuta*)	8
Eunicella verrucosa, *Alcyonium acaule*	8
Erect ascidians	8
Corallium rubrum, *Paramuricea clavata*, *Alcyonium coralloides*	9
Zooxantellate scleractinians (e.g. *Cladocora caespitosa*)	9
Pentapora fascialis	9
Flattened Rhodophyta with cortication (e.g. *Kallymenia* spp.)	10
Halimeda tuna	10
Fucales (e.g. *Cystoseira* spp., *Sargassum* spp.), *Phyllariopsis brevipes*	10
Eunicella singularis, *Eunicella cavolini*, *Savalia savaglia*	10
Aedonella calveti, *Reteporella grimaldii*, *Smittina cervicornis*	10

Figure 6: Values of the sensitivity level (SL) assigned to each of the main taxon/morphological group in the coralligenous assemblages (Piazzi et al., 2017a).

- *Spatial heterogeneity*. Coralligenous assemblages are also characterised by a high variability at small spatial scale, and consequently by high values of β-diversity, which is linked to the patchy distribution of the organisms. Under stressed conditions, the importance of biotic factors in regulating the distribution of organisms decreases, and their occurrence and abundance mostly follow the gradient of stress intensity (Balata et al., 2005). The loss of structuring perennial species and the proliferation of ephemeral algae lead to widespread biotic homogenization (Balata et al., 2007; Gatti et al., 2015b, 2017), and to a consequential reduction of β-diversity (Piazzi et al., 2016). Thus, the β-diversity of assemblages may be considered a valuable indicator of human pressure on coralligenous reefs. β-diversity, in general, can be calculated through different methods; in the case of coralligenous assemblages, variability of species composition among sampling units (heterogeneity of assemblages) has been measured in terms of multivariate dispersion calculated as the distance from centroids (Piazzi et al., 2017a) through permutational analysis of multivariate dispersion (PERMDISP). Thus, any change in the compositional variability displayed by PERMDISP may be directly interpretable as changes in the β-diversity.

Protocol for monitoring deep water mesophotic (down to 40 m depth) coralligenous reefs

65. The use of unmanned vehicles, such as ROVs, may be considered suitable to survey deep coralligenous reefs in mesophotic environments, down to 40 m depth (UNEP/MAP-RAC/SPA, 2008; Cánovas-Molina et al., 2016a; Ferrigno et al., 2017). The Italian MSFD protocol (MATTM/ISPRA, 2016) for monitoring mesophotic coralligenous and rocky reefs includes a standard sampling design conceived to gather various quantitative components, such as the occurrence and extent of the habitat (either biogenic or rocky reefs), the siltation level, and the abundance, condition, and population structure of habitat-forming megabenthic species (i.e., animal forests), as well as presence and typology of marine litter.

66. Three replicated video-transects, each at least 200 m long, should be collected in each area investigated (Enrichetti et al., 2019). Footages can be obtained by means of a ROV, equipped with a high-definition digital camera, a strobe, a high-definition video camera, lights, and a 3-jaw grabber. The ROV should also host an underwater acoustic positioning system, a depth sensor, and a compass to obtain georeferenced tracks to be overlapped to multibeam maps when available. Two parallel laser beams (90° angle) can provide a scale for size reference. To guarantee the best quality of video footages, ROV is expected to move along linear tracks, in continuous recording mode, at constant slow speed ($< 0.3\ ms^{-1}$) and at a constant height from the bottom (< 1.5 m), thus allowing for adequate illumination and facilitating the taxonomic identification of the megafauna. Transects are then positioned along dive tracks by means of a GIS software editing. Each video transect is analysed through any of the ROV-imaging techniques, using starting and ending time of the transect track as reference. Visual census of megabenthic species is carried out along the complete extent of each 200 m-long transect and within a 50 cm-wide visual field, for a total of 100 m^2 of bottom surface covered per transect.

67. From each transect the following parameters are measured on videos:

- Extent of hard bottom, calculated as percentage of total video time showing this type of substrate (rocky reefs and biogenic reefs) and subsequently expressed in m^2;

- Species richness, considering only the conspicuous megabenthic sessile and sedentary species of hard bottom in the intermediate and canopy layers (*sensu* Gatti et al., 2015a). Organisms are identified to the lowest taxonomic level and counted. Fishes and encrusting organisms are not considered, as well as typical soft-bottom species. Some hard-bottom species, especially cnidarians, can occasionally invade soft bottoms by settling on small hard debris dispersed in the sedimentary environment. For this reason, typical hard-bottom species (e.g., *Eunicella verrucosa*) encountered in highly silted environments have to be considered in the analysis;

- Structuring species are counted, measured (height expressed in cm) and the density of each structuring species is computed and referred to the hard-bottom surface (as n° of colonies or individuals · m^{-2});
- The percentage of colonies with signs of epibiosis, necrosis and directly entangled in lost fishing gears are calculated individually for all structuring anthozoans;
- Marine litter is identified and counted. The final density (as n° of items · m^{-2}) is computed considering the entire transect (100 m^2).

68. Within each transect, 20 random high-definition photographs targeting hard bottom must be obtained, and for each of them four parameters are estimated, following an ordinal scale. Modal values for each transect are calculated. Evaluated parameters on photos include:

- Slope of the substrate: 0°, <30° (low), 30°-80° (medium), >80°(high);
- Basal living cover, estimated considering the percentage of hard bottom covered by organisms of the basal (encrusting species) and intermediate (erect species but smaller than 10 cm in height) layers: 0, 1 (<30%), 2 (30-60%), 3 (>60%);
- Coralline algae cover (indirect indicator of biogenic reef), estimated considering the percentage of basal living cover represented by encrusting coralline algae: 0, 1 (sparse), 2 (abundant), 3 (very abundant);
- Sedimentation level, estimated considering the percentage of hard bottom covered by sediments: 0%, <30% (low), 30-60% (medium), >60% (high).

Protocol for monitoring rhodolith beds

69. A standardized and common sampling method for monitoring rhodolith beds is not available to date (UNEP/MAP-RAC/SPA, 2008). Mediterranean rhodolith beds seem to display more diverse assemblages of coralline and peyssonneliacean algal species than their Atlantic counterparts, and to be structured by a suite of combinations of rhodolith shapes and coralline compositions: from monospecific branched growth-forms, to multispecific rhodoliths (Basso et al., 2016). Therefore, the monitoring protocols available for sampling and monitoring rhodoliths in shallow subtidal waters of the Atlantic Ocean cannot be applied as such and require calibration to the Mediterranean specificities.

70. A recent proposal of protocol for monitoring rhodolith beds can be found in Basso et al. (2016). Monitoring of rhodolith habitats can be done by underwater diving and direct visual observation, with sampling and following taxa identification in laboratory, as well as by blind sampling from vessel using grabs, dredges, and box corers (Tab. 4). Surveys using ROVs and towed cameras are also effective because of the great homogeneity of this habitat, although they do not provide a complete quantitative information on composition and abundance of rhodolith community as that provided by destructive sampling techniques. Monitoring should address all the variables already described for the first descriptive characterisation of the habitat, with the addition of a full quantitative description of the rhodolith community composition, through periodical surveys, including number of typical or indicator species. A decrease in rhodolith beds extent, live/dead rhodoliths ratio, live rhodoliths percentage cover, associated with changes in the composition of the macrobenthic community (calcareous algal engineers and associated taxa) may reveal potential negative impacts acting on rhodolith beds. All possible variations in growth form, shape, and internal structure of rhodoliths have been simplified in a scheme with three major categories as focal points along a continuum: 1) compact and nodular pralines; 2) larger and vacuolar box work rhodoliths; and 3) unattached branches (Fig. 7). Each of the three end-members within rhodoliths morphological

variability corresponds to a typical (but not exclusive) group of composing coralline algal species and associated biota and it is possibly correlated with environmental variables, among which substrate instability (mainly due to water movement) and sedimentation rate are the most obvious. Thus, the indication of the cover (in %) by the three live rhodoliths categories at the surface of each rhodolith bed is a proxy of the rhodolith habitat structural and ecological complexity. The high species diversity hosted by rhodolith beds requires time-consuming and expensive laboratory analysis for species identification. Videos and photos allow for a less fine assessment on the composition of rhodolith community due to the absence of conspicuous, easy-to-detect species. Moreover, since most coralline algal species belong to few genera only, the use of taxonomic ranks higher than species is not useful.

Table 4: Comparison among four traditional methods used to monitor rhodolith habitat.

Underwater visual observation	
Advantages	Low cost, results immediately available, non-destructive method, reference samples, taxonomical precision, information on the distribution of species
Limits	Work limited as regards to depth, small area inventoried
Use	Exploratory studies, monitoring of assemblages, bionomic studies
Blind sampling (dredges, grabs, and box corers)	
Advantages	Easy to implement, taxonomical precision, reference samples, analysis on the substrate (granulometry, calcimetry, % of organic matter), large depth-range investigated
Limits	Low precision of observation, several replicates needed, limited area inventoried, destructive method, high costs for taxonomic analysis
Use	Localised studies integrating a taxonomical element, validation of acoustic methods
ROV and towed camera	
Advantages	Objective evaluation, reference samples (images), large area inventoried, non-destructive method, information on the distribution of conspicuous species, large depth-range investigated
Limits	High cost, low taxonomical precision, problem of *a posteriori* interpretation of images, observation only of the superficial layer, little information on the substrate and on the basal layer
Use	Studies on distribution and temporal change, validation of acoustic methods
Acoustic methods	
Advantages	Very large areas inventoried, information on water movement (sedimentary figures), can be reproduced, non-destructive method, large depth-range investigated
Limits	High cost, uncertainties in the sonograms interpretation, additional validation (inter-calibration), observation only of the superficial layer, no taxonomical information
Use	Studies over large spatial scales, monitoring of populations, bionomic studies

71. When necessary, for a detailed characterization of rhodolith communities, a minimum of three box-cores with opening ≥0.16 m^2 should be collected in each rhodolith bed at the same depth, and to a depth of about 20 cm of sediment. One additional box-corer sample must be collected within the rhodolith area with the highest percentage of live cover (based on preliminary ROV surveys that remain necessary to pilot blind samplings from vessel), and the others as far as possible from it, following the depth gradient in opposite directions of the maximum rhodolith bed extension. In many instances grab samples could be useful, but attention must be paid to seafloor surface disruption and mixing, and the possible loss of material during recovery. In those extreme cases of very coarse material preventing box-core penetration and closure, a grab could be used instead, although it cannot preserve stratification. Once the box-core is recovered a colour photograph of the whole surface of the box-core, at a high enough resolution to recognise the morphology of single live rhodoliths and

other conspicuous organisms, must be collected. In addition, the possible occurrence of heavy overgrowths of fleshy algae that may affect rhodoliths growth rate must be reported. The following descriptors must then be assessed: 1) visual estimation of the percentage cover of live red calcareous algae; 2) visual estimation of the live/dead rhodoliths ratio calculated for the surface of the box-core; 3) visual assessment of the rhodolith morphologies characterising the sample (Fig. 7); 4) measurement of the thickness of the live rhodoliths layer. According to the specific objective of investigation, the sediment sample can then be washed through a sieve (e.g., 0.5 mm mesh) and the sample treated with Rose Bengal to stain living material before being preserved for sorting under a microscope for taxa identification. All live calcareous algae and accompanying phytobenthos and zoobenthos could be identified and quantified, to detect variability in space and time, and for any change after possible impacts. Algal species must be evaluated using a semi-quantitative approach (classes of abundance of algal coverage: absent, 1-20%, 21-40%, 41-60%, 61-80%, >81%). For molecular investigations, samples from voucher rhodolith morphotypes should be air-dried, and then preserved in silica gel. The sediment sample should be analysed for grain-size (mandatory), and carbonate content.

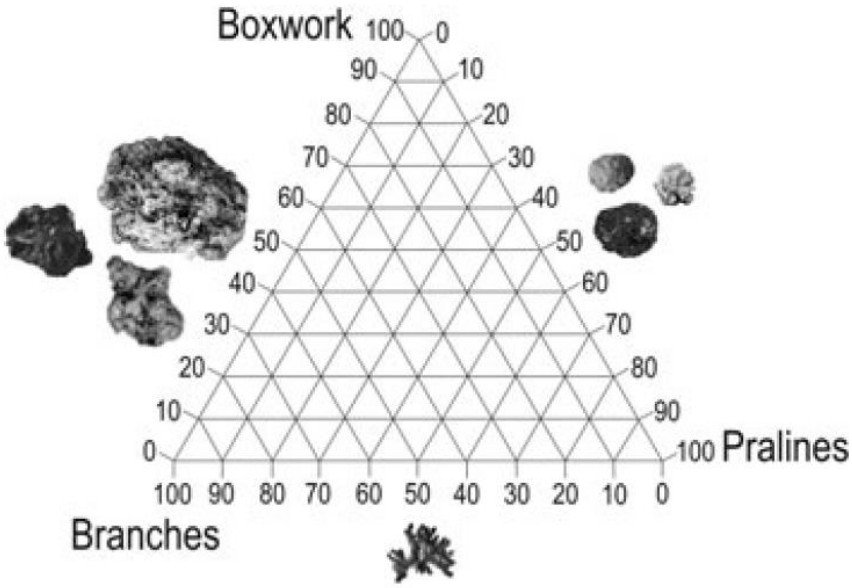

Figure 7: Ternary diagram for the description of the rhodoliths tridimensionality. The percentage cover of each rhodolith morphotype, relative to the total rhodoliths cover, can be plotted on the correspondent axis. The three main rhodolith morphotypes (box work rhodoliths, pralines, and unattached branches) are intended as focal points of a continuum, to which any possible rhodolith morphology can be approximately assigned. From Basso et al. (2016).

Ecological indices

72. At present, an ecological index to evaluate the status of rhodolith beds has not been proposed yet. On the contrary, to assess the ecological status of coralligenous reefs, several ecological indices have been developed based on different approaches (Kipson et al., 2011, 2014; Teixidó et al., 2013; Zapata-Ramírez et al., 2013; David et al., 2014; Féral et al., 2014; Piazzi et al., 2019a), which are summarised in Table 5. Most of the ecological indices available for monitoring shallow (up to about 40 m depth) coralligenous reefs require underwater surveys by scuba diving. These indices adopt distinct descriptors and sampling techniques, thus hampering the comparison of data and results, and requiring inter-calibration procedures. However, as described before, the protocol STAR (STAndaRdized coralligenous evaluation procedure; Piazzi et al., 2019a; Gennaro et

al., 2020) has been recently proposed as an effective procedure to obtain standardized data on most of the descriptors adopted in the different ecological indices through a single sampling effort and a shared data analysis. Detailed descriptions of the sampling tools and the methodologies needed to apply each ecological index listed in Table 5 can be found in the relative bibliographic references.

73. ESCA (Ecological Status of Coralligenous Assemblages; Cecchi et al., 2014; Piazzi et al., 2015, 2017a, 2021), ISLA (Integrated Sensitivity Level of coralligenous Assemblages; Montefalcone et al., 2017), and CAI (Coralligenous Assessment Index; Deter et al., 2012) indices are based on a biocenotic approach where coralligenous assemblages are investigated in terms of composition and abundance of all species for ESCA and ISLA, and of percentage cover of mud and builder organisms (i.e., Corallinales, bryozoans, and scleractinians) for CAI.

74. EBQI (Ecosystem-Based Quality Index; Ruitton et al., 2014) adopts a trophic web approach at the ecosystem level, in which the different functional components are identified, and an ecological status index is measured for each of them.

75. COARSE (COralligenous Assessment by ReefScape Estimate; Gatti et al., 2012, 2015a) uses a seascape approach to provide information about the structure of coralligenous reefs to assess the seafloor integrity. Since the coralligenous is characterised by high heterogeneity, extreme patchiness and coexistence of several biotic assemblages, a seascape approach seems to be the most reasonable solution for its characterisation.

76. OCI (Overall Complexity Index; Paoli et al., 2016) combines measures of structural and functional complexity, while the INDEX-COR (Sartoretto et al., 2017) integrates three descriptors (the sensitivity of taxa to organic matter and sediment deposition, the observable taxonomic richness, and the structural complexity of assemblages) to assess the health state of coralligenous assemblages.

77. Inter-calibrations among some of the above listed ecological indices have already been carried out. Comparison between ESCA and COARSE (Montefalcone et al., 2014; Piazzi et al., 2014, 2017a, 2017b), which are the two indices with the greatest number of successful applications to date (Piazzi et al., 2017b, 2021), in 24 sites of the NW Mediterranean Sea showed that the two indices provided different but complementary information to determine the intrinsic quality of coralligenous reefs and to detect the effects of human pressures on the associated assemblages. The concurrent use of ESCA and COARSE is thus effective in providing information about the alteration of ecological quality of coralligenous reefs. A recent comparison among ESCA, ISLA, and COARSE has also been carried out (Piazzi et al., 2018), which proved that the main differences among indices are linked to the different approaches used, with ESCA and ISLA showing the highest consistency being based on a biocenotic approach. Finally, CAI, ESCA, COARSE, and INDEX-COR have been compared in 21 sites along the southern coasts of France (Gatti et al., 2016). Results showed that the four indices are not always concordant in indicating the ecological quality of coralligenous habitats, some metrics being more sensitive than others to the increasing pressure levels.

78. Comparatively fewer efforts have been made to propose ecological indices for mesophotic environments based on ROV footages, resulting in three seascape indices (Tab. 6), namely MAES (Mesophotic Assemblages Ecological Status; Cánovas-Molina et al., 2016a), CBQI (Coralligenous Bioconstructions Quality Index; Ferrigno et al., 2017), and MACS (Mesophotic Assemblages Conservation Status; Enrichetti et al., 2019). MACS is a new multi-parametric index that is composed of two independent units, the Index of Status (*Is*) and the Index of Impact (*Ii*) following a DPSIR (Driving forces - Pressures - Status - Impacts - Response) approach. The MACS index integrates three descriptors included in the MSFD and listed by the Barcelona Convention to define the environmental status of seas, namely biological diversity, seafloor integrity, and marine litter. The *Is* depicts the biocenotic complexity of the investigated ecosystem, whereas the *Ii* describes its impacts. Environmental status is the outcome of the status of benthic communities plus the effects of impacts upon them: the integrated MACS index measures the resulting environmental status of deep coralligenous habitats reflecting the combination of the two units and their ecological significance. The MACS index has been effectively calibrated on 14 temperate mesophotic reefs of

the Ligurian and Tyrrhenian seas, all characterised by the occurrence of temperate reefs and subjected to different environmental conditions and levels of human pressures.

Final remarks

79. Inventorying and monitoring the condition of coralligenous reefs and rhodolith seabeds in the Mediterranean constitutes a unique challenge given the ecological and economic importance of these habitats and the threats that hang over their continued existence. Long ignored due to their difficult accessibility and the limited means of investigation, today these habitats are widely included in monitoring programs to assess environmental quality.

80. A standardized approach must be encouraged for monitoring the condition of coralligenous reefs and rhodolith seabeds, and in particular:

- Knowledge on coralligenous reefs and rhodolith seabeds distribution should be continuously enhanced at the Mediterranean scale, especially in the eastern basin, and reference areas/sites should be individuated;
- Long chronological dataset must be envisaged, and a network of Mediterranean experts settled up;
- Monitoring networks, locally managed and coordinated on a regional scale, should be started, and the standardized protocols here proposed should be applied to the entire Mediterranean both on coralligenous reefs and rhodolith seabeds.

Table 5: Descriptors used in the ecological indices mostly adopted in the regional/national monitoring programs to evaluate environmental quality of shallow water (up to 40 m depth) coralligenous reefs and based on different approaches.

Index	Method	Image analysis	Descriptors
Biocenotic			
ESCA	Photographic samples: 30 photographic quadrates (50 cm × 37.5 cm) in two areas hundreds of metres apart	Software Image J' for the estimation of the % cover of the main taxa and/or morphological groups of sessile macro-invertebrates and macroalgae	3 descriptors: Sensitivity Level of all species (SL); α diversity (diversity of assemblages); β diversity (heterogeneity of assemblages)
ISLA	Photographic samples: 30 photographic quadrates (50 cm × 37.5 cm) in two areas hundreds of metres apart	Software Image J' for the estimation of the % cover of the main taxa and/or morphological groups of sessile macro-invertebrates and macroalgae	2 descriptors: Integrated Sensitivity Level of all species (ISL), i.e. Sensitivity Level to stress (SSL) and Sensitivity Level to disturbance (DSL)
CAI	Photographic samples: 30 photographic quadrates (50 cm×50 cm) along a 40 m long transect	Software CPCe 3.6 for the estimation of the % cover by each species	3 descriptors: % cover of mud; % cover of builders; % cover of bryozoans
Ecosystem			
EBQI	Direct *in situ* observations and samples. A simplified conceptual model of the functioning of the ecosystem with 10 functional compartments		11 descriptors: % cover of builders; % cover of non-calcareous species; abundance of filter and suspension feeders; occurrence of bioeroders and density of sea urchins; abundance of browsers and grazers; biomass of planktivorous fish; biomass of predatory fish; biomass of piscivorous fish; Specific Relative Diversity Index for fish; % cover of benthic detritus matter; density of detritus feeders
Seascape			
COARSE	Direct *in situ* observations with the Rapid Visual Assessment (RVA): 3 replicated visual estimations over an area of about 2 m^2 each		9 descriptors, 3 per each layer: Basal layer: % cover of encrusting calcified rhodophyta, non-calcified encrusting algae, encrusting animals, turf-forming algae and sediment; amount of boring species marks; thickness and consistency of calcareous layer with a hand-held penetrometer (5 replicates) Intermediate layer: specific richness; n° of erect calcified organisms; sensitivity of bryozoans Upper layer: total % cover of species; % of necrosis of each population; maximum height of the tallest specimen

Index	**Method**	**Image analysis**	**Descriptors**
Integrated			
INDEX-COR	Photographic samples and direct observations: 30 photographic quadrates (60 cm × 40 cm) along two 15 m long transects (15 photos per transect); visual census of marine litter, conspicuous benthic sessile and mobile species (echinoderms, crustacean decapods, and nudibranchs), estimation of the % cover of gorgonians and sponges, % of necrotic gorgonian colonies	Free software photoQuad, using the uniform point count technique	3 descriptors: Taxa Sensitivity level (TS) to organic matter and sediment input; taxonomic richness of conspicuous taxa that are recognizable visually on photo-quadrates and *in situ*; structural complexity of the habitat, defined from the % cover of the taxa belonging to basal and intermediate layers estimated from the photo-quadrates and the % cover of gorgonians and large sponges observed *in situ* along the transects for the upper layer
OCI	Available detailed maps of benthic habitats		Surface area covered by coralligenous obtained from maps; list of the main taxonomic groups found in the habitat; biomass per unit area of each taxonomic group obtained from the literature. These descriptors are used to compute exergy and specific exergy as a measure of structural complexity, whilst throughput and information as a measure of functional complexity

Table 6: Descriptors used in the ecological indices mostly adopted in the regional/national monitoring programs to evaluate environmental quality of deep water (from about 40 m to about 120 m depth) coralligenous reefs occurring in the mesophotic zone.

Index	**Method**	**Image analysis**	**Descriptors**
Seascape			
MAES	ROV survey: 500 m long video transects per area and 20 random high-resolution photographs frontally on the seafloor	VLC program for video and Image J' software for photos	6 descriptors: n° of megabenthic taxa; % biotic cover in the basal layer; density of erect species; average height and % cover of the dominant erect species; % of colonies with epibiosis/necrosis; density of marine litter
CBQI	ROV survey and photographs	VisualSoft software for video and DVDVideoSoft software to obtain random frames every 10 seconds for quantitative analysis	9 descriptors: % cover of coralligenous on the bottom; n° of morphological groups; density of fan corals; % of colonies with epibiosis/necrosis; % of colonies with covered/entangled signs; % of fishing gear; depth; slope; substrate type
MACS	ROV survey: three replicated video transects, each at least 200 m long, and 20 random high-resolution photographs frontally on the seafloor	VLC program for video and Image J' software for photos	12 descriptors: species richness of the conspicuous megabenthic sessile and sedentary species in the intermediate and canopy layers; % cover of basal encrusting species; % cover of coralline algae; dominance of structuring species; density of structuring species; height of structuring species; % cover of sediment; % of colonies with signs of epibiosis; % of colonies with signs of necrosis; % of colonies directly entangled in lost fishing gears; density of marine litter; typology of marine litter

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Annex 1

List of the main species to be considered in the inventorying and monitoring of coralligenous and rhodolith habitats (from UNEP/MAP-RAC/SPA, 2015). Each Contracting Party can regularly improve these lists and chose the most appropriate species according to its geographical situation.

Coralligenous
(*invasive; **disturbed or stressed environments, when abundant; * protected species)**

Builders
Algal builders
Lithophyllum cabiochae (Boudouresque & Verlaque) Athanasiadis, 1999
Lithophyllum stictiforme (J.E. Areschoug) Hauck, 1877
Lithothamnion sonderi Hauck, 1883
Lithothamnion philippii Foslie, 1897
Mesophyllum alternans (Foslie) Cabioch & M.L. Mendoza, 1998
Mesophyllum expansum (Philippi) Cabioch & M.L. Mendoza, 2003
Mesophyllum macedonis Athanasiadis, 1999
Mesophyllum macroblastum (Foslie) W.H. Adey, 1970
Neogoniolithon mamillosum (Hauck) Setchell & L.R. Mason, 1943
Peyssonnelia rosa-marina Boudouresque & Denizot, 1973
Peyssonnelia polymorpha (Zanardini) F. Schmitz, 1879
Sporolithon ptychoides Heydrich, 1897

Animal builders
Foraminifera
Miniacina miniacea Pallas, 1766

Bryozoans
Adeonella spp. Canu & Bassler, 1930
Myriapora truncata Pallas, 1766
Pentapora fascialis Pallas, 1766
Rhynchozoon neapolitanum Gautier, 1962
Schizomavella spp.
Schizoretepora serratimargo (Hincks, 1886)
Smittina cervicornis Pallas, 1766
Turbicellepora spp.

Polychaeta
Serpula spp.
Protula tubularia (Montagu, 1803)
Spirobranchus polytrema Philippi, 1844
Spirorbis sp.

Cnidaria
Caryophyllia (Caryophyllia) inornata (Duncan, 1878)
Caryophyllia (Caryophyllia) smithii Stokes & Broderip, 1828
Cladocora caespitosa Linnaeus, 1767
Dendrophyllia ramea Linnaeus, 1758
Dendrophyllia cornigera Lamarck, 1816
Hoplangia durotrix Gosse, 1860
Leptopsammia pruvoti Lacaze-Duthiers, 1897
Madracis pharensis (Heller, 1868)
Polycyathus muellerae Abel, 1959
Phyllangia americana mouchezii Lacaze-Duthiers, 1897

Bioeroders
Sponges
Clionidae (*Cliona*, *Pione*)

Echinoids
Echinus melo Lamarck, 1816
Sphaerechinus granularis (Lamarck, 1816)

Molluscs
Hiatella arctica Linnaeus, 1767
Lithophaga lithophaga Linnaeus, 1758***
Petricola lithophaga (Retzius, 1788)
Rocellaria dubia (Pennant, 1777)

Polychaetes
Dipolydora spp.
Dodecaceria concharum Örsted, 1843
Polydora spp.

Sipunculids
Aspidosiphon (Aspidosiphon) muelleri muelleri Diesing, 1851
Phascolosoma (Phascolosoma) stephensoni Stephen, 1942

Other relevant species
Algae
Green algae
Caulerpa cylindracea Sonder, 1845*
Caulerpa taxifolia (M. Vahl) C. Agardh, 1817*
Codium bursa (Olivi) C. Agardh, 1817**
Codium fragile (Suringar) Hariot, 1889*
Codium vermilara (Olivi) Chiaje, 1829**

Flabellia petiolata (Turra) Nizamuddin, 1987
Halimeda tuna (J. Ellis & Solander) J.V. Lamouroux, 1816
Palmophyllum crassum (Naccari) Rabenhorst, 1868

<u>Brown algae</u>
Acinetospora crinita (Carmichael) Sauvageau, 1899**
Cystoseira dubia Valiante, 1883***
Cystoseira montagnei var. *compressa* (Ercegovic) M. Verlaque, A. Blanfuné, C.F. Boudouresque, T. Thibaut & L.N. Sellam, 2017
Cystoseira zosteroides (Turner) C. Agardh, 1821***
Dictyopteris lucida M.A. Ribera Siguán, A. Gómez Garreta, Pérez Ruzafa, Barceló Martí & Rull Lluch, 2005**
Dictyota spp.**
Halopteris filicina (Grateloup) Kützing, 1843
Laminaria rodriguezii Bornet, 1888***
Phyllariopsis brevipes (C. Agardh) E.C. Henry & G.R. South, 1987
Stictyosiphon adriaticus Kützing, 1843**
Stilophora tenella (Esper) P.C. Silva in P.C. Silva, Basson & Moe, 1996**
Stypopodium schimperi (Kützing) M. Verlaque & Boudouresque, 1991*

<u>“Yellow” algae (Pelagophyceae)</u>
Nematochrysopsis marina (J. Feldmann) C. Billard, 2000**

<u>Red algae</u>
Acrothamnion preissii (Sonder) E.M. Wollaston, 1968*
Asparagopsis taxiformis (Delile) Trevisan de Saint-Léon, 1845*
Cryptonemia lomation (Bertoloni) J. Agardh, 1851
Gloiocladia spp.
Halymenia spp.
Kallymenia spp.
Leptofauchea coralligena Rodríguez-Prieto & De Clerck, 2009
Lophocladia lallemandii (Montagne) F. Schmitz, 1893*
Osmundaria volubilis (Linnaeus) R.E. Norris, 1991
Peyssonnelia spp. (non calcareous)
Phyllophora crispa (Hudson) P.S. Dixon, 1964
Ptilophora mediterranea (H.Huvé) R.E. Norris, 1987
Rodriguezella spp.
Sebdenia spp.
Womersleyella setacea (Hollenberg) R.E. Norris, 1992*

Animals
<u>Sponges</u>
Acanthella acuta Schmidt, 1862
Agelas oroides Schmidt, 1864
Aplysina aerophoba Nardo, 1843***
Aplysina cavernicola Vacelet, 1959***
Axinella spp.***
Calyx nicaeensis (Risso, 1827)
Chondrosia reniformis Nardo, 1847
Clathrina clathrus Schmidt, 1864
Cliona viridis (Schmidt, 1862)
Crambe crambe (Schmidt, 1862)
Dysidea spp.
Fasciospongia cavernosa (Schmidt, 1862)
Haliclona (Reniera) mediterranea Griessinger, 1971
Haliclona (Soestella) mucosa Griessinger, 1971
Haliclona (*Halichoclona*) *fulva* (Topsent, 1893)
Hemimycale columella Bowerbank, 1874
Ircinia oros Schmidt, 1864
Ircinia variabilis Schmidt, 1862
Oscarella spp.
Petrosia (Petrosia) ficiformis (Poiret, 1789)
*Phorbas tenacior*Topsent, 1925
Sarcotragus foetidus Schmidt, 1862
Sarcotragus spinosulus Schmidt, 1862
Spirastrella cunctatrix Schmidt, 1868
Spongia (Spongia) officinalis Linnaeus, 1759***
Spongia (Spongia) lamella Schulze, 1879***

<u>Cnidaria</u>
Aglaophenia kirchenpaueri (Heller, 1868)
Alcyonium acaule Marion, 1878
Alcyonium palmatum Pallas, 1766
Antipathes spp.***
Callogorgia verticillata Pallas, 1766
Cerianthus lloydii Gosse, 1859
Cerianthus membranaceus (Gmelin, 1791)
Corallium rubrum Linnaeus, 1758***
Desmophyllum dianthus (Esper, 1794)
Ellisella paraplexauroides Stiasny, 1936
Eunicella spp.
Leptogorgia sarmentosa Esper, 1789
Madracis pharensis (Heller, 1868)
Paramuricea clavata Risso, 1826
Parazoanthus axinellae Schmidt ,1862
Savalia savaglia Bertoloni, 1819***

<u>Polychaeta</u>
Filograna implexa Berkeley, 1835
Sabella spallanzanii Gmelin, 1791
Salmacina dysteri Huxley, 1855
Protula spp.

<u>Bryozoans</u>

Chartella tenella Hincks, 1887
Hornera frondiculata (Lamarck, 1816)***
Margaretta cereoides Ellis & Solander, 1786

Tunicates
Aplidium spp.
Cystodytes dellechiajei (Della Valle, 1877)
Halocynthia papillosa Linnaeus, 1767
Herdmania momus (Savigny, 1816)
Microcosmus sabatieri Roule, 1885
Pseudodistoma cyrnusense Pérès, 1952

Molluscs
Cerithium scabridum Philippi, 1848*
Charonia lampas Linnaeus, 1758***
Charonia variegata Lamarck, 1816
Luria lurida Linnaeus, 1758***
Naria spurca (Linnaeus, 1758)
Pinna rudis Linnaeus, 1758***

Decapoda
Dardanus arrosor (Herbst, 1796)
Maja squinado Herbst, 1788***
Palinurus elephas Fabricius, 1787***
Pilumnus hirtellus (Linnaeus, 1761)
Scyllarides latus Latreille, 1803***

Echinodermata
Antedon mediterranea Lamarck, 1816
Centrostephanus longispinus Philippi, 1845***
Diadema setosum (Leske, 1778)*
Echinaster (*Echinaster*) *sepositus* (Retzius, 1783)
Hacelia attenuata Gray, 1840
Holothuria (Panningothuria) forskali Delle Chiaje, 1823
Holothuria (Platyperona) sanctori Delle Chiaje, 1823
Synaptula reciprocans (Forsskål, 1775)

Pisces
Anthias anthias (Linnaeus, 1758)
Coris julis (Linnaeus, 1758)
Chromis chromis (Linnaeus, 1758)
Epinephelus spp.***
Mycteroperca rubra Bloch, 1793
Pterois miles (Bennett, 1828)*
Sargocentron rubrum (Forsskål, 1775)*
Seriola dumerili (Risso, 1810)
Siganus luridus (Rüppell, 1829)*
Siganus rivulatus Forsskål & Niebuhr, 1775*
Sparisoma cretense (Linnaeus, 1758)
Sciaena umbra Linnaeus, 1758***
Scorpaena scrofa Linnaeus, 1758
Raja spp.***
Torpedo spp.
Mustelus spp.
Phycis phycis Linnaeus, 1766
Serranus cabrilla Linnaeus, 1758
Scyliorhinus canicula Linnaeus, 1758

<u>Rhodoliths</u>
(*invasive; **disturbed or stressed environments, when abundant; * protected species. Species that can be dominant or abundant are preceded by #)**

Algae
<u>Red algae (calcareous)</u>
Lithophyllum cabiochae (Boudouresque et Verlaque) Athanasiadis
#*Lithophyllum racemus* (Lamarck) Foslie, 1901
Lithophyllum stictiforme (J.E. Areschoug) Hauck, 1877
#*Lithothamnion corallioides* (P.L. Crouan & H.M. Crouan) P.L. Crouan & H.M. Crouan, 1867***
Lithothamnion minervae Basso, 1995
#*Lithothamnion valens* Foslie, 1909
Mesophyllum alternans (Foslie) Cabioch & Mendoza, 1998
Mesophyllum expansum (Philippi) Cabioch & Mendoza, 2003
Mesophyllum philippii (Foslie) W.H. Adey, 1970
Neogoniolithon brassica-florida (Harvey) Setchell & L.R. Mason, 1943
Neogoniolithon mamillosum (Hauck) Setchell & L.R. Mason, 1943
#*Peyssonnelia crispate* Boudouresque & Denizot, 1975
Peyssonnelia heteromorpha (Zanardini) Athanasiadis, 2016
#*Peyssonnelia rosa-marina* Boudouresque & Denizot, 1973
#*Phymatolithon calcareum* (Pallas) W.H. Adey & D.L. McKibbin ex Woelkering & L.M. Irvine, 1986***
#*Spongites fruticulosa* Kützing, 1841
Sporolithon ptychoides Heydrich, 1897
#*Tricleocarpa cylindrica* (J. Ellis & Solander) Huisman & Borowitzka, 1990

<u>Red algae (non-builders)</u>
Acrothamnion preissii (Sonder) E.M. Wollaston, 1968*
Alsidium corallinum C. Agardh, 1827
Cryptonemia spp.
Felicinia marginata (Roussel) Manghisi, Le Gall, Ribera, Gargiulo & M. Morabito, 2014
Gloiocladia microspora (Bornet ex Bornet ex Rodríguez y Femenías) N. Sánchez & C. Rodríguez-Prieto ex Berecibar, M.J. Wynne, Barbara & R. Santos, 2009
Gloiocladia repens (C. Agardh) Sánchez & Rodríguez-Prieto, 2007
Gracilaria spp.
Halymenia spp.
Kallymenia spp.
Leptofauchea coralligena Rodríguez-Prieto & De Clerck, 2009
Nitophyllum tristromaticum J.J. Rodríguez y Femenías ex Mazza, 1903
Osmundea pelagosae (Schiffner) K.W. Nam, 1994
#*Osmundaria volubilis* (Linnaeus) R.E. Norris, 1991
Peyssonnelia spp. (non-calcareous)
#*Phyllophora crispa* (Hudson) P.S. Dixon, 1964
Phyllophora heredia (Clemente) J. Agardh, 1842
Rhodophyllis divaricata (Stackhouse) Papenfuss, 1950
Rytiphlaea tinctoria (Clemente) C. Agardh, 1824
Sebdenia spp.
Vertebrata byssoides (Goodenough & Woodward) Kuntze, 1891
Vertebrata subulifera (C. Agardh) Kuntze, 1891
Womersleyella setacea (Hollenberg) R.E. Norris, 1992*

<u>Green algae</u>
Caulerpa cylindracea Sonder, 1845*
Caulerpa taxifolia (M. Vahl) C. Agardh, 1817*
Codium bursa (Olivi) C. Agardh, 1817

Flabellia petiolata (Turra) Nizamuddin, 1987
Microdictyon umbilicatum (Velley) Zanardini, 1862
Palmophyllum crassum (Naccari) Rabenhorst, 1868
Umbraulva dangeardii M.J. Wynne & G. Furnari, 2014

Brown algae
Arthrocladia villosa (Hudson) Duby, 1830
Acinetospora crinita (Carmichael) Sauvageau, 1899**
Carpomitra costata (Stackhouse) Batters, 1902
Cystoseira abies-marina (S.G. Gmelin) C. Agardh, 1820
Cystoseira foeniculacea (Linnaeus) Greville, 1830
Cystoseira foeniculacea f. *latiramosa* (Ercegovic?) A. Gómez Garreta, M.C. Barceló, M.A. Ribera & J.R. Lluch, 2001
Cystoseira montagnei var. *compressa* (Ercegovic) M. Verlaque, A. Blanfuné, C.F. Boudouresque, T. Thibaut & L.N. Sellam, 2017
Cystoseira zosteroides (Turner) C. Agardh, 1821***
Dictyopteris lucida M.A. Ribera Siguán, A. Gómez Garreta, Pérez Ruzafa, Barceló Martí & Rull Lluch, 2005
Dictyota spp.
Halopteris filicina (Grateloup) Kützing, 1843
Laminaria rodriguezii Bornet, 1888***
Lobophora variegata (J.V. Lamouroux) Womersley ex E.C.Oliveira, 1977
Nereia filiformis (J. Agardh) Zanardini, 1846
Phyllariopsis brevipes (C. Agardh) E.C. Henry & G.R. South, 1987
Spermatochnus paradoxus (Roth) Kützing, 1843
Sporochnus pedunculatus (Hudson) C. Agardh, 1817
Stictyosiphon adriaticus Kützing, 1843
Stilophora tenella (Esper) P.C. Silva, 1996
Zanardinia typus (Nardo) P.C. Silva, 2000

Animals
Sponges
Aplysina spp.***
Axinella spp.***
Cliona viridis Schmidt, 1862
Dysidea spp.
Haliclona spp.
Hemimycale columella Bowerbank, 1874
Oscarella spp.
Phorbas tenacior Topsent, 1925
Spongia (Spongia) officinalis Linnaeus, 1759***
Spongia (Spongia) lamella Schulze, 1879***

Cnidaria
Adamsia palliata (Müller, 1776)
Alcyonium palmatum Pallas, 1766
Aglaophenia spp.
Calliactis parasitica Couch, 1838
Cereus pedunculatus Pennant 1777
Cerianthus membranaceus (Gmelin, 1791)
Eunicella verrucosa Pallas, 1766
Funiculina quadrangularis Pallas, 1766
Leptogorgia sarmentosa Esper, 1789
Nemertesia antennina Linnaeus, 1758

Paramuricea macrospina Koch, 1882
Pennatula spp.
Veretillum cynomorium Pallas, 1766
Virgularia mirabilis Müller, 1776

<u>Polychaetes</u>
Aphrodita aculeata Linnaeus, 1758
Sabella pavonina Savigny, 1822
Sabella spallanzanii Gmelin, 1791

<u>Bryozoans</u>
Cellaria fistulosa Linnaeus, 1758
Hornera frondiculata (Lamarck, 1816)
Pentapora fascialis Pallas, 1766
Turbicellepora spp.

<u>Tunicates</u>
Aplidium spp.
Ascidia mentula Müller, 1776
Diazona violacea Savigny, 1816
Halocynthia papillosa Linnaeus, 1767
Microcosmus spp.
Phallusia mammillata Cuvier, 1815
Polycarpa spp.
Pseudodistoma crucigaster Gaill, 1972
Pyura dura Heller, 1877
Rhopalaea neapolitana Philippi, 1843
Synoicum blochmanni Heiden, 1894

<u>Echinodermata</u>
Astropecten irregularis Pennant, 1777
Chaetaster longipes (Bruzelius, 1805)
Echinaster (Echinaster) sepositus Retzius, 1783
Hacelia attenuata Gray, 1840
Holothuria (Panningothuria) forskali Delle Chiaje, 1823
Leptometra phalangium Müller, 1841
Luidia ciliaris Philippi, 1837
Ophiocomina nigra Abildgaard in O.F. Müller, 1789
Parastichopus regalis Cuvier, 1817
Spatangus purpureus O.F. Müller 1776
Sphaerechinus granularis Lamarck, 1816
Stylocidaris affinis Philippi, 1845

<u>Pisces</u>
Mustelus spp.
Pagellus acarne (Risso, 1827)
Pagellus erythrinus (Linnaeus, 1758)
Raja undulata Lacepède, 1802
Scyliorhinus canicula (Linnaeus, 1758)
Squatina spp.***
Trachinus radiatus Cuvier, 1829

Annex IX

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

Table of Contents

LEXICON

1. Definitions used in Summary Tables

Primary monitoring tool or scale: "Primary" here means the necessary (mandatory) monitoring tool and scale to assess EcAp/IMAP GES Common Indicators for marine mammals as approved by the Parties. Establishing primary monitoring tools does not impede contracting parties to use additional methods ("secondary" or new tools), knowing that those will answer other questions than those related to EcAp and IMAP reporting.

Secondary monitoring tool or scale: "Secondary" does not mean the "second-best" method or monitoring scale, but it indicates a method that applied to a different scale allows gathering complementary data that helps filling knowledge gaps, which will help correcting adaptive processes as, in this case, EcAp and MSFD. These "secondary" methods and scales are important in the long-term, but do not allow to assess EcAp/IMAP GES Common Indicators for marine mammals.

Voluntary monitoring tool: These are other data collection tools that can be used for marine mammals, better if applying existing guidelines (UNEP MAP 2019) and in an international cooperation programme. Even though they will not produce useful information to assess the GES in the short-, medium- or long-term, they can produce useful information to manage human-uses of the sea at a national or smaller scale.

2. Acronyms

A: Adriatic sub-region.
ACCOBAMS: Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area.
AL: Aegean-Levantine sub-region.
BC: Barcelona Convention.
CCI: Candidate Common Indicator.
CI: Common Indicator.
CORMONs: Correspondence Groups on Monitoring.
EcAp: Barcelona Convention Ecosystem Approach policy.
EO: EcAp/IMAP Ecological Objective.
EU: European Union.
FAO: Food and Agriculture Organization of the United Nations.
GFCM: General Fisheries Commission for the Mediterranean.
GSA: Geographical Subareas.
HD: Habitats Directive.
HELCOM: Convention on the Protection of the Marine Environment of the Baltic Sea Area - Helsinki Convention.
ICES: International Council for the Exploration of the Sea.
ICM: Ionian and Central Mediterranean sub-region.
IMAP: Barcelona Convention Integrated Monitoring and Assessment Programme.
IWC: International Whaling Commission.
MEDPOL: Programme for the Assessment and Control of Marine Pollution in the Mediterranean.
MAP: Mediterranean Action Plan.
MSFD: Marine Strategy Framework Directive.
OSPAR: Convention for the Protection of the Marine Environment of the North-East Atlantic.
PAP/RAC: Priority Actions Programme Regional Activity Centre.
RSMS: Regional Strategy for the conservation of Monk Seal in the Mediterranean.
SAP BIO: Strategic Action Programme for the conservation of Biological Diversity.
SPA/RAC: Regional Activity Centre for Specially Protected Areas Special.
STECF: Scientific, Technical and Economic Committee for Fisheries.
UNEP/MAP: United Nations Environment Programme /Mediterranean Action Plan.
WGBYC: Working Group on Bycatch of Protected Species.
WM: Western Mediterranean sub-region.

EXECUTIVE SUMMARY

This document was prepared in the framework of the EcAp process to propose refinement to the monitoring and assessment scales and propose reference and thresholds values for the IMAP Common Indicator (CI) 3 (*Species distributional range*), CI 4 (*Population abundance of selected species abundance*) and CI 5 (*Population demographic characteristics*) for marine mammal species, it also considers CI 12 (*Bycatch of vulnerable and non-target species*) because of its strong connection with CI 3, CI 4 and CI5.

This document summarizes background information on these CIs, including material on reference values, thresholds and targets, monitoring and assessment scales and GES definitions contained in the Barcelona Convention Decisions, and the necessary explanatory material. It also includes relevant material discussed and/or approved in the context of the EU Habitats Directive (HD) and Marine Strategy Framework Directive (MSFD), OSPAR, HELCOM and even some EU Mediterranean National prospective.

Early drafts were thoroughly discussed with a pool of Mediterranean experts composed by Rimel Ben Messaoud, Ali Cemal Gucu, Arda Tonay, Souad Lamouti, Giulia Mo, Vincent Ridoux, Aviad Scheinin, José Antonio Vázquez Bonales and revised accordingly. The final draft of this document benefited from revisions suggested by members of the ACCOBAMS Scientific Committee (particularly, Simone Panigada, Ayaka Amaha Ozturk and Joan Gonzalvo) and the Biodiversity Online Working Group (OWG) on Marine mammals.

The main products of this work are: (a) the Summary Tables (pages 32-38), (b) a list of recommended revisions to Appendix 1 of the Annex to the Decision IG.22/7 on '*Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria*' (Annex 1 to this document) and (c) a list of recommendations on future work to be carried out within the EcAp/IMAP revision and implementation.

Particularly, the **Summary Tables** summarize the current state of play and contain our proposals in regard to IMAP CI 3, 4, 5 and 12, GES objectives and targets for marine mammals. In particular, they provide background information on agreed EcAp Common Indicators, Ecological Objectives (EO), GES definitions and GES target and few proposals for changes and/or updates. They also include proposal on refining scales of monitoring for marine mammals and identify adequate scales for the most relevant species in the Mediterranean context. Finally, they contain proposals on assessment scales and criteria, including methods to set threshold and potential reference values.

The "**Recommendations for future work**", to be addressed in the context of the IMAP revision process, focus on the following issues:

- To ensure consistency or, at least, to ensure complementarity of EcAp/IMAP GES definitions, targets and IMAP monitoring and assessment scales with SAP BIO (Decision IG.24/7).
- To coordinate technical work on several aspects needing streamlining and regional agreement among experts, including:
    - The definition of specific aspects of CIs of reference values and parameters for the assessment for marine mammals, prior the next assessment (2023).
    - The appropriate level of significance for thresholds and reference values before the next assessment (2023).
    - The consideration of the potential impact of constantly changing baselines and on allowing the use of constantly decreasing trends within a specific time-window for CI3, CI4 and CI5.
    - The elaboration of initial reference maps for C3 and estimates of C4 and C5 for all possible species.
- To develop the Common Indicator 12 (bycatch) under EO1 rather than EO3, in cooperation with relevant agreements and organisations (e.g., for marine mammals: ACCOBAMS and Pelagos Agreement), in line with the MSFD D1C1 approach.

1. INTRODUCTION

1.1 Working methods to compile this report

1. Even though the priority of this report is to refine monitoring and assessment scales and define reference values and thresholds for EcAp/IMAP Common Indicator (CI) 3 (*Species distributional range*), CI4 (*Population abundance of selected species abundance*) and CI5 (*Population demographic characteristics*) for marine mammal species, it also considers CI12 (*Bycatch of vulnerable and non-target species*) because its strong connection with CI3, CI4 and CI5. It summarizes background information on these CIs, including material on reference values, thresholds and targets, monitoring and assessment scales and GES definitions contained in the Barcelona Convention Decisions, and the necessary explanatory material. It also includes relevant material discussed and/or approved in the context of the EU Habitats Directive (HD) and Marine Strategy Framework Directive (MSFD), OSPAR, HELCOM and even some EU Mediterranean National prospective. Finally, it contains some information on Candidate CIs (CCI), namely CCI24 (*Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles*), CCI26 (*Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animal*) and 27 (*Levels of continuous low frequency sounds with the use of models as appropriate*), which are relevant to marine mammals (e.g., on marine litter and acoustic pollution).

2. There are also pieces of preliminary boxed text identified as "***Recommendation for future work***". These highlight preliminary ideas on actions that must be taken immediately after having agreed the Assessment framework for marine mammals, possibly before the next assessment (2023).

3. The draft report has been prepared by Caterina Fortuna and Léa David. The first draft of each section has been then circulated to a group of Mediterranean experts acting as external reviewers. These experts are: Rimel Ben Messaoud, Ali Cemal Gucu, Souad Lamouti, Giulia Mo, Vincent Ridoux, Aviad Scheinin, Arda Tonay, José Antonio Vázquez Bonales.

4. A consolidated draft was shared with the ACCOBAMS Scientific Committee. Then, the revised draft was further discussed by the Biodiversity Online Working Group (OWG) on marine mammals before its finalization and submission to the CORMON meeting on Biodiversity and Fisheries.

1.2 Background material on relevant aspects of the EcAp/IMAP discussion in the European context

5. In the following sections, you find a compilation of material regarding definitions, reference values, thresholds for marine mammals mostly in the context of the HD and MSFD discussions. This material (which might disappear or become an appendix) is meant to inform the selection of proposed options on equivalent topics in the context of EcAp and IMAP discussions.

6. The **Summary Tables** (in A3 format, see pages 32-38) at the end of these introductory material are the main output of this report, as they summarize the current state of the play and contain our proposals.

1.2.1 EU MSFD and Barcelona Convention EcAp/IMAP Mediterranean sub-regions

1. EcAp sub-regions are the same as European Union (EU) Marine Strategy Framework Directive (MSFD) Mediterranean sub-regions: Western Mediterranean (WM), Ionian and Central Mediterranean (ICM), Adriatic (A) and Aegean-Levantine (AL). See the map below.

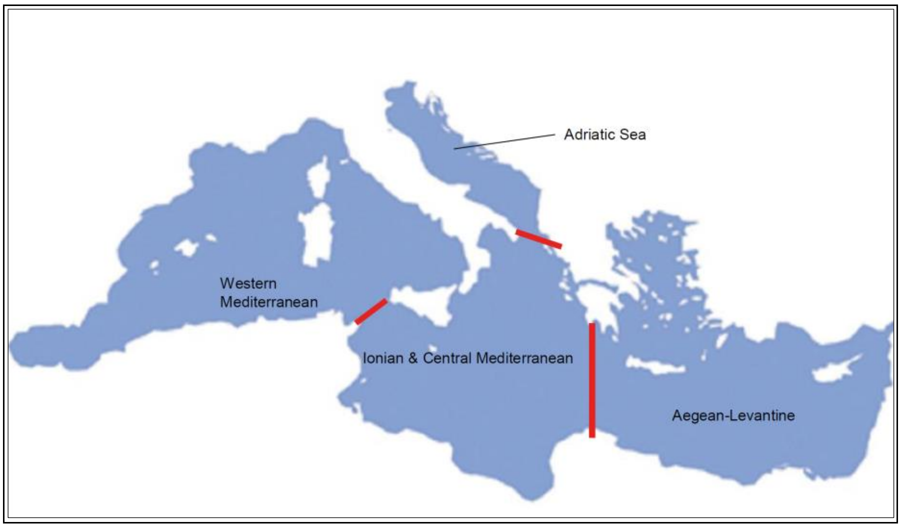
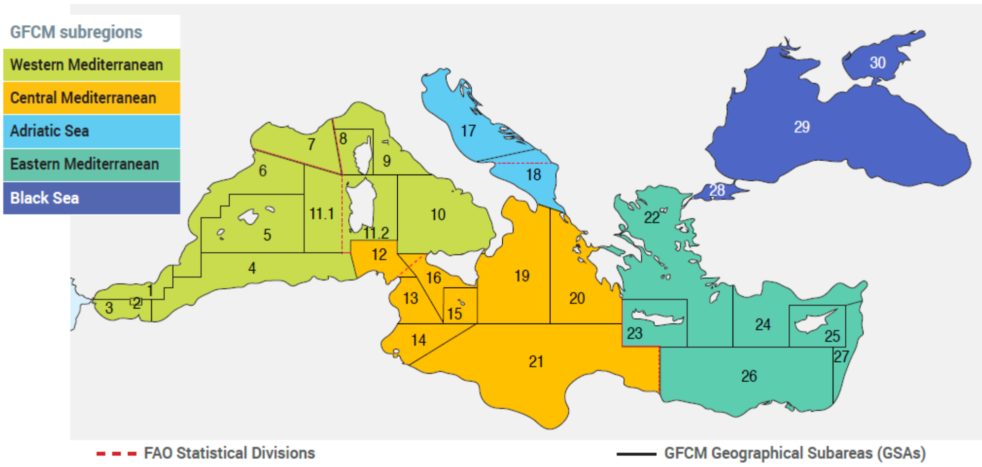


Figure 1: EcAp subregions

2. Sub-divisions are not yet defined; although some countries (e.g., Spain) have subdivisions and management units used within the MSFD.

3. In terms of sub-areas/management units already identified by other relevant organization (i.e. organizations dealing with pressures that might affect marine mammal species), the General Fisheries Commission for the Mediterranean (GFCM) Geographical Subareas (GSAs) exist and are relevant for the EcAp/IMAP assessment when considering Common Indicator 12 on bycatch mortality and its impact on species and their populations. Therefore, **the GFCM GSAs should be taken into due consideration** when designing substrata for the ACCOBAMS Survey Initiative (ASI)-like surveys, so that species abundance estimates can be provided in relation to these GSAs to assess bycatch mortality of marine mammals and other species of conservation concern.



GFCM GSAs

01 - Northern Alboran Sea	07 - Gulf of Lion	13 - Gulf of Hammamet	19 - Western Ionian Sea	25 - Cyprus
02 - Alboran Island	08 - Corsica	14 - Gulf of Gabes	20 - Eastern Ionian Sea	26 - South Levant
03 - Southern Alboran Sea	09 - Ligurian Sea and Northern Tyrrhenian Sea	15 - Malta	21 - Southern Ionian Sea	27 - Eastern Levant Sea
04 - Algeria	10 - South and Central Tyrrhenian Sea	16 - South of Sicily	22 - Aegean Sea	28 - Marmara Sea
05 - Balearic Islands	11.1 - Sardinia (west) 11.2 - Sardinia (east)	17 - Northern Adriatic Sea	23 - Crete	29 - Black Sea
06 - Northern Spain	12 - Northern Tunisia	18 - Southern Adriatic Sea	24 - North Levant Sea	30 - Azov Sea

Figure 2: General Fisheries Commission for the Mediterranean (GFCM) Geographical Subareas (GSA) *(Source: http://www.fao.org/gfcm/about/area-of-application/en/)*

1.2.2 GES DEFINITIONS AND GES TARGET IN THE HD, MSFD AND ECAP

4. Table 1 shows a comparison of definitions of conservation status/GES (state) and targets in the EU HD, MSFD and EcAp/IMAP contexts. It is worth noting that the HD focuses on habitats and species, whereas the MSFD focuses on the whole marine ecosystem.

Table 1 - Comparison of definitions of conservation status/GES (state) and targets in the EU HD, MSFD and BC EcAp/IMAP contexts

Conservation status in the EU HD: "state" definition	**Conservation status of a species in the EU HD: "state" targets**
The '*conservation status of a species*' is taken as '*favourable*' when (Article 1i): • population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, **and** • the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, **and** • there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis. Conservation Status is defined as: • **Favourable** (FV) describes the situation where species can be expected to prosper without any change to existing management or policies. FV is coded as GREEN. • **Unfavourable-Inadequate** (U1): describes situations where a change in management or policy is required to return the species to FV status, but there is no danger of extinction in the foreseeable future. U1 is coded as AMBER. • **Unfavourable-Bad** (U2): is for species in serious danger of becoming extinct (at least regionally). U2 is coded as RED. • **Unknown** (XX) class which can be used where there is insufficient information available to allow an assessment. XX is coded as GREY.	• **Favourable Reference Range (FRR)**: **Range** within which all significant ecological variations of species are included for a given biogeographical region and which is **sufficiently large to allow the long term survival** of the species. • **Favourable Reference value (FRV)** must be **at least the range (in size and configuration)** when the Directive **came into force**; if the range was insufficient to support a favourable status, the reference for favourable range should take account of that and should be larger (in such a case information on historic distribution may be found useful when defining the favourable reference range); 'best expert judgement' may be used to define it in absence of data. **Favourable Reference Population (FRP):** Population in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the species; favourable reference value must be at least the size of the population when the Directive came into force; information on historic distribution/population may be found useful when defining the favourable reference population; 'best expert judgement' may be used to define it in absence of other data.
Good Environmental Status in the EU MSFD: "state" definition	**Good Environmental Status in the EU MSFD: "state" targets**
Art, 3.5 states that "*'good environmental status'* [GES] *means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and* ***the use of the marine environment is at a level that is sustainable****, thus* ***safeguarding the potential for uses and activities*** *by current and future generations, i.e.:* *(a) the structure, functions and processes of the constituent marine ecosystems, together with the associated physiographic, geographic, geological and climatic factors,* ***allow those ecosystems to function fully and to maintain their resilience to human-induced environmental change****.* ***Marine species and habitats are protected****,* ***human-induced decline of biodiversity is prevented,*** *and diverse biological components function in balance;* *(b) hydro-morphological, physical and chemical properties of the ecosystems, including those properties which result from human activities in the area concerned, support the ecosystems as described above. Anthropogenic inputs of substances and energy, including noise, into the marine environment do not cause pollution effects*".	Relevant **qualitative descriptors** for determining GES (MSFD Annex I): *(1) 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. [**D1**]* *(4) All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity. [**D4**]* *(8) Concentrations of contaminants are at levels not giving rise to pollution effects. [**D8**]* *(10) Properties and quantities of marine litter do not cause harm to the coastal and marine environment. [**D10**]* *(11) Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. [**D11**]* In MSFD Annex III, among listed characteristics, pressures and impacts there are the following relevant definitions: ***Characteristics***: "*a description of the population dynamics, natural and actual range and status of species of marine*

Art. 10: "*[…] When devising those targets and indicators, Member States shall take into account the continuing application of relevant existing environmental targets laid down at national, Community or international level in respect of the same waters, ensuring that these targets are mutually compatible and that relevant transboundary impacts and transboundary features are also taken into account, to the extent possible*	*mammals and reptiles occurring in the marine region or subregion".* ***Pressures and impacts***: "*Biological disturbance:* […] *selective extraction of species, including incidental non-target catches (e.g. by commercial and recreational fishing*)".
Good Environmental Status in the Barcelona Convention EcAp: "state" definition	**Good Environmental Status in the Barcelona Convention EcAp: "state" targets**
EcAp aim to "A healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations". The EcAp ecological vision: • To protect, allow recovery and, where practicable, restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain good ecological status and allow for their sustainable use. • To reduce pollution in the marine and coastal environment so as to minimize impacts on and risks to human and/or ecosystem health and/or uses of the sea and the coasts. • To prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities and natural events.	**Ecological Objective 1 - Biological diversity (EO1):** "*Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic, and climatic conditions*". The term '*maintained*' is key and its condition is determined by three factors: i. No further loss of the diversity within species, between species and of habitats/communities and ecosystems at ecologically relevant scales. ii. Any deteriorated attributes of biological diversity are restored to and maintained at or above target levels, where intrinsic conditions allow. iii. Where the use of the marine environment is sustainable. **Ecological Objective 3 (EO3) - Harvest of commercially exploited fish and shellfish** ("*Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock*") is relevant for marine mammals because of Common Indicator 12: Bycatch of vulnerable and non-target species (EO1 and EO3). **Ecological Objective 4 (EO4) - Marine food webs:** "*Alterations to components of marine food webs caused by resource extraction or human-induced environmental changes do not have long-term adverse effects on food web dynamics and related viability*". In this EO marine mammals are considered under various functional groups. **Ecological Objective 9 (EO9) - Pollution:** "*Contaminants cause no significant impact on coastal and marine ecosystems and human health*" **Ecological Objective 10 (EO10) - Marine litter** is relevant for marine mammals because of Candidate Indicator 24 (Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles). **Ecological Objective 11 (EO11) - Energy including underwater noise** is relevant for some cetacean species because of two Candidate Indicators 26 (Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animal) and 27 (Levels of continuous low frequency sounds with the use of models as appropriate).

Key: EU HD= European Habitats Directive (Council *Directive* 92/43/EEC). **Sources:** Habitats Directive (Council *Directive* 92/43/EEC); Evans & Arvela (2011); Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardized methods for monitoring and assessment and repealing Decision 2010/477/EU.

1.2.3 Conservation status, reference values, thresholds and targets definitions in the HD and MSFD

5. In the context of the MSFD discussions, there is an ongoing effort to streamline definitions and approaches when setting **reference points** and **thresholds,** within and across descriptors. In practice, this means efforts to maintaining consistency in approaches by setting clear definitions. It has been concluded that this can be achieved only with a strong engagement in coordinating efforts at regional level (*see, for example, discussion at the MSFD workshop on cross-cutting issues on 30 September 2020*) and spelling out more clearly the official terminology.

1.2.3.1 Habitats Directive context

6. Under the EU HD, each Member State can set its own definitions of favourable status of conservation, reference points and thresholds, which then apply within its territorial waters. Definitions can change over time if an appropriate rationale is provided.

7. Concerning the distribution of species, HD art. 17 guidelines suggest that when estimating what they call **Favourable Reference Range** (FRR) for a species, the following factors should be considered:

- Current range.
- Potential extent of range taking into account physical and ecological conditions (such as climate, geology, soil, altitude).
- Historic range and causes of change.
- Area required for viability of habitat type/species, including consideration of connectivity and migration issues.
- Variability including genetics.

8. Concerning the species abundance, when setting the **Favourable Reference Population** (FRP) it is suggested to keep in mind the following background information and parameters:

- Historic distribution and abundances.
- Potential range.
- Biological and ecological conditions.
- Migration routes and dispersal ways.
- Gene flow or genetic variation including clines.
- Population should be sufficiently large to accommodate natural fluctuations and allow a healthy population structure.

9. Palialexis and colleagues observe that there are two approaches to set FRP (DG Environment, 2017):

- Model-based methods are built on biological considerations, such as those used in Population Viability Analysis (PVA) or on other estimates of Minimum Viable Population (MVP) size.
- Reference-based approaches that are founded on an indicative historical baseline corresponding to a documented (or perceived by conservation scientists) good condition of a particular species or restoring a proportion of estimated historical losses.

10. Data availability and quality determines the selection of the proper approach between reference-based and model-based (DG Environment, 2017).

11. The data used to estimate population size can be grouped in the following categories in the HD reporting (DG Environment, 2017):

- Complete survey or a statistically robust estimate
- Estimate based on partial data with some extrapolation and/or modelling
- Estimate based on expert opinion with no or minimal sampling
- Absent data
- Minimum viability population < FRP < potential population.

1.2.3.1.1 TRENDS

12. Under the HD, the period for **short-term trend** is recommended to be 12 years (two reporting cycles). The short-term trend should be used for the status assessment. The direction of the short- term trend can be: i) stable; ii) increasing; iii) decreasing; or iv) unknown. The percentage change over the period reported, if it can be quantified should be given as a precise figure (e.g., 27 %) or a banded range (e.g. 20-30 %) (ETC/BD, 2011; DG Environment, 2017). The **long-term trend** is recommended to be evaluated over a period of 24 years (four reporting cycles).

1.2.3.1.2 MAPPING

13. For mapping purposes, it is advised to use the ETC/BD to 10 x 10 km for visualisation, ETRS 89 LAEA grid; allowing to submit maps of 50 x 50 km for exceptional cases such as, for example, widely ranging but data poor cetaceans. In this sense, it is advisable to keep this in mind when defining the monitoring scales, to avoid in the medium-term too many empty cells.

1.2.3.1.2 ASSESSMENT MATRIX AND DEFINITION OF CONSERVATION OBJECTIVES

14. Table 2 (**HD evaluation matrix**) is a modified version of table 3 in Palialexis *et al*. 2019. It summaries all relevant definitions of HD Conservation Status reference thresholds.

Table 2 - HD evaluation matrix of Conservation Status of species *(modified)*

***Species* Parameter**	**Favourable** ('green')	**Unfavourable - Inadequate** ('amber')	**Unfavourable - Bad** ('red')	**Unknown**
Range (within the concerned biogeographical region)	**Stable** (loss and expansion in balance) or increasing **AND not < 'favourable reference range'.**	Any other combination.	**Large decline**: = to a loss of > 1% per year within period specified by MS **OR** > 10% < favourable reference range.	No or insufficient reliable information available to assess it.
Population	Population(s) **not < 'favourable reference population'** **AND** reproduction, mortality and age structure **not deviating from normal** (if data available).	[**Moderate decline** = to a loss of less than 1 % per year and ≤ 'favourable reference population'; **OR** a **large decline** = to a loss of > than 1 % per year and ≥ 'favourable reference population'; **OR** population size is < than 25 % below favourable reference population; **OR** age structure somehow different from a natural, self-sustaining population].	**Large decline**: = to a loss of > 1% per year (**indicative value MS may deviate from if duly justified**) within period specified by MS **AND** < 'favourable reference population' **OR** > 25% < favourable reference population **OR** reproduction, mortality and age structure strongly deviating from normal.	No or insufficient reliable information available to assess it.
Habitat for the species	Area of habitat is sufficiently large (and stable or increasing) **AND** habitat quality is suitable for the long-term survival of the species.	Any other combination.	Area of habitat is clearly not sufficiently large to ensure the long-term survival of the species **OR** Habitat quality is bad, clearly not allowing long term survival of the species.	No or insufficient reliable information available to assess it.
Future prospects (as regards to	**Main pressures and threats** to the species	Any other combination.	Severe influence of pressures and threats to	No or insufficient reliable information

population, range & habitat availability)	**not significant**; **species** will remain **viable on the long-term.**		the species; very bad prospects for its future, long-term viability at risk.	available to assess it.
Overall CS assessment	All 'green' **OR** three 'green' **AND** one 'unknown'.	**One or more** 'amber' **but no** 'red'.	**One or more** 'red'.	**Two or more** 'unknown' combined with green **OR** all "unknown".
Source: Modified from Table 3 in Palialexis *et al*. 2019 on definitions of HD parameters and list the threshold values set for the identification of the Conservation Status of each parameter.				

15. When discussing **reference values**, we should consider:
- using reference conditions/reference state (based on current conditions of sites considered to be in reference state, historical data or modelling);
- using a baseline condition set at a specified date in the past (i.e. the entering into force of HD);
- using a baseline condition set as 'current' state.

16. For **targets**:
- use of directional/trend-based targets (either purely a direction of change or incorporating a rate of desired change from a baseline);
- use of baseline value as the target;
- use of deviation (in absolute value terms or percentage change terms) from a specified given baseline;
- use of limits or thresholds (in relation to a specified baseline).

17. There are various ways to set conservation targets that are under discussion/consideration. For example, modelling carrying capacity, based on parameters of life history, and setting a target as a deviation from this total carrying capacity to allow for "sustainability" (e.g., 80%). IWC is using this method to manage aboriginal whaling sustainably or setting levels of pressure in line with agreed deviations from modelled carrying capacity (e.g., the Harbour porpoise EcoQO which sets a 1.7% limit for anthropogenic removal (including bycatch) so that a target population of at least 80% of carrying capacity is maintained).

1.2.3.2 Relevant indicators (i.e. criteria) in the MSFD context

18. In Table 3 are shown extracts of text on relevant criteria for marine mammals from "*Criteria and methodological standards, specifications and standardised methods for monitoring and assessment of essential features and characteristics and current environmental status of marine waters under point (a) of Article 8(1) of Directive 2008/56/EC"* (Commission Decision (EU) 2017/84).

Table 3 - Extract on relevant criteria for marine mammals from Commission Decision (EU) 2017/848

Criteria elements	Criteria	Methodological standards
Species of mammals, which are at risk from incidental by-catch in the region or subregion. *Member States shall establish that list of species through regional or subregional cooperation.*	**D1C1 - Primary**: The **mortality rate per species from incidental by-catch** is below levels which threaten the species, such that its long- term viability is ensured. *Member States shall establish the threshold values for the mortality rate from incidental by-catch per species, through regional or subregional cooperation.* Note: For D1C1, data shall be provided per species per fishing metier for each ICES area or GFCM Geographical Sub-Area or FAO fishing areas for the Macaronesian biogeographic region, to enable its aggregation to the relevant scale for the species concerned, and to identify the particular fisheries and fishing gear most contributing to incidental catches for each species. References to: • Article 25(5) of Regulation (EU) No 1380/2013	*Scale of assessment:* As used for assessment of the corresponding species or species groups under criteria D1C2-D1C5. *Use of criteria:* The extent to which good environmental status has been achieved shall be expressed for each area assessed as follows: • the mortality rate per species and whether this has achieved the threshold value set. This criterion shall contribute to assessment of the corresponding species under criterion D1C2.

<table>
<tr><td></td><td>• Table 1D of the Annex to Commission Implementing Decision (EU) 2016/1251.
• Regulation (EC) No 199/2008</td><td></td></tr>
<tr><td rowspan="4">Species groups, as listed under Table 1 and if present in the region or subregion.

Member States shall establish a set of species representative of each species group, selected according to the criteria laid down under 'specifications for the selection of species and habitats', through regional or subregional cooperation. These shall include the mammals and reptiles listed in Annex II to Directive 92/43/EEC and may include any other species, such as those listed under Union legislation (other Annexes to Directive 92/43/EEC, Directive 2009/147/EC or through Regulation (EU) No 1380/2013) and international agreements such as Regional Sea Conventions.</td><td>D1C2 - Primary:
• The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.
Member States shall establish threshold values for each species through regional or subregional cooperation, taking account of natural variation in population size and the mortality rates derived from D1C1, D8C4 and D10C4 and other relevant pressures.
For species covered by Directive 92/43/EEC, these values shall be consistent with the Favourable Reference Population values established by the relevant Member States under Directive 92/43/EEC.</td><td rowspan="4">Scale of assessment:
Ecologically-relevant scales for each species group shall be used, as follows:
• for deep-diving toothed cetaceans, baleen whales: region,
• for small toothed cetaceans: subregion for Mediterranean Sea,
• for seals: subregion Mediterranean Sea.
Use of criteria:
The status of each species shall be assessed individually, on the basis of the criteria selected for use, and these shall be used to express the extent to which good environ- mental status has been achieved for each species group for each area assessed, as follows:
(a) the assessments shall express the value(s) for each criterion used per species and whether these achieve the threshold values set;
(b) the overall status of species covered by Directive 92/43/EEC shall be derived using the method provided under that Directive. The overall status for commercially-exploited species shall be as assessed under Descriptor 3. For other species, the overall status shall be de- rived using a method agreed at Union level, taking into account regional or subregional specificities;
(c) the overall status of the species group, using a method agreed at Union level, taking into account regional or subregional specificities.</td></tr>
<tr><td>D1C3 - Secondary for marine mammals:
• 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.
Member States shall establish threshold values for specified characteristics of each species through regional or sub-regional cooperation, taking account of adverse effects on their health derived from D8C2, D8C4 and other relevant pressures.</td></tr>
<tr><td>D1C4 - Primary for species covered by Annexes II [i.e. bottlenose dolphins, harbor porpoise, monk seal], IV [all cetaceans] or V to Directive 92/43/EEC and secondary for other species:
• 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 sub-regional cooperation. For species covered by Directive 92/43/EEC, these shall be consistent with the Favourable Reference Range values established by the relevant Member States under Directive 92/43/EEC.</td></tr>
<tr><td>D1C5 - Primary for species covered by Annexes II [i.e. bottlenose dolphins, harbor porpoise, monk seal], IV and V to Directive 92/43/EEC and secondary for other species:
• The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.</td></tr>
<tr><th>Criteria elements</th><th>Criteria</th><th>Methodological standards</th></tr>
<tr><td>Litter and micro-litter classified in the categories 'artificial polymer materials' and 'other', assessed in any species from the following groups: birds, mammals, reptiles, fish or invertebrates.</td><td>D10C3 - Secondary:
• The amount of litter and micro-litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned.
Member States shall establish threshold values for these levels through regional or subregional cooperation.</td><td>The use of criteria D10C1, D10C2 and D10C3 in the overall assessment of good environmental status for Descriptor 10 shall be agreed at Union level. The outcomes of criterion D10C3 shall also contribute to assessments under Descriptor 1, where appropriate.</td></tr>
</table>

<table>
<tr><td>Member States shall establish that list of species to be assessed through regional or subregional cooperation.</td><td></td><td></td></tr>
<tr><th>Criteria elements</th><th>Criteria</th><th>Methodological standards</th></tr>
<tr><td>Species of birds, mammals, reptiles, fish or invertebrates which are at risk from litter.

Member States shall establish that list of species to be assessed through regional or subregional cooperation.</td><td>D10C4 - Secondary:
• The number of individuals of each species which are adversely affected due to litter, such as by entanglement, other types of injury or mortality, or health effects.
Member States shall establish threshold values for the adverse effects of litter, through regional or subregional cooperation.</td><td>Scale of assessment: As used for assessment of the species group under Descriptor 1.
Use of criteria:
The extent to which good environmental status has been achieved shall be expressed for each area assessed as follows: — for each species assessed under criterion D10C4, an estimate of the number of individuals in the assessment area that have been adversely affected.
The use of criterion D10C4 in the overall assessment of good environmental status for Descriptor 10 shall be agreed at Union level.
The outcomes of this criterion shall also contribute to assessments under Descriptor 1, where appropriate.</td></tr>
<tr><td>Anthropogenic impulsive sound in water.</td><td>D11C1 — Primary:
• The spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect populations of marine animals.
Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</td><td rowspan="2">Scale of assessment: Region, subregion or subdivisions.
Use of criteria:
The extent to which good environmental status has been achieved shall be expressed for each area assessed as follows: (a) for D11C1, the duration per calendar year of impulsive sound sources, their distribution within the year and spatially within the assessment area, and whether the threshold values set have been achieved; (b) for D11C2, the annual average of the sound level, or other suitable temporal metric agreed at regional or subregional level, per unit area and its spatial distribution within the assessment area, and the extent (%, km^2) of the assessment area over which the threshold values set have been achieved.
The use of criteria D11C1 and D11C2 in the assessment of good environmental status for Descriptor 11 shall be agreed at Union level.
The outcomes of these criteria shall also contribute to assessments under Descriptor 1.</td></tr>
<tr><td>Anthropogenic continuous low-frequency sound in water.</td><td>D11C2 — Primary:
• The spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals.
Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</td></tr>
</table>

<table>
<tr><th colspan="2">Species groups</th></tr>
<tr><td>Ecosystem component</td><td>Species groups</td></tr>
<tr><td>Mammals</td><td>Small-toothed cetaceans
Deep-diving toothed cetaceans
Baleen whales
Seals</td></tr>
<tr><td colspan="2">Specifications and standardised methods for monitoring and assessment relating to theme ‘Species groups of marine birds, mammals, reptiles, fish and cephalopods’
1. Species may be assessed at population level, where appropriate.
2. Wherever possible, the assessments under Directive 92/43/EEC, Directive 2009/147/EC and Regulation (EU) No 1380/2013 shall be used for the purposes of this Decision: […] (b) for mammals, reptiles and non-commercial fish, the criteria are equivalent to those used under Directive 92/43/EEC as follows: D1C2 and D1C3 equate to ‘population’, D1C4 equates to ‘range’ and D1C5 equates to ‘habitat for the species’;
3. Assessments of the adverse effects from pressures under criteria D1C1, D2C3, D3C1, D8C2, D8C4 and D10C4, as well as the assessments of pressures under criteria D9C1, D10C3, D11C1 and D11C2, shall be taken into account in the assessments of species under Descriptor 1.
Units of measurement for the criteria:
- D1C2: abundance (number of individuals or biomass in tonnes (t)) per species.</td></tr>
</table>

1.2.3.3 Definitions of reference points and thresholds in the context of regional discussions (i.e. OSPAR, HELCOM, HD) and national implementation

19. The following tables (Table 4, 5 and 6) summarise relevant information on definitions of criteria reference points and thresholds in the context of regional discussions (i.e. OSPAR and HELCOM), the HD and national implementation. In particular, they provide an overview of different approaches taken in different contexts. The national prospective is presented for some of the EU Mediterranean countries and represents examples of decisions taken by those countries only.

Table 4 - Definitions of criteria reference points and thresholds in the context of regional discussions (i.e. OSPAR, HELCOM, HD)

Criterion	Reference/baseline values	Thresholds
HELCOM C2.1 Population trends and abundance of seals (haul-out areas)	**Limit Reference Level** (LRL): at least 10,000 individuals.	GES is achieved for each species, when: i) the abundance of seals in each management unit is has attained a LRL of at least 10,000 individuals to ensure long-term viability; and ii) the species-specific growth rate is achieved indicating that abundance is not affected by severe anthropogenic pressures (HELCOM, 2018b). The growth rate aspect of the threshold value is assessed separately for populations at and below the **Target Reference Level** (TRL; which is population close to carrying capacity) (HELCOM, 2018b): - For populations at TRL, good status is defined as 'No decline in population size or pup production exceeding 10% occurred over a period up to 10 years'. - For populations below TRL, good status is defined as 3% below the maximum rate of increase for seal species, i.e. 7% annual rate of increase for grey seals and ringed seals and 9% for harbour seals. For good status, 80 % statistical support for a value at or above the threshold is needed.
HELCOM C4.1 Distribution of Baltic seals		GES is achieved when the threshold values for all considered parameters are achieved (HELCOM, 2018g): 1) the distributions of seals are close to pristine conditions (e.g. 100 years ago); 2) or where appropriate when all currently available haul-out sites are occupied (modern baseline); and 3) when no decrease in area of occupation occurs.

OSPAR C2.2 Harbour Seal and Grey Seal Abundance	**Rolling baseline** (current six-year assessment population size vs previous six-year assessment) and an historical fixed baseline. **Historical baseline** in 1992 or the closest value => year of HD entry into force.	***Assessment Value 1***: No decline in seal abundance of > 1% per year in the previous six-year period (a decline of approximately 6% over six years). ***Assessment Value 2***: No decline in seal abundance of >25% since the fixed baseline in 1992 (or closest value). The 25% chosen for the second assessment value currently approximates to 1% a year since 1992. Seal long-term trend in abundance (*Δbaseline*) calculated via generalised linear models (GLMs) or generalised additive models (GAMs). $\Delta abundance=(B-A/A)\times 100$; where A is the count fitted by the model in the baseline year and B is the count fitted by the model in the most recent survey year (OSPAR, 2018b). 80% confidence intervals.
HD Distributional Range and pattern of seals	**Favourable Reference Range** (ETC/BD, 2011): Range within which all significant ecological variations of the habitat/species are included for a given biogeographical region and which is sufficiently large to allow the long-term survival of the habitat/species.	**Favourable reference value**: at least the range (in size and configuration) when the Directive came into force (1992). If range insufficient to support a favourable status: larger (in such a case information on historic distribution may be found useful when defining the favourable reference range). **Changes in distributional pattern** are percentage change in occupancy between two periods for a given spatial unit: $\Delta\boldsymbol{distribution} = ((\boldsymbol{B}/\boldsymbol{N}) - (\boldsymbol{A}/\boldsymbol{N})) \times \mathbf{100}$; where A is the number of spatial units (e.g., sub-areas, grid cells) in an assessment unit (AU) occupied by seals 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 AU. For the present assessment, period A is 2003–2008 and period B is 2009–2014. The **Index of shift in occupancy** describes the overall shift in the seasonal distribution of seals between sub-areas or grid cells over time: $Shift = 2(A\&B)/(A+B)$; where A is the number of spatial units (e.g., sub-areas, grid cells) occupied by seals 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. For the present assessment, period A is 2003–2008 and period B is 2009–2014. 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.
Criterion	**Reference/baseline values**	**Thresholds**
OSPAR Grey Seal Pup Production	**Baselines** (OSPAR, 2018d): A fixed-baseline year (1992) is used. A short-term rate-based assessment value was also adopted that uses a **rolling baseline** (Method 1; OSPAR, 2012).	Use of the two types of baseline and associated assessment values seeks to provide an indicator that would warn against both a slow, but long-term steady decline (the problem of 'shifting baselines' associated with only having a rolling baseline) and against a recovery followed by a subsequent decline (potentially missed with a fixed baseline set below reference conditions) (OSPAR, 2018d). **Indicator assessment** values were set as a **percentage deviation** from the **baseline value** (Method 3; OSPAR, 2012). Associated with these baselines, two **assessment values** were used to assess grey seal pup production in each AU: • ***Assessment value 1***: **No decline** in grey **seal pup production of >1% per year in the previous six-year period** (a decline of approximately 6% over six years). • ***Assessment value 2***: **No decline** in grey seal pup production of **>25% since the fixed baseline in 1992** (or closest year). The percentage change in pup numbers since the baseline year (Equation 2; $\Delta abundance$) and 80% confidence intervals is calculated from fitted values. Although no formal hypothesis testing was conducted, 80% confidence intervals were calculated to reflect the choice to set the significance level, α, equal to 0.20 or 20%. Calculation of **long-term trend in abundance**: $\Delta abundance=(B-A/A)\times 100$

OSPAR Abundance and Distribution of Coastal Bottlenose Dolphins		**Declining**: a decreasing trend of ≥5% over ten years (significance level p<0.05). Increasing is defined as an increasing trend of ≥5% over ten years (significance level p<0.05). **Stable**: population changes of <5% over ten years. 5% is derived from IUCN criterion to detect a 30% decline over three generations for a species (**Vulnerable**).
OSPAR Abundance and Distribution of Cetaceans	**Species Distribution**: • Density surface models if sufficient data are available from large-scale purpose-designed surveys. • Maps of observed sightings provide information on distribution as alternative.	**Declining**: decreasing trend of ≥5% over ten years (significance level p<0.05). **Increasing**: increasing trend of ≥5% over ten years (significance level p<0.05). **Stable**: population changes of <5% over ten years. **Power Analysis**: on at least three data points. Data have 80% power (the conventional acceptable level) to detect an annual rate of change, at a significance level (p value) of 0.05, of 1.5% for harbour porpoise, 2.5% for white-beaked dolphin, and 0.5% for minke whale. The power to detect trends could be improved by increasing the frequency of the large-scale surveys.
HELCOM Reproductive status of seals		Good status is achieved when the annual reproductive rate (i.e. the proportion of females pregnant/showing postpartum pregnancy signs per year) is at least 90% for harbour seals of five years and older, and grey and ringed seals of six years and older (HELCOM 2018f). A reproductive rate of **90%** is defined as the threshold for each of these parameters as this is **indicative of increasing populations**.

Source: Palialexis et al. 2019.

Table 5 - OSPAR Intermediate Assessment (2017) on cetaceans

Assessment scale	*Monitoring methods*	*Thresholds*	*Pressures/thresholds*
NE Atlantic (encompassing the North Sea/OSPAR Area II and Celtic Seas/OSPAR Area III)	Regular surveillance of abundance and distribution.	• ‘increasing’ means an increasing trend of ≥5% over 10 years (significance levels, p value, of 0.05) • ‘stable’ means population changes of < 5% over 10 years, and • ‘decline’ means a decreasing trend of ≥5% over 10 years (significance levels, p value, of 0.05).	• The main human induced cause of mortality is bycatch. • Bycatch of harbour porpoise: data from the ICES assessments of bycatch in the North Sea and Celtic Seas *vs.* best population estimate for the areas using two thresholds: 1% and 1.7%. (ASCOBANS agreed on 1 % bycatch mortality and 1.7 % total anthropogenic mortality).

Source: ICES WKDIVAGG REPORT 2018, ICES CM 2018/ACOM:47, Report of the Workshop on MSFD biodiversity of species D1 aggregation.

Table 6 - Extract from Table 3. Cetacean indicators currently employed by Contracting Parties in the OSPAR region as of August 2019. *In ACCOBAMS-MOP7/2019/Inf 47. 2019. REPORT FROM THE JOINT ACCOBAMS/ASCOBANS WORKING GROUP ON THE MARINE STRATEGY FRAMEWORK DIRECTIVE (MSFD)***.**

France[1]			
MSFD Criteria	**Proposed Indicators**	**Species**	**Assessment value/threshold value/target**
D1C1	*OSPAR Common Indicator M6:* Incidental mortality rate (bycatch observer data)	Harbour porpoise	This common indicator currently does not have an assessment value. It will be decided upon by OSPAR in 2019/2020.
	National Indicator: Bycatch mortality rate (strandings data)	Common dolphin Harbour porpoise	
D1C2	*OSPAR Common Indicator M4:* Abundance of Cetaceans	Harbour porpoise Bottlenose dolphin White-beaked dolphin Minke whale	No assessment value has been applied in this assessment. For a trends’ assessment: a significant decline means a decreasing trend of ≥5%

			over 10 years (significance level p<0.05); a significant increase means an increasing trend of ≥5% over 10 years (significance level p<0.05); stable means population changes of <5% over 10 years.
	National Indicator: Trend in the relative abundance of Cetaceans	Common dolphin Striped dolphin Bottlenose dolphin Pilot whale Risso's dolphin Minke whale	
D1C3	*National indicator:* Recurrence of unusual mortality events	Common dolphin Harbour porpoise Striped dolphin	
D1C4	*National indicator:* Trends in occupancy of cetaceans	Common dolphin Striped dolphin Bottlenose dolphin Pilot whale Risso's dolphin Minke whale Fin whale	
Spain[6]			
MSFD Criteria	**Proposed Indicators**	**Species**	**Assessment value/threshold value/target**
MT-tam D1.2.1	*National indicator:* Population size (Abundance, no. Individuals)	Harbour porpoise Common dolphin Bottlenose dolphin Atlantic fin whale	Maintain or restore the natural balance of the populations of key species for the ecosystem.
MT-dist D1.1.1 D1.1.2	*National indicator:* Range and pattern of distribution of the populations	Harbour porpoise Common dolphin Bottlenose dolphin Atlantic fin whale	The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.
MT-dem D1.3.1	*National indicator*: Demographic characteristics of the population (mortality rate) (Parameters required for analysis- population size, mortality caused by these pressures. Others (birth rate, survival / mortality rate, etc.))	All species of cetaceans	Reduce the main causes of mortality and decrease of populations of groups of non-commercial species in the top of the food chain (marine mammals, reptiles, birds, marine, pelagic and demersal elasmobranchs), such as accidental catches, boat collisions, ingestion of marine litter, introduced land predators, pollution, destruction of habitats and overfishing.

20. France has more recently agreed to the following descriptions in relation to criterion D1C1 (Spitz et al. 2018). For each species they use two approaches (as in previous tables):
   1. Estimation of the number of individuals who died by accidental capture using a drift model applied to stranded individuals.
   2. Estimation of the annual incidental capture rate (total number of individuals incidentally captured divided by total abundance of the species) through a Bycatch Risk Assessment (see below).

21. Threshold reference values are set as follow:
   - By-catch mortality rate less than 1.7% of the abundance with a probability> 80% ; and
   - 80% confidence interval of the mean by-catch mortality rate less than 1.7%.

1.2.3.3.1 Criterion D1C1 on bycatch and available methods to estimate maximum bycatch thresholds for bycaught cetacean species

22. The MSFD Criterion D1C1, assessing that '*the mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long-term viability is ensured*', is well developed, at least

for cetacean species. For these species, a widely recommended framework exists, and it is well defined also for data-poor situations (e.g., FAO 2018 and STEFC 2019). This approach covers monitoring, assessment and mitigation aspects and it is based on direct data (independent observer data), not on interviews or self-assessment (indirect data). The latter **will never be able to assess the actual impact** of fishery-induced mortality at a population level.

23. In data poor context, a basic **Bycatch Risk Assessment (BRA)** can be applied to evaluate the impact of bycatch on relevant species. This is an approach proposed by the International Council for the Exploitation of the Sea (ICES)'s Working Group on Bycatch of Protected Species (WGBYC) and developed during the Workshop on Bycatch of Cetaceans and other Protected Species (WKRev812; ICES 2013). The essential idea of a BRA is to use an estimate of total fishing effort for the fisheries of concern in a specific region, in combination with some estimate of likely or possible bycatch rates that apply for the species of concern. This allows to evaluate whether the estimated total bycatch in that given region might be a conservation issue by threatening the survival of a given population, generating subsequent actions. The BRA is a better approach compared to that of applying discretionary flat percentages of "sustainable mortality" to the whole population of a given species (e.g., Rule of Thumb of 1% or the ASCOBANS 1.7 % when extended to all cetacean species; see Table 7) or establish a generic percentual decrease of total bycatch mortality in a fleet without taking into consideration the actual effect of such percentual decrease at population level.

Table 7 - Methods to assess the impact of fisheries on species of conservation concern (STECF 2019)

Method	Algorithm/concept	Key/Notes/Reference paper
ASCOBANS "rule of thumb"	To reduce bycatches to less than 1 % of the best available population estimate.	ASCOBANS 2000
ASCOBANS 1.7 %	1.7 % of best population estimate for harbour porpoises.	This was based on a simple deterministic population dynamics model with assumed maximum net productivity rate of 4 %, which found that 1.7 % total annual removal would allow a population to achieve 80 % of its carrying capacity over a very long time horizon (over un "infinite" period of time or until stabilisation). Extended to all species as total human-induced mortality.

24. When more data are available, particularly from observer programmes, more quantitatively accurate and conservative methods (i.e. in terms of total number of animal taken relative to the total population) can be applied to assess the impact of fisheries on species of conservation concern. These methods allow to incorporate into the assessment quantitative measures of conservation objectives. The most used and robust methods are the Potential Biological Removal (PBR), the Catch Limit Algorithm (CLA) and/or Removal Limit Algorithm (RLA) (STECF 2019). Specifics on these are given in Table 8.

Table 8 - Methods to assess the impact of fisheries on species of conservation concern (STECF 2019)

Method	Algorithm/concept	Key/Notes/Reference paper
U.S. Potential Biological Removal (PBR)	$Removal \quad limit = N_{min} \times \frac{1}{2} R_{max} \times F_R$	**N_{min}**=20th percentile of a log-normal distribution surrounding the abundance estimate (N) equivalent to the lower limit of a 60 % 2-tailed confidence interval). **R_{max}**=maximum population growth rate, **F_R**=tuning factor related to conservation objectives (assumed value for cetaceans of 0.04). U.S. **target** in cetacean PBRs is 50 % of carrying capacity within a 100-year period. Wade et al. 1998
Catch Limit Algorithm (CLA)	$CLA = \alpha \times R_{max} \times (D_T - \beta) \times N_T$	**D_T** =current population status **N_T** = current population size

Removal Limit Algorithm (RLA)		**α** and **β** = tuning factors related to conservation objectives. **IWC CLA conservation objective** = 72 % K within a 100-year period. **North Sea harbour porpoise RLA conservation objective** = 80% K within a 100-year period. **CLA:** Cooke 1999 **RLA:** Hammond *et al.* 2019

25. This general approach (i.e. carry out a BRA for data-poorer situations and use more accurate algorithms for data from fishery observer programmes) is similar to that discussed in other regional contexts (e.g., OSPAR, ASCOBANS) in the context of the MSFD implementation strategy.

In addition, the OSPAR Marine Mammal Expert Group (OMMEG) is currently discussing a new update for indicator M6 (Marine Mammal Bycatch).

2. RELEVANT ASPECTS OF THE ECAP/IMAP DISCUSSION

26. The overall discussion on the EcAp/IMAP process happens in the context of the UNEP/MAP Programme of Work (PoW) and is coordinated by the regional Activity Centres, mainly SPA/RAC for the biodiversity cluster, MEDPOL for pollution and marine litter cluster, and PAP/RAC for coast and hydrography. Documents prepared by experts are discussed by relevant Correspondence Groups on Monitoring CORMONs and subsequently submitted to the relevant Focal Points meetings, the EcAp Coordination Group (CG), the MAP Focal meeting and then the BC COP.

2.1 IMAP Common Indicators

27. Specific guidelines on Common Indicators, including their development, are contained in BC decisions regarding different taxa. For example, Decision IG.22/7 specifically stated that: "*it is an absolute necessity for UNEP/MAP to strengthen its cooperation with the relevant regional bodies, especially in relation to:*

- *EO1 […] with […] the Secretariat of the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), noting that the ACCOBAMS Survey Initiative […] will provide important inputs (in terms of monitoring methodologies, capacity building and reliable data on abundance and distribution of cetaceans).*
- *EO11, with ACCOBAMS, noting that further development of the candidate common indicators will need to be carried out in a close cooperation between UNEP/MAP and ACCOBAMS in light of pilot monitoring activities, additional expert knowledge, and scientific developments, during the initial phase of IMAP, and considering that ACCOBAMS is undertaking an identification of noise hot spots in the Mediterranean*".

28. Table 9 offers a comparison between MSFD criteria and EcAp/IMAP Common Indicators.

Table 9 - Comparison between MSFD Criteria and EcAp/IMAP Common Indicators for marine mammals

MSFD Criteria	EcAp/IMAP Common Indicators (CI) and Candidate Common Indicators (CCI)
D1C1 - PRIMARY: The **mortality rate per species from incidental by-catch** is below levels which threaten the species, such that its long- term viability is ensured.	**CI12 - Bycatch of vulnerable and non-target species (EO1 and EO3)** • No definitions of targets/of methods.
D1C2 - PRIMARY: • The **population abundance** of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.	**CI4 - Population abundance of selected species** • Population size of selected species is maintained: o Cetaceans: The species population has abundance levels allowing to qualify to Least Concern Category of IUCN. o Monk seal: Number of individuals by colony allows to achieve and maintain a favourable conservation status.

<table>
<tr>
<td>D1C3 - SECONDARY for marine mammals:
• The population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity, and survival rates) of the species are indicative of a healthy population which is not adversely affected due to anthropogenic pressures.</td>
<td>CI5 - Population demographic characteristics
• Population condition of selected species is maintained:
○ <u>Cetaceans</u>:
▪ State - Decreasing trends in human induced mortality
▪ Pressure - Appropriate measure implemented to mitigate incidental catch, prey depletion and other human induced mortality.
○ <u>Monk seal</u>:
▪ Pressure - Appropriate measures implemented to mitigate direct killing and incidental catches and to preclude habitat destruction.</td>
</tr>
<tr>
<td>D1C4 - PRIMARY for species covered by Annexes II [i.e. bottlenose dolphins, harbour porpoise, monk seal], IV or V to Directive 92/43/EEC and secondary for other species:
• The species distributional range and, where relevant, pattern is in line with pre- vailing physiographic, geographic and climatic conditions.</td>
<td>CI3 - Species distributional range
• Species distribution is maintained:
○ No definition for cetaceans.
○ The <u>Monk Seal</u> is present along recorded Mediterranean coasts with suitable habitats for the species</td>
</tr>
<tr>
<td>D1C5 - PRIMARY for species covered by Annexes II [i.e. bottlenose dolphins, harbour porpoise, monk seal], IV and V to Directive 92/43/EEC and secondary for other species:
• The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.</td>
<td>Partially related to CI5</td>
</tr>
<tr>
<td>D10C3 - SECONDARY:
• The amount of litter and micro-litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned. Member States shall establish threshold values for these levels through regional or subregional cooperation.</td>
<td rowspan="2">CCI24 - Trends in the amount of litter ingested by or entangling marine organisms, especially mammals, marine birds and turtles.
• Decreasing trend in the cases of entanglement or/and a decreasing trend in the stomach content of the sentinel species.
Threshold and reference values
• Baseline Values for Ingested Marine Litter (gr)[1]:
○ Minimum value: 0 gr
○ Maximum value: 14 gr
○ Mean value: 1.37 gr
○ Proposed Baseline: 1-3 gr
• Environmental Targets for Ingested Marine Litter (gr):
○ Types of Target: % decrease in quantity of ingested weight (gr)
○ Minimum: -
○ Maximum: -
○ Reduction Targets: Statistically Significant</td>
</tr>
<tr>
<td>D10C4 - SECONDARY:
• The number of individuals of each species which are adversely affected due to litter, such as by entanglement, other types of injury or mortality, or health effects. Member States shall establish threshold values for the adverse effects of litter, through regional or subregional cooperation.</td>
</tr>
<tr>
<td>D11C1 - PRIMARY:
• The spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect populations of marine animals. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</td>
<td>CCI26: Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals</td>
</tr>
</table>

[1] Appendix 1 to Annex to Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria.

D11C2 - PRIMARY: • The spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.	**CCI27: Levels of continuous low frequency sounds with the use of models as appropriate**

29. From Table 9, it is apparent that there is not always an equivalence between MSFD criteria and EcAp/IMAP Common Indicators. Moreover, some agreed definition for EcAp/IMAP Common Indicators somehow overlap topics that should be separated to allow a correct assessment (e.g., CI5 and CI12).

30. See also document UNEP/MED WG.482/25 (2020) that contains a comparative analysis of IMAP Indicators with those in the Commission Decision (EU) 2017/848.

31. Decision IG.22/7 also pointed out the necessity to set up a structured cooperation with GFCM, to develop EO3 (fisheries), that includes CI 12 (Bycatch of vulnerable and non-target species), which is common to EO1 and EO3 and fundamental for marine mammals. However, it is more relevant to EO1 as it constitutes a direct pressure on CI3, CI4 and CI5. The cooperation between BC and GFCM will help developing also elements of EO4 (food webs).

32. In addition, Decision IG.22/7 states that '*compared to Descriptor 11 related indicators (MSFD), candidate indicators 26 and 27 are more closely related to the acoustic biology of key marine mammal species of the Mediterranean which are known to be sensitive to noise, i.e. the fin whale, the sperm whale and the Cuvier's beaked whale*'. The discussion on the development of these CCIs is happening in the context of the collaboration between UNEP/MAP-SPA/RAC and ACCOBAMS, and thanks to the financial and organisational support from EU funded projects (i.e. QuietMed; see Table 9). Therefore, these are not considered in this document, except in relation to monitoring activities under CI3 (Species distributional range), particularly for *Ziphius* (a species for which impulsive noise of certain types represents a deadly threat).

33. The discussion on Candidate Common Indicator 24 (Trends in the amount of litter ingested by or entangling marine organisms, especially mammals, marine birds and turtles) already happened in the context of the work coordinated by UNEP/MAP-MED POL. In Decision IG.22/7, Contracting Parties agreed definitions and targets for marine litter ingested by marine mammals. Therefore, these are not considered in this document (see Table 9).

2.2 IMAP species of interest

34. IMAP fixes a reference list of species and habitats to be monitored. All cetacean species occurring in the Mediterranean Sea are considered in the IMAP. Particular attention is given to the eight resident cetacean species, divided into three different functional groups:

- Baleen whales: fin whale (*Balaenoptera physalus*)
- Deep-diving cetaceans: sperm whale (*Physeter macrocephalus*), Cuvier's beaked whale (*Ziphius cavirostris*), long-finned pilot whale (*Globicephala melas*) and Risso's dolphin (*Grampus griseus*).
- Other toothed species: short-beaked common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), common bottlenose dolphin (*Tursiops truncatus*).

35. IMAP recommends monitoring and assessing common indicators for this selection of representative species for cetacean. However, four other rare species of cetaceans occur also in the Mediterranean Sea: harbour porpoise (*Phocoena phocoena*), rough-toothed dolphin (*Steno bredanensis*), false killer whale (*Pseudorca crassidens*) and killer whale (*Orcinus orca*).

2.3 IMAP assessment, monitoring scales and geographic reporting scales

36. On assessment, monitoring scales and geographic reporting scales, Annex to Decision IG.22/7 states the following:

'*A scale of reporting units' needs to be defined during the initial phase of IMAP taking into account both ecological considerations and management purposes, following a nested approach.*

The nested approach aims to accommodate the needs of the above is to take into account 4 main reporting scales:

(1) *Whole region (i.e. Mediterranean Sea);*
(2) *Mediterranean sub-regions, as presented in the Initial Assessment of the Mediterranean Sea, UNEP(DEPI)/MED IG.20/Inf.8;*
(3) *Coastal waters and other marine waters;*
(4) *Subdivisions of coastal waters provided by Contracting Parties'*.

37. For marine mammals, this nesting approach it is not necessary or, in some case, might even be not applicable, as for most CIs the monitoring and assessment must happen at regional level and a lower-level monitoring would not help assessing the GES. The only exceptions are the CI5 and CI12 which could be also assessed at lower scales (e.g., GFCM GSAs or new subdivisions given by the aggregation of some GSAs, in relation to each species' population structure).

3. PROPOSED REVISIONS AND/OR UPDATES TO AGREED OFFICIAL EcAp/IMAP DOCUMENTS

38. The reading of all relevant EcAp/IMAP materials on marine mammals has generated few proposals not only on EcAp/IMAP elements that need to be completed or created (e.g., assessment scales, reference values and thresholds, which were the main objective of this report), but also on necessary updates of some agreed aspects of EcAp/IMAP processes, which are no longer in line with the current situations (particularly because of new species' knowledge and progress made in discussions about those two processes). In the following paragraphs these are briefly presented.

39. The EcAp/IMAP framework, as well as the MSFD, is an adaptive process that should be re-evaluated regularly every six-year and retuned if necessary.

40. In the following sections we propose a set of revisions in documents attached to EcAp/IMAP decisions. For example, Appendix 1 to Annex to Decision IG.22/7 on IMAP, assigns a lower priority to *Ziphius*, *Stenella*, *Globicephala* and *Grampus* compared to the other species, based on some unclear/inexistent evidence on threats and population status. Based on robust knowledge on threats on some of these species, we propose that *Ziphius* becomes a priority species. This request is based on known and measured threats (underwater mid-frequency sounds, e.g., Frantzis *et al*. 1998) and the relatively limited availability of preferred habitat within the Mediterranean Sea (Cañadas *et al*. 2018).

3.1 Revisions to Appendix 1 of Annex to Decision Ig.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and related Assessment Criteria

41. Proposed revisions to Appendix 1 of Annex to Decision Ig.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria are shown in Annex 1 to this report.

3.2 Proposed updates of definitions for some Common Indicator

42. In Decision IG.21/3, Common Indicator 5 (demography) GES definition includes a reference to human-induced mortality, for both cetaceans and the monk seal and to habitat destruction for the monk seal. However, human-induced mortality, when it is relative to accidental capture in fishing gear, should be addressed for coherence in separate Common Indicator, such as, for example Common Indicator 12 (Bycatch of vulnerable and non-target species (EO1 and EO3). This is consistent with the MSFD primary criterion D1C1.

43. Moreover, the text of the CI5's definition refers to the assessment of the measures taken to reduce the different pressures (i.e. appropriate measures taken to reduce direct killing/by-catch/habitat destruction) rather than the assessment of the different parameters that should describe population demographic characteristics,

as the title of the indicator would suggest. The text of the CI5 title should, therefore, be reformulated so that it either refers to an indicator of measures to contrast the main pressures or the definition of the indicator should be modified so that it coherently reflects the assessment of specific demographic parameters (i.e. the mortality rate due to direct killing is such that it does not negatively influence the viability of the species, or the pupping rate/reproductive rate is within the range of increasing population levels etc). See Summary Tables for proposed text (see pages 32-38).

44. **Summary Tables** (see pages 32-38) also offer how to tackle the full development of Common Indicator 12 for marine mammal species, in line with what has been proposed by experts of several regional organisations, including FAO. So far, little progress has been made on the development of monitoring CI12 (GFCM 2019) and no progress on the methodological development of assessment methods and targets. However, given the good progress made within the FAO and EU context (FAO 2018, STEFC 2019; see section 1.2.3.3.1), we believe that the proposed solutions can be agreed by Barcelona Convention's Parties, at least for marine mammal species.

3.3 Streamlining definitions of Monk seal conservation status in SAP BIO

45. Barcelona Convention Decision IG.24/7 - *on Strategies and Action Plans under the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean, including the SAP BIO, the Strategy on Monk Seal, and the Action Plans concerning Marine Turtles, Cartilaginous Fishes and Marine Vegetation; Classification of Benthic Marine Habitat Types for the Mediterranean Region, and Reference List of Marine and Coastal Habitat Types in the Mediterranean* – contains several recommendations on monitoring different species, including the Monk Seal. The same applies to other agreed Regional Action Plans (RAP), including the one on Cetacean species (UNEP/MAP 2017). In this RAP, there is a proposed definition of "favourable conservation status"[2] that does not seem to be fully in line with the GES target as defined in the Decision IG.22/7 and should be reconsidered. In **Summary Tables** (see pages 32-38) take these recommendations into consideration, as much as possible. However, everything has been retuned in relation to the relevant agreed GES definitions.

Recommendation for future work: Within the ongoing process launched by SPA/RAC to elaborate the post 2020 SAP BIO, it would be beneficial to ensure the consistency of EcAp/IMAP GES definitions, targets and IMAP monitoring and assessment scales with SAP BIO (Decision IG.24/7) or at least, to ensure complementarity. In fact, any environmental management framework must be necessarily adaptive given the expected endless improvement on knowledge regarding habitats, species and threats, and constantly shifting baselines.

3.4 Monitoring and assessment methods and scales for cetacean species

46. It is fundamental to keep in mind that appropriate geographic scales must be consistent with the ecology of different marine mammal species and the geographic extent of their major threats/pressures, which need to be assessed. Therefore, ASI-like basin-wide data collection projects on distribution and abundance are the only means that will allow to populate the CI 3 and 4 and to provide key information for CI 12. This makes these means the highest priority for IMAP.

47. It is also very important that the Mediterranean basin-wide data collection is designed taking into consideration, as much as possible, all existing relevant sub-strata, including the EcAp/IMAP sub-regions, GFCM Geographical Sub Areas, National sub-division (if any) and other relevant descriptors sub-divisions (if any) related to pressures on these species.

48. Systematic surveys carried out at sub-regional level or smaller scale (e.g., national level), can only complement but not substitute data obtained through basin-wide surveys. Also, given the nature of these species (wide-ranging marine mammals), any sub-regional monitoring effort must be synchronised and designed to appropriately complement existing knowledge and fill gaps between ASI or similar campaigns.

[2] '*The conservation status will be taken as «favourable» when: i) population dynamic data indicate that cetaceans in the Mediterranean Sea Area are maintaining themselves on a long- term basis as a viable component of the ecosystem; ii) the range of cetaceans in the Mediterranean Sea Area is neither currently being reduced, nor is likely to be reduced on a long-term basis; iii) there is, and will be in the foreseeable future, sufficient habitats in the Mediterranean Sea Area to maintain cetaceans on a long-term basis'*.

49. In addition, it is important to focus Contracting Parties' resources on data collection that allow them to assess the status of these species at the required geographical scale. Thus, the proposed order of priority for monitoring scales of species and pressures is given in relation to species assessment scales. In this sense, the endorsed key message in the Annex I of Decision IG.23/6 ('more effort should be devoted in poorly monitored areas') it may become detrimental unless understood as complementary national data collection, to fill sub-regional gaps, only.

50. Sub-stratification within the Mediterranean region is a key aspect that must be considered at various levels:

1. during the design of monitoring surveys;
2. during the data analysis;
3. during the species' and overall GES assessments.

51. Conclusions on the best solutions are guided by considerations on the following aspects:

1. species' ecology;
2. existing geographical management units of human pressures (e.g., GFCM Sub-Areas);
3. administrative constraints on logistics (this becomes preponderant for the fieldwork phase);
4. administrative requirements for reporting under various international policies (e.g., MSFD, HD, EcAp, IMAP, etc.).

52. In regard to administrative constraints on logistics, during the early phases of the design of monitoring surveys, support from Contracting Parties is critical to identify the limitations due to air traffic regulation and to facilitate the delivery of appropriate permissions for aerial and ship surveys and allow the coverage of ecologically and administratively appropriate regions.

53. In regard to existing geographical management units of human pressures and to Contracting Parties' needs to report under various international policies (e.g., EcAp, IMAP, Habitat Directive and MSFD), consideration of different strata can be done as post-stratification while analysing data and carrying out assessments. However, all the relevant sub-divisions need to be considered, at least theoretically, during design to inform the best options, for example, on the most appropriate coverage.

Recommendations for future work: Concerning Common Indicator 3 (species distributional range), a better definition of specific High Priority (HP) and Low Priority (LP) sub-regional units, to be monitored in relation to important habitats for certain species (e.g., fin whales feeding grounds, *Ziphius* preferred habitats, sperm whales breeding grounds), needs to be refined based on ASI data, latest IUCN species Red List assessments, etc., prior the next assessment (2023).

Recommendation for future work: Concerning Common Indicator 12 (bycatch) for cetaceans and other protected species, since it is a shared indicator that requires the combination of data under EO1 and EO3, this should not be developed and regularly re-evaluated in isolation by the GFCM (as per approach suggested in Decision XXX), but it should be retuned through a specific work involving experts that developed CI3, CI4 and CI5 descriptions for the species of concern, ensuring the full cooperation with other relevant agreements (i.e. ACCOBAMS, Pelagos Agreement) and integration with other policies relevant at regional level (e.g., the MSFD D1C1). The assessment of CI12 should also be made by the same pool of experts.

54. Box 1 summarises details of the potential minimum requirements for a cetacean monitoring framework on Common Indicators 3, 4, 5 and 12 to enable Contracting Parties to meet their commitments in the EcAp framework. Full details are given in the **Summary Tables** (see pages 32-38).

Box 1 – Summary of monitoring framework for EcAp/IMAP Common Indicators for cetaceans		
CI3 – Distributional range CI4 - Abundance	**Regional monitoring**	**Sub-regional monitoring**
Frequency of data collection	• At least every 6 years (as per reporting cycle).	• Optimal: annually. • Minimum: biennially (3 comparable datasets/estimates). • Seasonal: fin whale, pilot whale*(?)*

Monitoring method	• Basin-wide line transect distance sampling surveys (see ASI standard protocols): shipboard and aerial (both visual and acoustic).	• Line-transect distance sampling methods: shipboard or aerial. • Mark-recapture Photo-ID (on selected species). • Passive acoustic monitoring (PAM) for selected species. • Multidisciplinary surveys.
Authority responsible for monitoring	• ACCOBAMS, UNEP/MAP/ SPA/RAC, EU, CPs periodic concerted action.	• Each CP: national monitoring schemes. • CPs of sub-regions when cooperation needed.
Frequency of Common Indicators update	*6 years (as per reporting cycle).*	
Frequency of assessment update	*6 years (as per reporting cycle).*	
Minimal amount of monitoring locations	• Mediterranean region (all four sub-regions must be covered with equal effort).	• Monitoring must cover representative parts of in sub-regions waters (at least three locations per sub-region to be identified through sub-regional workshops). • Photo-ID for relevant putative local populations or management units (e.g., bottlenose dolphins, common dolphins, fin whales, Cuvier's beaked whales; Risso's dolphins; sperm whales). • PAM stations dependent in potential corridors and important habitats for deep diving species.
CI5 - Demography	**Regional monitoring**	**Sub-regional monitoring**
Frequency of data collection	• Not applicable.	• Systematic.
Monitoring method	• Not applicable.	• Photo-id. • Strandings.
Authority responsible for monitoring	• None.	• Each CP: national monitoring schemes. • CPs of sub-regions when cooperation needed (matching photo-id catalogues).
Frequency of Common Indicators update	*6 years (as per reporting cycle).*	
Frequency of assessment update	*6 years (as per reporting cycle).*	
Minimal amount of monitoring locations	• Not applicable.	• Demographic parameters should be obtained from long-term studies in more than two locations per sub-region per species. • Strandings: whenever they occur on *Stenella* (pelagic delphinids) and *Tursiops* (coastal delphinids) or any other most frequent stranded species.
CI12 - Bycatch	**Regional monitoring**	**Sub-regional monitoring**
Frequency of data collection	• At least once per high priority fishing métiers within a reporting period.	• At least one year per high priority fishing métiers/gears to obtain bycatch rates, within each reporting cycle. • GFCM provides data on fishing effort for priority fishing gears and per fleet segment during a reference year, for each GSA and produce a risk analysis on the Mediterranean region, based on available bycatch rates per species.
Monitoring method	• Fishing effort per GSA per métier/gear.	• Annually: bycatch (onboard observations, at port questionnaires and strandings; FAO 2019 protocol may be used). • CPs monitor their fleets (at least one métier/gear per sub-region per year, rotating, starting from the most impacting ones). • National stranding networks collect data on fishery-induced mortality in marine mammal tissues. They provide biennial reports on these matters.
Authority responsible for monitoring	• GFCM, Contracting Parties (relevant authorities)	• Each CP: national monitoring schemes to provide bycatch rates and annual fishing effort.

Frequency of Common Indicators update	*6 years (as per reporting cycle)*
Frequency of assessment update	*6 years (as per reporting cycle)*

3.5 Monitoring and assessment methods and scales for the Mediterranean Monk seal

55. Box 3 describes the minimum requirements for a monitoring framework on monk seals for CIs 3, 4 and 5, organised mostly according to Group A and Group B countries (*sensu* revised Mediterranean monk seal conservation Strategy 2020-2026), as defined in Decision 24/7 (i.e. Group A countries are those that '*host monk seal resident breeding populations and the majority of the species population*'; Group B countries '*are important, because current monk seal sighting records suggest the potential for the species' survival and expansion in areas beyond Group A country borders*' and which '*may contain* […] *critical coastal habitat, which is likely to be re-colonised*''.

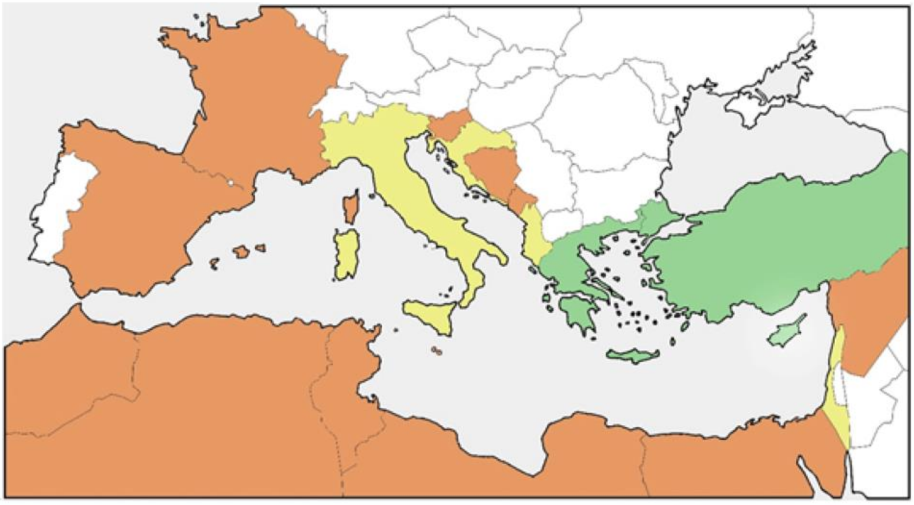


Figure 3: Monk seal conservation status by country (updated at 31.04.2019). *Key: Green: "Group A" countries (where monk seal breeding has been reported after year 2010). Yellow: "Group B" countries (where no monk seal breeding is reported, but where repeated sightings of monk seals (>3) were reported since 2010). Tan: "Group C" countries (where no monk seal breeding is reported, and where very rare or no sightings of monk seals (≤3) were reported since 2010), source: Decision.IG24/7.*

Box 2 – Summary of monitoring framework for EcAp/ IMAP Common Indicators 3 and 4 for the monk seal		
	Group A countries	**Group B and C countries**
Frequency of data collection	• Biennial (minimum requirement) • Annual (optimal)	• Continuous.
Monitoring method	• Pup counts based on cave inspections allow interpolation of population estimate (=> CI4) through conversion formula and allow pupping rate estimate (=> CI5) (minimum requirement). • Population estimate based on mark-recapture of photo-identified individuals based on camera trap monitoring (optimal) => CI4&5 • Opportunistic sightings and cave monitoring => CI3	• Recording opportunistic sightings (minimum requirement) => CI3 • Counts of photo-identified individuals based on camera trap monitoring in caves (optimal) => CI4 and CI5
Authority responsible for monitoring	• Each CP: national monitoring schemes	• Each CP: national monitoring schemes
Frequency of Common Indicators update	6 years (as per reporting cycle)	

Frequency of assessment update	6 years (as per reporting cycle)	
Minimal amount of monitoring locations	• All known locations in each Group A country covered at least once per reporting period.	• selected locations identified in Decision IG24/7 or in areas with high reported sighting frequency and habitat suitability

56. However, it is important to note that the country category subdivisions in the Strategy were revised in 2019, based on the availability of knowledge on monk seal presence in Mediterranean countries, with the objective of defining priority actions to be carried out in 2020-2026 in light of the regional Action Plan non-implementation. According to the strategy, Group C countries are "*also important because, although they are characterized by rare monk seal occurrence, they contain historical monk seal critical habitat.* […] *In the absence of sighting data collection mechanisms, some countries, known to host seals and suitable environmental conditions in the recent past, may currently qualify as Group C*". Some level of monitoring should therefore be carried out also in Group C countries, which hosted seals and suitable environmental conditions in the recent past. In fact, some of the priority actions foreseen for some Group C countries are defined with the intent of soliciting data collection frameworks designed at assessing monk seal presence in specific sectors of coastline (the ones with historical and currently more pristine suitable geomorphological habitat and seal presence).

3.6 Recommended monitoring, assessment, and reporting scales

57. Box 3 presents and additional summary of the proposed approach for marine mammal species in terms of monitoring methods and scales (MS), assessments scales (AS) and reporting scales (MRU) for considered Common Indicators and Candidate Common Indicators.

58. For mapping purposes, it is recommended to adopt the ETC/BD 10x10km for visualisation, ETRS 89 LAEA grid and the 50x50km for wide-ranging, relatively low-density species.

Box 3 - Proposed for marine mammal species primary monitoring methods and assessment & monitoring scales

Taxa	**Common Indicators**	**Region**	**Sub-region**	**Sub-division (e.g., GFCM GSA)**	**National jurisdiction**
Cetaceans	CI 3 Species distributional range	• **MS, AS, MRU** • **Distance sampling** for all species ○ **Acoustic and visual methods** for *Ziphius & Physeter*			• **MS** • **Acoustic and visual methods in** important habitats for *Ziphius, Physeter & Balaenoptera*
	CI 4 Population abundance	• **MS, AS, MRU** • **Distance sampling** for all species ○ **Acoustic and visual methods** for *Ziphius & Physeter*		• **MS** • **Distance sampling** for all species	
	CI 5 Population demography		• **MS, AS, MRU** • **Photo-id:** *Tursiops, Balaenoptera* • **Strandings**: *Stenella, Tursiops.*		• **MS** • **Photo-id:** *Tursiops, Balaenoptera* • **Strandings**: *Stenella, Tursiops.*
	CI 12 By-catch	• **MS, AS, MRU** • **Bycatch Risk Analysis** for all species		• **MS** • **On-board observers** for all species	

	CCI 26 Impulsive noise				• **MS** • **Acoustic buoys**: in *Ziphius* important habitats
Monk Seal	CI 3 Species distributional range	• **AS, MRU**			• **MS** • **Cave monitoring** in Country Group A • **Registry** of **opportunistic sighting** in Country Group B and C
	CI 4 Population abundance				• **MS** • **Pup counts in caves** in Country Group A and/or mark –recapture based on **Photo-id** through **caves' monitoring**
	CI 5 Population demography				

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units.

3.7 Proposed reference values and thresholds for marine mammal species

3.7.1 THE IUCN LEAST CONCERN GUIDING PRINCIPLE FOR CETACEAN SPECIES, REFERENCE VALUES AND THRESHOLDS

59. The development of thresholds for the Common Indicator 4 (Species abundance) of cetacean species followed the guiding principle contained in a decision of the Parties (Decision IG.21/3) to use the IUCN "*Least Concern*" (LC) concept. Hence, all proposals are consistent with the MSFD process, but not necessarily identical.

60. Box 4 summaries proposed assessment reference values, thresholds, and assessment units for the Common Indicator 4 (Species abundance) of cetacean species. Summaries of our proposals on potential reference values and thresholds for these species on Common Indicators (3, 5 and 12) are contained in "*STEP 3*" (light red section) of the **Summary Tables** (see pages 32-38).

Box 4 - Proposed assessment reference values, thresholds, and assessment units for the Common Indicator 4 (Species abundance) related to the 8 species commonly encountered in the Mediterranean

Note: this table needs to be updated with the outcome of the ongoing IUCN Red List Assessment on Mediterranean cetaceans

Species	**Proposed assessment units/MRUs**	**Reference value**	**Proposed 'state' assessment definition**	**If 'Least Concern'**
Striped dolphin (*Stenella coeruleoalba*) • Regularly present in all sub-regions • IUCN Mediterranean listing: VU • Generation length=22.5 (3-gen period=67.5 years)	Regional	ASI 2018 DS design-based estimate. *Corrected and uncorrected for availability bias.* Every time that historical abundance values are revised, a new assessment of the species is necessary.	Maintain total abundance at or above reference levels.	*Stable or no decrease of ≥20% over 3 generations (1.8% within a reporting period).*
Common dolphin (*Delphinus delphis*) • Regularly present in all sub-regions • IUCN Mediterranean listing: EN • Generation length=14.8 (3-gen period=44.4 years)	Regional		Maintain total abundance at or above reference levels.	*No decrease of ≥20% over 3 generations (2.7% within a reporting period).*

Coastal bottlenose dolphins (*Tursiops truncatus*)
• Regularly present in all sub-regions
  ○ Preferred habitat <100 m
  ○ Common over the continental shelf (<200m)
  ○ Present offshore
• IUCN Mediterranean listing: LC
• Generation length=21.1 (3-gen period=63.3 years)
	Regional		Not applicable	*No decrease of ≥20% over 3 generations (1.9% within a reporting period).*

• Threats *to assess:* ○ bycatch ○ *food chain* pollution *(PCBs, heavy metals, etc.)*				
Risso's dolphin (*Grampus griseus*) • Regularly present in all sub-regions • IUCN Mediterranean listing: DD • Generation length=19.6 (3-gen period=58.8 years)	Regional		Maintain total abundance at or above reference levels.	*No decrease of ≥20% over 3 generations (2.0% within a reporting period).*
Long finned pilot whale (*Globicephala melas*) • Regularly present in the Western Mediterranean • IUCN Mediterranean listing: EN • Generation length=24 (3-gen period=72 years)	Regional		Maintain total abundance at or above reference levels.	*No decrease of ≥20% over 3 generations (1.7% within a reporting period).*
Cuvier's beaked whale (*Ziphius cavirostris*) • Regularly present in all sub-regions ○ Deep-*waters'* canyons, slope. • IUCN Mediterranean listing: VU • Generation length= Unknown • Threats *to assess:* ○ bycatch ○ *mid-frequency impulsive noise in* important *habitats*	Regional	ASI 2018 DS design-based estimate. *Corrected and uncorrected for availability bias.* Every time that historical abundance values are revised, a new assessment of the species is necessary.	Maintain total abundance at or above reference levels.	*No decrease of ≥ 1.5% within a reporting period.*
Sperm whale (*Physeter macrocephalus*) • Regularly present in all sub-regions, but the Adriatic. • IUCN Mediterranean listing: EN • Generation length=31.9 (3-gen period=95.7 years)	Regional		Maintain total abundance at or above reference levels.	*No decrease of ≥20% over 3 generations (1.3% within a reporting period).*
Fin whale (*Balaenoptera physalus*) • Regularly present in all sub-regions • IUCN Mediterranean listing: EN • Generation length=25.9 (3-gen period=77.7 years)	Regional		Maintain total abundance at or above reference levels.	*No decrease of ≥20% over 3 generations (1.5% within a reporting period).*

Source: estimated generation lengths are from Taylor et al. 2007.

61. In terms of existing GES definitions for cetacean species CI4 (*Abundance*), it is important to notice that IUCN categories do not evaluate the current status of a species in relation to a "pristine" condition, nor the MSFD or HD. There is a general agreement on the fact that it is impossible to establish what "natural levels" means in quantitative terms, because of a combination of lack of historical data and series and demographic and ecological complexity of many species, including marine mammals. This explains the reason why we do not use the terminology "baseline values", which could be misleading, but rather "reference values". Initial reference values for cetacean species can be based on the results of the data analyses from the 2018 ASI project; although some subregions (i.e. Adriatic) can have abundance values collected earlier on at the correct scale and through "primary methods" (see **Summary Tables**, pages 32-38), which can allow moving the first reference value at an earlier date with respect back in the years (i.e. 2010; Fortuna et al. 2018).

62. The transposition of the quantitative meaning of IUCN Criterion A to define the condition of "Least Concern" over a "3-generation time" window was made in relation to the EcAp/IMAP reporting period (6-year). In simple words, this means that a decrease of less than 20% over a "3-generation" period is acceptable. Anything between 20% and 29% would qualify a species for the category "Near Threatened". Potential "acceptable" decreases vary among species because generation-time varies, sometimes considerably.

63. The IUCN definition of "generation length" is "*the average age of parents of the current cohort (i.e. newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding*

individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in taxa that breed only once. Where generation length varies under threat, the more natural, i.e. pre-disturbance, generation length should be used" (Taylor *et al*. 2007). The Generation length include the Inter-breeding interval (IBI) parameter.

64. Proposed thresholds consider what to do in case of LC species and what for all other species that are listed into threaten categories (i.e. Critically Endangered, Endangered and Vulnerable). In terms of monitoring routine, the Category "Near threaten" should be considered a "buffer" zone in which countries should engage in *ad hoc* monitoring cycles, possibly focusing on parameters that can help to best understand the real situation for a given species.

Recommendation for future work: The appropriate level of significance for thresholds and reference values needs to be discussed and agreed before the next assessment (2023).

Recommendation for future work: Some additional work needs to be done before the next assessment on the evaluation of the potential impact of constantly changing baselines and on allowing the use of constantly decreasing trends within a specific time-window for CI3, CI4 and CI5. See, for example, the solutions adopted by OSPAR on Grey Seal Pup Production.

65. For Common Indicator 5 (demographic parameters), reference and threshold values will need to be defined, as soon as sufficient information will become available on demographic characteristics and will be sufficiently robust to provide average values for sub-regional reference populations. In fact, in order to develop appropriate reference values for those species for which is possible (i.e. those for which data on mark-recapture, gender and reproductive history can be acquired), long-term datasets are necessary (usually of a few decades). In addition, given the high variability within species, this indicator might be particularly challenging for cetacean species.

3.7.2 PROPOSED REFERENCE VALUES AND THRESHOLDS FOR THE MONK SEAL

66. Summaries of our proposals on Potential reference values and thresholds for the Monk seal for all Common Indicators (3, 4, 5 and 12) are contained in "*STEP 3*" (light red section) of the **Summary Tables** (see pages 32-38).

67. Unfortunately, there is no reference map for the species range at Mediterranean level, with sufficient detail that allows to measure shifts in range across 6-year reporting periods. At present the only available data is contained in the IUCN 2015 red listing and the 2019 monk seal strategy subdivision of monk seal areas hosting resident (and therefore known reproductive nuclei) seals, as opposed to areas with monk seal sightings but no formal map exists.

Recommendation for future work: Concerning CI 3, the existing range maps constructed for Habitats Directive reporting, which should be the same as those for MSFD, should be merged into one, with the addition of other data from non-EU and EU countries (e.g., citizen-science, IMAP monitoring, field-work and strandings, etc.). This should be the current baseline against which to measure changes. This work should be finalised before the next reporting period (2023).

68. Similar issues apply to the estimated abundance: at present the IUCN estimate, while based on the best available evidence, is still far from describing the actual population estimate that should be based on homogeneous methodologies. In fact, methods used in the region to estimate abundance are extremely different (e.g., Greek population is estimated through pup counts converted into number of total individuals based on a multiplier obtained from various monk seal populations; whereas the south-eastern Turkish coast population is estimated using mark-recapture methods).

Recommendation for future work: In regard to CI 4, Mediterranean experts need to cooperate to establish a standard method to estimate abundance that takes into account individual displacement across whole range, which will allow to inform and compare temporal and sub-regional trends, before 2023 assessment. This initiative should be organised in the context of the IMAP revision process.

69. The monitoring and assessment of this endangered species (Karamanlidis and Dendrinos 2015) would highly benefit from concerted programmes carefully analysing trends in distributional range, total abundance and reproductive rates.

70. In regard to demographic parameters, pup production (pup counts) is an important parameter to be used to assess the Mediterranean population. Considering the difficulty in doing wide ranging monitoring it could be reasonable to elect "index areas" (e.g., Levantine basin, Ionian islands, North Aegean, etc.) in which to do a more in depth analysis to identify other parameters. These could be: (a) the annual birth rate in "index areas" (reproductive females/number of pups); (b) age class structure (long term); (c) age at maturity, etc.

Recommendation for future work: In regard to CI 5, Mediterranean experts need to cooperate to elaborate a more structured approach on how to explore and identify the best demographic parameters for the medium-long term monitoring, before 2023 assessment. This initiative should be organised in the context of the IMAP revision process.

3.8 New IMAP Candidate Common Indicators (CCI) relevant to marine mammals

71. In terms of assessing the impact of a polluted ecosystem at population level (EO9), the creation of a Candidate Common Indicator that represents a proxy for "population health condition of cetacean species" is proposed. This CCI would assess the level of pollutants' concentration in tissues of free-ranging and stranded specimens, in particular, of compounds such as polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), hexachlorobenzene (HCB) and dichlorodiphenyltrichloroethane and its main metabolites (DDTs), heavy metals and new emerging pollutants. This new CCI could be monitored at sub-regional level and it would necessitate concerted/coordinated programmes. It would be analysed in blubber, liver, kidney and skin samples (ideally bone, spleen and lung should also be considered) from stranded animals and on free-ranging specimens (through blubber-skin biopsies sampling conducted within national jurisdictions and by researchers with contrasted expertise on remote biopsy sampling). These data should be considered at sub-regional level for the assessment.

72. The definitions of the Candidate Common Indicator could be similar to those of Criterion D8C2 (Species and habitats which are at risk from contaminants) of the MSFD, as in the table below:

Criteria elements	Criteria	Methodological standards
Species and habitats which are at risk from contaminants. Member States shall establish **that list of species**, and **relevant tissues to be assessed**, and habitats, through regional or subregional cooperation.	**D8C2** — Secondary: The **health of species** and the condition of habitats (such as their species composition and relative abundance at locations of chronic pollution) are **not adversely affected due to contaminants including cumulative and synergetic effects**. Member States shall establish those adverse effects and their threshold values through regional or subregional cooperation.	*Use of criteria:* The extent to which good environmental status has been *achieved* shall be expressed for each area assessed as follows: […] for each species assessed under criterion D8C2, an estimate of the abundance of its population in the assessment area that is adversely affected; […]. The use of criterion D8C2 in the overall assessment of good environmental status for Descriptor 8 shall be agreed at regional or subregional level. The *outcomes* of the assessment of criterion D8C2 shall contribute to assessments under Descriptors 1 and 6, where appropriate.

4. SUGGESTIONS POTENTIALLY RELEVANT TO THE DISCUSSION ON DECISIONS REGARDING AGREED GES AND OF THE ONGOING OVERALL INTEGRATION PROCESS

73. While considering current ongoing process at the European level on the MSFD and regionally on EcAp and IMAP, the authors identified few topics that might be of interest for future consideration. These are:

1) The following species have a limited geographical distribution in the Mediterranean. Some consideration should be given on whether to consider them at some stage, in relation to their importance within a sub-region prospective.

Species with limited sub-regional geographical distribution			
Species	**Present**	**Reference value**	**Additional information**
Harbour porpoise (*Phocoena phocoena relicta*)	Eastern Mediterranean: North Aegean Sea	Not Available	• *Phocoena phocoena* is a Priority species under the EU HD. This sub-species is endemic of the Black Sea. • Generation length=11.9 (for *Phocoena phocoena*)
Killer whale (*Orcinus orca*)	Gibraltar Strait (Western Mediterranean)	Check the ongoing IUCN Assessment	• Generation length=25.7
Rough-toothed dolphin (*Steno bredanensis*)	Eastern Mediterranean	Check the ongoing IUCN Assessment	• Generation length= Not available
False Killer Whale (*Pseudorca crassidens*)	Eastern Mediterranean (in proximity of Suez Canal)	Not Available	• Species frequently encountered in the Suez Canal adjacent area. Recent observations and strandings (2019-2020) were reported in Tunisia and Libya.

2) Common Indicators could be prioritised. For example, in order to assess the status of a given cetacean species it is sufficient to collect regularly information on abundance (CI4) and human-induced mortality (e.g., CI12). This is true also in the context of IUCN Red listing, under Criterion A.

74. In addition to these considerations, knowing that the discussion on the overall integration of GES of all Common Indicators (topic outside the scope of this report) is ongoing, it is important to highlight that this process should duly consider issues related to transboundary species and pressures and their connectivity, since GES achievement by one Contracting Party may be dependent on actions taken by other Contracting Parties within the region or any sub-regions, given various interactions, among these elements especially regarding anthropogenic pressures that may have transboundary effects.

75. To achieve the ultimate objective (i.e.: assess the overall Mediterranean GES), a strategy on how to integrate pressures, impacts and state elements and their interrelation to the extent possible among different relevant Ecological Objectives (EO) needs to be defined (2018 UNEP/MED WG.450/3; 2019 UNEP/MED WG.467/7; 2020 UNEP/MED WG.482/Inf.13).

5. REFERENCES

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<u>SUMMARY TABLES</u> - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						STEP 1 Refining scales of <u>monitoring</u>, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		STEP 2 Developing scales of assessment (if different from those of monitoring) and assessment criteria		STEP 3 Develop threshold and reference values	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
CI3: Species distributional range[3]	Eo1 - Biological diversity is maintained or enhanced. The quality and occurrence of coastal[4] and marine habitats and the distribution and abundance of coastal and marine species[5] are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.1 Species distribution is maintained	None in Decision IG.21/3. ***2017 Proposal***: The species are present in all their **natural** distributional range.	***State***: none in Decision IG.21/3. ***2017 Proposal***[6]: The distribution of marine mammals remains stable or expanding and the species that experienced reduced distribution in the past are in favourable status of conservation and can recolonise areas with suitable habitats. ***Pressure/Response***[7]: Human activities having the potential to exclude marine mammals from their natural habitat within their range area or to damage their habitat are regulated and controlled. Conservation measures implemented for the zones of importance for cetaceans. Fisheries management measures that strongly mitigate the risk of incidental taking of monk seals and cetaceans during fishing operations are implemented.		Fin whale / Mysticetes	<u>**Primary monitoring**</u> • *Geographic scale*: Regional. • *Method*: standard & synchronised between all countries (i.e. ASI-like). • *Frequency*: at least once per reporting period. <u>**Secondary monitoring**</u> • *Geographic scale*: Sub-Regional / National. ○ **High Priority sub-regions** (HP): in WM and I&CM key habitats for this species (i.e. feeding, corridor). ○ **Low priority sub-regions** (LP) in A and A&LS. • **Method**: ○ in **HP**: systematic regular monitoring (including photo-id). ○ in **LP** complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in **HP** sub-regions the minimum requirement is: at least three times (better annually in selected places); ○ in **LP** at least one time over the reporting period.	New proposal in UNEP/MED WG.450/3: • Regional: large cetaceans	• Primary assessment/MRU: Regional. • Frequency: once every reporting period.	None	**Reference values distributional range**: • <u>*Mediterranean cetaceans* (**all species**)</u>: map to be created based on Mannocci et al. 2018, Canadas et al. 2018 (*Ziphius*) • <u>*Adriatic cetaceans*</u>: Fortuna et al. 2018 (*Tusiops*, *Stenella*) • <u>*Monk seals*</u>: map to be created based all existing data. **Thresholds for distributional range**: • The extent of the distribution of each species remains stable or expanding compared to a **reference map** (see above). In particular, the Extent of occurrence (EOO) shows: 1) no decline (in all sub-regions where the species was regularly found since last assessment, 2) no decline of number of locations or local putative populations for the species within its distributional range. Given the difficulty to assess the distribution of cetacean species at a finer scale, both reference values and thresholds for this CI should be revised at each assessment cycle.
						Sperm whale / Odontocete (deep feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. <u>**Secondary monitoring**</u> • **Geographic scale**: Sub-Regional / National. ○ **High Priority** (HP) in WM, I&CM and A&LS key habitats for this species (i.e. breeding, corridor). ○ **Low priority** (LP) in A • **Method**: As in “Fin whale” cell. • **Frequency**: As in “Fin whale” cell.			None	
						Cuvier's beaked whale (deep feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: As in “Fin whale” cell. • **Frequency**: As in “Fin whale” cell. <u>**Secondary monitoring**</u> **Geographic scale**: Sub-Regional / National. ○ **High Priority** (HP) in WM, I&CM and A&LS key habitats for this species (i.e. feeding). ○ **Low priority** (LP) in A • **Method**: As in “Fin whale” cell. • **Frequency**: As in “Fin whale” cell.			None	

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[3] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-mammals
[4] By coastal it is understood both the emerged and submerged areas of the coastal zone as considered in the SPA/BD Protocol as well as in the definition of coastal zone in accordance with Article 2e and the geographical coverage of Article 3 of the ICZM Protocol.
[5] On the basis of Annex II and III of the SPA and Biodiversity Protocol of the Barcelona Convention.
[6] UNEP(DEPI)/MED WG.444/6/Rev.1. IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries). 6th Meeting of the Ecosystem Approach Coordination Group, Athens, Greece, 11 September 2017.
[7] Decision IG.21/3 on the Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and targets.

SUMMARY TABLES - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						STEP 1 Refining scales of monitoring, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		STEP 2 Developing scales of assessment and assessment criteria		STEP 3 Develop threshold and reference values	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
CI3: Species distributional range[8] *continue*	Eo1 - Biological diversity is maintained or enhanced. The quality and occurrence of coastal[9] and marine habitats and the distribution and abundance of coastal and marine species[10] are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.1 Species distribution is maintained	None in Decision IG.21/3. ***2017 Proposal***: The species are present in all their **natural** distributional range.	***State***: none in Decision IG.21/3. ***2017 Proposal***[11]: The distribution of marine mammals remains stable or expanding and the species that experienced reduced distribution in the past are in favourable status of conservation and can recolonise areas with suitable habitats. ***Pressure/Response***[12]: Human activities having the potential to exclude marine mammals from their natural habitat within their range area or to damage their habitat are regulated and controlled. Conservation measures implemented for the zones of importance for cetaceans. Fisheries management measures that strongly mitigate the risk of incidental taking of monk seals and cetaceans during fishing operations are implemented.		Long finned pilot whale (epipelagic feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: standard & synchronised between all countries (i.e. ASI-like). • **Frequency**: at least once per reporting period. <u>**Secondary monitoring**</u> • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in I&CM. • **Method**: ○ in **HP**: systematic regular monitoring; ○ in **LP** complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in **HP** sub-regions the minimum requirement is biannual; ○ in **LP** at least one time over the reporting period.	New proposal in UNEP/MED WG.450/3: • Sub-regional: small cetaceans	• **Primary assessment/MRU**: Regional. • **Frequency**: once every reporting period.	None	*See previous page.*
						Risso's dolphin (epipelagic feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. <u>**Secondary monitoring**</u> • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM & A key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in I&CM and A&LS. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
						Bottlenose dolphin (epipelagic feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. <u>**Secondary monitoring**</u> • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in key habitats for this species in all sub-regions (i.e. feeding, corridor). ○ **Low priority** (LP) in offshore areas. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
						Common dolphin (epipelagic feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. <u>**Secondary monitoring**</u> • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM, A&LS key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in A, I&CM. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
						Striped dolphin (epipelagic feeder)	<u>**Primary monitoring**</u> • **Geographic scale**: Regional. • **Method**: As in "Fin whale" cell (except for photo-id).			None	

[8] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-mammals
[9] By coastal it is understood both the emerged and submerged areas of the coastal zone as considered in the SPA/BD Protocol as well as in the definition of coastal zone in accordance with Article 2e and the geographical coverage of Article 3 of the ICZM Protocol.
[10] On the basis of Annex II and III of the SPA and Biodiversity Protocol of the Barcelona Convention.
[11] UNEP(DEPI)/MED WG.444/6/Rev.1. IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries). 6th Meeting of the Ecosystem Approach Coordination Group, Athens, Greece, 11 September 2017.
[12] Decision IG.21/3 on the Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and targets.

							• **Frequency**: As in “Fin whale” cell.				

<u>SUMMARY TABLES</u> - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						**STEP 1** **Refining scales of <u>monitoring</u>, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment and assessment criteria**		**STEP 3** **Develop threshold and reference values**	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
CI3: Species distributional range *continue*	EO1 - Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.1 Species distribution is maintained	The **Monk Seal** is present along recorded Mediterranean coasts with suitable habitats for the species[6].	***State***[7]: The distribution of Monk Seal remains stable or expanding and the species is recolonizing areas with suitable habitats. ***Pressure***[7]: Human activities having the potential to exclude marine mammals from their natural habitat within their range area or to damage their habitat are regulated and controlled. Fisheries management measures that strongly mitigate the risk of incidental taking of monk seals and cetaceans during fishing operations are implemented.		Monk Seal	<u>**Primary monitoring**</u> • **Geographic scale**: Sub-regional ○ In Group A countries: ○ Specifically, monitor populations in sites consistent with the Regional Strategy for the conservation of Monk seal in the Mediterranean (RSMS). ○ In Group B and C countries: area with suitable habitat and/ historical presence. • **Method**: ○ In Group A countries: ▪ Registry on opportunistic sightings / citizen science ▪ Photo traps in selected caves ○ In Group B & C countries: ▪ Registry on opportunistic sightings (minimum requirement) ▪ Photo traps in selected caves of selected locations identified by the revised RSMS. • **Frequency**: Annual (minimum requirement) or all known locations in each Group A country covered at least three times (biannually) per reporting period.	None	• **Primary assessment/MRU**: Regional. • **Frequency**: once every reporting period.	None	**Reference values distributional range**: • <u>*Monk seals*</u>: map to be created based all existing data.

SUMMARY TABLES - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						STEP 1 Refining scales of monitoring, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		STEP 2 Developing scales of assessment and assessment criteria		STEP 3 Develop threshold and reference values	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
CI4: Population abundance of selected species[13]	EO1- Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.2 Population size of selected species is maintained	The species population has abundance levels allowing to qualify to Least Concern Category of IUCN.	***State***[6]: Populations recover towards natural levels. ***2017 Proposal***: No human-induced mortality is causing a decrease in breeding population size or density. Populations recover towards natural levels.		Fin whale	**Primary monitoring** • *Geographic scale*: Regional. • *Method*: standard & synchronised between all countries (i.e. ASI-like). • *Frequency*: at least once per reporting period. **Secondary monitoring** • *Geographic scale*: Sub-Regional / National. ○ *High Priority sub-regions* (HP): in WM and I&. ○ *Low priority* (LP):in A and A&LS. • **Method**: ○ in HP: systematic regular monitoring (including photo-id); ○ in LP complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in HP sub-regions the minimum requirement is biennial. ○ in LP at least one time over the reporting period.	IMAP Monitoring Protocols 2019	• **Assessment / MRU**: Regional. • **Frequency**: once every reporting period.	None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.5% within a 6-year reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
						Sperm whale	**Primary monitoring**: As in "Fin whale" cell. **Secondary monitoring**: • *Geographic scale*: Sub-Regional / National. ○ HP: in WM, I&CM and A&LS. ○ LP: in A. • *Method*: As in "Fin whale" cell. • *Frequency*: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.3% within a 6-year reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
						Cuvier's beaked whale	**Primary monitoring**: As in "Fin whale" cell. **Secondary monitoring** • *Geographic scale*: Sub-Regional / National. ○ HP in WM, I&CM and A&. ○ LP in A. • *Method*: As in "Fin whale" cell. • *Frequency*: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥ 1.5% within a 6-year reporting period. • Regional reference value: Canadas *et al.* 2018 & ASI 2018 DS design-based estimate (see Box 4 for details).
						Long finned pilot whale	**Primary monitoring**: As in "Fin whale" cell. **Secondary monitoring** • *Geographic scale*: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM. ○ **Low priority** (LP) in I&CM. • **Method**: As in "Fin whale" cell. ○ **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.7% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
						Risso's dolphin	**Primary monitoring**: As in "Fin whale" cell. **Secondary monitoring** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM & A. ○ **Low priority** (LP) in I&CM and A&LS. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (2.0% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

[13] https://www.medqsr.org/common-indicator-4-population-abundance-selected-species-marine-mammals

<u>SUMMARY TABLES</u> - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						**STEP 1** **Refining scales of <u>monitoring</u>, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment and assessment criteria**		**STEP 3** **Develop threshold and reference values**	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
CI4: Population abundance of selected species[14] *continue*	EO1- Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.2 Population size of selected species is maintained	The species population has abundance levels allowing to qualify to Least Concern Category of IUCN.	***State***[6]: Populations recover towards natural levels. ***2017 Proposal***: No human-induced mortality is causing a decrease in breeding population size or density. Populations recover towards natural levels.		Bottlenose dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP). ○ **Low priority** (LP) in offshore areas. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • No decrease of ≥20% over 3 generations (1.9% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details). ○ Adriatic: Reference value (2010: Fortuna et al. 2018)
						Common dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM, A&LS key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in A, I&CM. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (2.7% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
						Striped dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell.	None.		None.	• Check IUCN status and if EN, CR, VU then > only. • Maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.8% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
			Number of individuals by colony allows to achieve and maintain a favourable conservation status.	***State***[7]: Continual recovery of population density.		Monk Seal	**<u>Primary monitoring (pending definition of a single standardised method to avoid double counting and allow inter-regional comparison)</u>** • **Geographic scale**: Sub-regional • **Method**: ○ Group A countries: ▪ Individuals counts based on cave monitoring (minimum requirement) and/or mark-recapture based on photo-identified seals data in sites consistent with the revised Monk seal strategy. ○ Group B & C countries: ▪ Photo-identification of individuals based on images obtained from non-invasive monitoring of resting caves. Caves in sites that require monitoring should be decided based on evidence of recurrent sightings recorded through the results of the opportunistic sighting registry ○ **Frequency**: Annual.	None.	• **Assessment/ MRU**: Regional	None.	• Increase on total population of 1% over six-year reporting period AND increase in number of pups compared to the last assessment. • Provisional reference value: to be estimated.

[14] https://www.medqsr.org/common-indicator-4-population-abundance-selected-species-marine-mammals

<u>SUMMARY TABLES</u> - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						STEP 1 Refining scales of <u>monitoring</u>, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		STEP 2 Developing scales of assessment and assessment criteria		STEP 3 Develop threshold and reference values	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
CI5: Population demographic characteristics[15]	EO1 - Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.3 Population condition of selected species is maintained	***State[7]***: Decreasing trends in human induced mortality. ***Pressure[7]***: Appropriate measure implemented to mitigate incidental catch, prey depletion and other human induced mortality.	Species populations are in good condition: Low human induced mortality, balanced sex ratio and no decline in calf production[7]. ***2017 Proposal***: preliminary assessment of incidental catch, prey depletion and other human induced mortality followed by implementation of appropriate measures to mitigate these threats.	Move GES definitions for state and pressure to CI12 and reformulate GES definitions for CI5	Cetaceans (*Stenella*, *Tursiops* and *Balaenoptera* as proxy for functional groups)	**<u>Primary monitoring</u>** • **Geographic scale**: Sub-regional / National. • **Species**: focus on *Stenella*, *Tursiops* and *Balaenoptera*. **Parameters**: ○ adult survival probability, juvenile survival probability; fecundity/breeding productivity/rate; age class distribution; sex ratio; population growth rate. • **Method**: ○ **Stranding network** collecting standard measures and biological material (e.g., teeth and reproductive organs) ○ **Photo-ID network** collecting standard pictures (list of parameters including calf) • **Frequency**: continuous for strandings, regularly and frequent for photo-ID. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional. • **Method**: one dedicated concerted and cooperative campaign collecting biopsies (for sex ratio, and hormones rates). • **Frequency**: at least once per reporting period.		• **Assessment/ MRU**: Sub-regional & all “local populations” (long-term studies). • **Frequency**: once per reporting period.		It is not possible to develop reference and threshold values at this point.
			Pressure[7]: Appropriate measures implemented to mitigate direct killing and incidental catches and to preclude habitat destruction and disturbance.	Species populations are in good condition: Low human induced mortality, appropriate pupping seasonality, high annual pup production, balanced reproductive rate and sex ratio[6]. ***2017 Proposal***: decreasing trends in human induced mortality (e.g., direct killings, pupping/resting habitat /disturbance/occupation)	Move GES definitions for state and pressure to CI12 and reformulate GES definitions for CI5. Add “Habitat disturbance” to the definition of Pressure in GES.	Monk seal	**<u>Primary monitoring</u>** • **Geographic scale**: Sub-regional in countries Group A. • **Method**: Pup counts in critical/selected breeding caves (minimum requirement). • **Frequency**: annual.		• **Assessment/MRU**: Sub-regional & all “colonies”. • **Frequency**: once per reporting period.		**Reference values demography**: • *<u>Total annual national pup counts</u>*: to be estimated. • *<u>Annual birth rate</u>*: define index areas and produce estimates. **Threshold values**: • Increase from last assessment.

[15] https://www.medqsr.org/common-indicator-5-population-demographic-characteristics-marine-mammals

SUMMARY TABLES - IMAP COMMON INDICATORS (CI), GES OBJECTIVES AND TARGETS RELATED TO MARINE MAMMALS

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target						STEP 1 Refining scales of monitoring, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		STEP 2 Developing scales of assessment and assessment criteria		STEP 3 Develop threshold and reference values	
Common Indicator	**Ecological Objective**	**Operational Objective**	**GES definition**	**GES target**	***Comments, suggestions***	***Existing context*** Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
CI12: Bycatch of vulnerable and non-target species (EO1 and EO3)	EO3-EO1 - Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock	***2017 Proposal***: Incidental catch of vulnerable species (i.e. sharks, marine mammals, seabirds and turtles) are minimized.		***2017 Proposal***: The abundance / trends of populations of seabirds, marine mammals, sea turtles and sharks key species (selected according to their actual and total dependence on the marine environment, and to their ecological representativeness) is stable or not reducing in a statistically significant way taking into account the natural variability compared to the current situation.	***Cetaceans*** ***State***[7]: **No unsustainable impact at population level.** Decreasing trends in human induced mortality. ***Pressure***[7]: Appropriate measure implemented to mitigate incidental catch, prey depletion and other human induced mortality.	Marine mammals	• In each GFCM GSA, at least one year of cetacean bycatch rate monitoring per each high priority fishing métiers (to be defined), within each reporting cycle. • GFCM provides data on fishing effort during reference year for priority fishing métiers, for each GSA. • **Annually**: bycatch (onboard observations, questionnaires and strandings) and systemic pollution (strandings) • CPs monitor their fleets (**at least one métier per sub-region per year, rotating**). • National stranding network collect data on fishery-induced mortality and level of pollutants in marine mammal tissues. They provide biennial reports on these matters. • Each CP: national monitoring schemes to provide bycatch rates and annual fishing effort.		• **Assessment/MRU**: Regional & Sub-regional (or aggregated GFCM GSAs). • **Frequency**: annual or biennial.		• **Regional**: BRA on each species for the potentially most dangerous fishing gears. ○ Threshold of the total estimated bycatch per all fishing gears: **1% of the total population**. This triggers in-depth monitoring programmes. • **Sub-regional**: ***thresholds*** calculated with CLA or RLA on each species, based on actual observations on bycatch rates, total fishing effort, biological parameters and conservation objectives (CLA = 72% K; RLA = 80% K).
					Monk seal ***Pressure***[7]: Appropriate measures implemented to mitigate direct killing and incidental catches and to preclude habitat destruction.						

ANNEX 1 - PROPOSED REVISIONS TO APPENDIX 1 OF ANNEX TO DECISION IG.22/7 ON INTEGRATED MONITORING AND ASSESSMENT PROGRAMME OF THE MEDITERRANEAN SEA AND COAST AND RELATED ASSESSMENT CRITERIA

Proposed revisions to Appendix 1 of Annex to Decision Ig.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria are all in red. Added text is in **bold**, proposed deletions are ~~strikethrough~~.

Revisions are proposed for the next three tables.

Proposed revisions to Annex to Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria

Species class	Species functional groups	
	~~CEEC~~/**OSPAR**	~~FR experts proposal~~ **EcAp/IMAP** ~~(subdivision of toothed whales)~~
Marine mammals	Baleen whales	~~baleines à fanons (Mysticètes)~~ **Baleen whales (Mysticetes)**
	Toothed wales	~~Odontocètes épipélagiques stricts (alimentation entre 0 à -200 m)~~ **Strictly epipelagic Odontocetes (feeding between 0 and -200m)**
		~~Odontocètes épi- et méso-bathy-pélagiques (alimentation de 0 à >-200 m)~~ **Epi-, mesopelagic Odontocetes (feeding > -200m)**
	Seals	~~Phoques (pinnipèdes)~~ **Seals (pinnipeds)**

Proposed revisions to Appendix 1 to Annex to Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria

Corrections in red, **added text** in **bold**, proposed deletions are ~~strikethrough~~ and ~~red~~.

Minimum list			Texel-Faial Criteria								Typology/listed	
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
Predominant habitat or "Functional" group of species	**Specific habitat type or species to be monitored**	**ADDITIONAL INFORMATION (to be further discussed): specific representatives species or habitats (Invertebrates associated with habitats)**	**(sub)regional importance**	**Rarity**	**Key functional role**	**Declining or threatened**	**Sensitivity / Vulnerability (exposure to pressures): cf. column N to V**	**feasibility (for monitoring): cf. column W to AG**	**Priority (estimated from column D to I)**	**Assessment monitoring scale**	**EUNIS 2015**	**Habitats Directive**
Mammals - baleen whales	*Balaenoptera physalus* (Linnaeus, 1758)		subregional			**T**		**yes**	**1**	~~subregional~~ **regional**		
Mammals - toothed whales (deep feeder)	*Physeter macrocephalus* (Linnaeus, 1758)		subregional			**T**	**High**	**yes**	**1**	subregional		
Mammals - toothed whales (deep feeder)	*Ziphius cavirostris* (Cuvier G., 1832)		subregional			**T**	**High**	**yes**	~~2~~ **1**	subregional		
Mammals - toothed whales (epipelagic feeder)	*Delphinus delphis* ~~(~~Linnaeus, 1758~~)~~		subregional					**yes**	**1**	subregional		
Mammals - toothed whales (epipelagic feeder)	*Tursiops truncatus* (Montagu, 1821)		~~regional~~ **subregional**				**Moderate**	**yes**	**1**	~~regional~~ **subregional**		priority species
Mammals - toothed whales (epipelagic feeder)	*Stenella coeruleoalba* (Meyen, 1833)		regional					**yes**	**2**	regional		
Mammals - toothed whales (epipelagic feeder)	*Globicephala melas* (Trail**l**, 1809)		subregional					**yes**	**2**	subregional		
Mammals - toothed whales (epipelagic feeder)	*Grampus griseus* (Cuvier G., 1812)		subregional				**Moderate**	**yes**	**2**	subregional		
Mammals - seals	*Monachus monachus* (Hermann, 1779)		subregional			T	**High**		**1**	subregional		priority species

<u>Proposed revisions</u> to Appendix 1 to Annex to Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria *[continuing from previous table]*

Corrections in red, **added text** in **bold**, proposed deletions are ~~strikethrough~~ and ~~red~~.

Minimum list		Main pressures (binary=occuring or not: to be prioritized (ranked) for each specific representatives species or									Feasibility										
		N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
Predominant habitat or "Functional" group of species	Specific habitat type or species to be monitored	Physical loss of habitat (construction ports, marinas)	Physical damage to habitat	Nutrient enrichment	Contaminants	Removal by fishing (target, non-target)	Hydrological changes (thermal, salinity regime)	Other disturbances to species (e.g. litter, visual disturbance)	UW noise	NIS	Vessel	Lab facilities, equipment, consumables	Taxonomic expertise (technicians, scientists)	Monitoring techniques developed	Aerial	Land-based	In-water	Indicators established	Existing observatory stations / long term monitoring programmes	Satellite / Remote Sensing / aerial platforms	Oceanographic platforms
Mammals - seals	*Monachus monachus* (Hermann, 1779)										Yes	Yes	~~Moderate~~	**Non invasive monitoring of selected resting/breeding caves to allow photoidentification for mark-recapture and pup counts**				Yes	Yes	~~Teledection Tracking~~	
Mammals – baleen whales	*Balaenoptera physalus* (Linnaeus 1758)										Yes	Yes	Moderate	Shipboard, acoustic or aerial ~~strip~~ **line** transects	**Yes, line transect**	**Only used in the Strait of Gibraltar**		Yes	Yes	~~Teledection Tracking~~ **Yes**	
Mammals - toothed whales (deep feeder)	*Physeter macrocephalus* (Linnaeus, 1758)					***					Yes	Yes	Moderate	Shipboard surveys; Acoustic surveys; Aerial surveys (but not optimum due to long dives, **photo-ID**			**Yes, acoustic**	Yes	Yes	~~Teledection Tracking~~ **Yes**	
Mammals - toothed whales (deep feeder)	*Ziphius cavirostris* (Cuvier G., 1832)										Yes	Yes	Moderate	Shipboard surveys, Acoustic surveys (but not easy to detect), Aerial surveys (but not optimum due to long dives)			***Fix acoustic***	Yes	Yes	~~Teledection Tracking~~ **Yes**	
Mammals - toothed whales (epipelagic feeder)	*Delphinus delphis* ~~(~~Linnaeus, 1758~~)~~										Yes	Yes	Moderate	Shipboard or aerial ~~strip~~ **line** transects	**Yes, line transect**			Yes	Yes	~~Teledection Tracking~~ **No**	
Mammals - toothed whales (epipelagic feeder)	*Tursiops truncatus* (Montagu, 1821)										Yes	Yes	Moderate	Shipboard, acoustic or aerial ~~strip~~ **line** transects, **photo-ID**	**Yes, line transect**			Yes	Yes	~~Teledection Tracking~~ **No**	
Mammals - toothed whales (epipelagic feeder)	*Stenella coeruleoalba* (Meyen, 1833)										Yes	Yes	Moderate	Shipboard or aerial ~~strip~~ **line** transects	**Yes, line transect**			Yes	Yes	~~Teledection Tracking~~ **No**	
Mammals - toothed whales (epipelagic feeder)	*Globicephala melas* (Traill, 1809)										Yes	Yes	Moderate	Shipboard, acoustic or aerial ~~strip~~ **line** transects	**Yes, line transect**			Yes	Yes	~~Teledection Tracking~~ **No**	
Mammals - toothed whales (epipelagic feeder)	*Grampus griseus* (Cuvier G., 1812)										Yes	Yes	Moderate	Shipboard, acoustic or aerial ~~strip~~ **line** transects, **photo-ID**	**Yes, line transect**			Yes	Yes	~~Teledection Tracking~~ **No**	

Notes on proposed revisions: ***Marine mammals are dramatically impacted by IUU driftnets. In case of Sperm whales, even few animals per year taken at regional level are to be considered a serious threat.

Annex X

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

Executive Summary

Two necessarily overlapping sympatric assessment systems have been established covering marine habitats and species within the Mediterranean. On one hand, you have 2 European Union (EU) Directives the EU Marine Strategy Framework Directive (MSFD- Directive 2008/56/EC) and the EU Habitats directive (92/43/EC) both of which apply only to EU Member States (MSs) and the second is the Ecosystem Approach (EcAp) & Integrated Monitoring and Assessment Programme (IMAP) process of the Barcelona Convention (UNEP/MAP 2016; UNEP(DEPI)/MED IG.22/Inf.7) that apply to all Contracting Parties (CPs) of the Mediterranean, noting that all are parties to this Regional Sea Convention, this means *all* the 21 riparian countries that border the Mediterranean Sea and including the European Union.

In terms of certain marine species and in this case, sea turtles, both systems intend to report on their conservation status and that of populations with reference to Good Environmental Status (GES), which is determined through elaboration of certain criteria/indicators. Predefined scales of monitoring and assessment are required for these criteria/indicators and findings need to be compared to either baseline or threshold values (whichever is most appropriate) to confirm GES is met, and/or to determine if trends are improving or worsening.

Elaboration of three specific EcAp/IMAP Common Indicators (CI) for marine turtles in the Mediterranean are the subject of this report namely:

CI 3 – Species distribution range

> Existing GES definition: “The species continues to occur in all its natural range in the Mediterranean, including nesting, mating, feeding and wintering and developmental (where different to those of adults) sites”

CI 4 – Population abundance

> Existing GES definition: “The population size allows to achieve and maintain a favourable conservation status taking into account all life stages of the population”

CI 5 – Population demographic characteristics

> Existing GES definition: “Low mortality induced by incidental catch and favourable sex ratio and no decline in hatching rate”

This report presents information, perspectives and recommendations on 1) revising the existing scales of monitoring, 2) establishing suitable scales of assessment and appropriate assessment criteria, and 3) establishing appropriate baseline and threshold values on which to base GES.

In order to stimulate progress towards realisation of workable regional assessments for sea turtles, proposals contained herein provide a pragmatic approach to establishing baselines and thresholds using conceptually simple methods for determination and assessment of populations in terms of GES. Given time and increased capacity, following the acceptance of the initial scales and thresholds/baselines determined by the current process, it is foreseen that some adjustment may be required, especially for the threshold and baseline components, to reflect more robust scientific determination of GES, however no adjustment would be expected for the remainder of the current and subsequent IMAP six-year assessment periods.

The following tables provide summaries of the existing status of the elaboration of the three subject CIs together with proposed updates and clarifications that are made within the main body of this report.

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target					**STEP 1** **Refining scales of monitoring, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment**		**STEP 3** **Developing assessment criteria**		**STEP 4** **Develop threshold and baseline values**	
Common Indicator	**Operational Objective**	**GES definition**	**GES target**	**Comments, suggestions**	**Existing context**	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
CI3: Species distributional range [1]	Species distribution is maintained	The species continues to occur in all its natural range in the Mediterranean, including nesting, mating, feeding and wintering and developmental (where different to those of adults) sites	State • Turtles continue to nest in all known nesting sites • Turtle distribution is not significantly affected by human activities Pressure/Response • Protection of known nesting, mating, foraging, wintering and developmental turtle sites. • Human activities having the potential to exclude marine turtles from their range area are regulated and controlled. • The potential impact of climate change is assessed		Species distribution ranges can be gauged at local (i.e., within a small area like a national park) or regional (i.e., across the entire Mediterranean basin) scales using a variety of approaches. Long-term monitoring of these areas provides information on the temporal evolution in species distributions.	Revise mapping requirements to two maps; one for nesting areas and one for marine areas. Nesting areas monitoring • Geographic scale: ○ (sub-)National. Up to 7 established sites or 75% of national nesting activity (index areas) • Method: ○ standard nesting beach surveys. • Frequency: ○ Minimum = June/July annually for index areas. ○ six-yearly national scale. Nearshore monitoring • Geographic scale: ○ (sub-)National. Up to 4 sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording. ○ six-yearly national scale. Offshore monitoring • Geographic scale: ○ (sub-)National/regional. • Method: ○ Aerial surveys ○ Boat surveys ○ Bycatch recording. ○ Opportunistic boat surveying. • Frequency: ○ Yearly for aerial and boat surveys ○ Year-round for bycatch records ○ *Ad hoc* boat surveying. ○ six-yearly national scale.	The European (ETRS) 10x10km grid is used for mapping the distribution and range…, Three different maps (grids) are produced yearly for each species accounting for breeding sites, wintering sites and feeding/developmental sites. Number of 10x10 km cells (presence/absence) occupied for breeding or wintering or feeding/developmental areas along the Mediterranean (or subregional) coast and in all pelagic marine areas.	Nesting areas National and Subdivisional level GES assessments based on maintenance of distribution of all nesting sites. Marine areas Subregional GES assessments.	Turtles continue to nest in all known nesting sites. Turtle distribution is not significantly affected by human activities.	Nesting areas Turtles remain present in all parts of annually monitored nesting sites and at all established sites during periodic surveys. Marine areas Turtles remain present in all annually monitored, CP defined, hotspot areas and no evidence of definitive absences in any other area withing the RMU distribution.	None	Nesting areas Baselines centred on 1992 to be used for established nesting sites. More recent data to be modelled to 1992 era levels for these sites. New and emerging sites to use maximum existing 6-year average as baseline. Marine areas All areas assumed to have turtle presence (in line with updated IUCN-MTSG RMU boundaries) unless proven otherwise.

[1] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-turtles

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target					STEP 1 Refining scales of monitoring, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		STEP 2 Developing scales of assessment		STEP 3 Developing assessment criteria		STEP 4 Develop threshold and baseline values	
Common Indicator	**Operational Objective**	**GES definition**	**GES target**	**Comments, suggestions**	**Existing context**	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
CI4: Population abundance of selected species [2]	Population size of selected species is maintained	The population size allows to achieve and maintain a favourable conservation status taking into account all life stages of the population	State • No human induced decrease in population abundance • Population recovers towards natural levels where depleted		For counts carried out on an annual basis, a number of sites should be selected that represent a sufficiently large proportion of the subregional or national population, with criteria being delineated by expert groups. The "Demography Working Group[3]" suggests that comprehensive surveys should be carried out every 5 years, with the aim of covering all breeding, foraging, wintering and developmental sites. However, here, it is recommended that the whole coastal and marine area is covered on a national or subregional scale to take into account changes in population distribution (and hence counts) in relation to climate change.	Nesting areas monitoring • Geographic scale: ○ (sub-)National. Up to 7 sites or 75% of national nesting activity (index areas) • Method: ○ standard nest count surveys. • Frequency: ○ Minimum = June/July annually for index areas. ○ six-yearly national scale. Nearshore monitoring • Geographic scale: ○ (sub-)National. Up to 4 sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording. ○ six-yearly national scale. Offshore monitoring • Geographic scale: ○ (sub-)National. • Method: ○ Aerial surveys ○ Boat surveys using standardised protocols • Frequency: ○ Yearly organised aerial/boat surveys ○ six-yearly national scale.	For counts carried out on an annual basis, a number of sites should be selected that represent a sufficiently large proportion of the subregional or national population, with criteria being delineated by expert groups. The "Demography Working Group" suggests that comprehensive surveys should be carried out every 5 years, with the aim of covering all breeding, foraging, wintering and developmental sites. However, here, it is recommended that the whole coastal and marine area is covered on a national or subregional scale to take into account changes in population distribution (and hence counts) in relation to climate change.	Nesting areas National and Subdivisional level GES assessments based on maintenance of nesting abundance at all sites. Marine areas Subregional GES assessments based on relevant population segments present in each area.	Nesting areas The average breeding population size during at least a decade is suggested as the base level (based on International Union for Conservation of Nature Red List minimal criteria for sea turtles) Marine areas for non-breeding animals at wintering / foraging / developmental sites, number of individuals (n) with appropriate modelling to extrapolate population numbers	Nesting areas Rolling average of previous six years' data to count in the annual assessment. To coincide with the six-yearly regionwide GES assessments. Marine areas Rolling average of previous six years' data to count in the annual assessment. To coincide with the six-yearly regionwide GES assessments. Observations on numbers of turtles in different life-stages and sex ratios to be considered for indications of perturbations in population structure (see CI 5)	None.	Nesting areas Baselines centred on 1992 to be used for established nesting sites. More recent data to be modelled to 1992 era levels for these sites. New and emerging sites to use maximum existing 6-year average as baseline. Marine areas GES baseline taken as annual abundance derived from existing modelled abundances[4] or first year of monitoring which should begin ASAP across the Mediterranean. Where historic (post 1992) data showing larger populations exist, they can be used to amend the baseline of specific countries. For both areas a decrease in population abundance of 10% over a six-year reporting period should trigger increased conservation actions to prevent further decreases and populations falling out of GES

[2] https://www.medqsr.org/common-indicator-4-population-abundance-selected-species-marine-reptiles

[3] Cardona L, *et al.* (2015) Demography of marine turtles nesting in the Mediterranean Sea: a gap analysis and research priorities. Demography Working Group of the 5th Mediterranean Conference on Sea Turtles. 37pp. Bern Convention, T-PVS/Inf (2015) 15

[4] Sparks LM & DiMatteo AD (2020) Loggerhead sea turtle density in the Mediterranean Sea. NUWC-NPT Tech Rep 12360. 77pp.

Agreed EcAp Common Indicators, Ecological Objectives, GES definitions and GES target					**STEP 1** **Refining <u>scales of monitoring</u>, by revising the existing IMAP/EcAp proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing <u>scales of assessment</u>**		**STEP 3** **Developing <u>assessment criteria</u>**		**STEP 4** **Develop <u>threshold and baseline values</u>**	
Common Indicator	**Operational Objective**	**GES definition**	**GES target**	**Comments, suggestions**	**Existing context**	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
CI5: Population demographic characteristic[5]	Population condition of selected species is maintained	Low mortality induced by incidental catch. Favourable sex ratio and no decline in hatching rates.	Response • Measures to mitigate incidental captures in turtles implemented	Reformulate GES definitions for CI5 based on factors that can be influenced by intervention but gather data on wider demographic parameters.	A number of sites should be selected that represent a ***sufficiently large proportion of the subregional or national population for demographic data to be collected (reflecting the breeding, wintering, foraging and developmental populations that are representative of the region).*** If possible, populations should be selected where animals have been tracked with a sufficient number of units (i.e., >50 individuals), from which the connectivity among these different habitat types can be established.	<u>Nesting areas monitoring</u> • Geographic scale: ○ (sub-)National. Up to 7 established sites or 75% of national nesting levels • Methods: ○ Standard: hatchling emergence success (HES) and nest temperature data. ○ Additional: Sex ratio adults • Frequency: ○ Annually, Minimum: August/September for index area HES and May-September for temperature data. April-May for adult sex ratios. ○ six-yearly national scale. <u>Nearshore monitoring</u> • Geographic scale: ○ (sub-)National. Up to 4 index hotspot sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording. ○ six-yearly national scale. <u>Offshore monitoring</u> • Geographic scale: ○ (sub-)National. • Method: ○ Bycatch recording. ○ Opportunistic boat surveying. • Frequency: ○ Year-round bycatch records ○ *Ad hoc* boat surveying. ○ six-yearly national scale.	The selected breeding sites should aim to be genetically diverse, so as this diversity can be detected at foraging/ wintering/ developmental grounds where different populations diverge. This will facilitate the selection of marine areas for protection that support the highest genetic diversity (i.e., the greatest accumulation of different breeding populations), as well as those that support single breeding populations, which may be of equal importance. Opportunistic data should be collected from all possible sources, wherever possible, and compiled into a single database, which might be used to provide an overview of the entire area. Knowledge about the sex, health and genetic structure of the different populations/subpopulations will be obtained, by understanding recruitment and mortality within different parts of a population and across populations. This information is important to understand whether there are sex-specific mortality risks at different age/size classes, which is important towards aiding population recovery. Also, knowledge on the physical health and genetic health of populations will be obtained, which will indicate the capacity for resilience to human activities, including climate change.	<u>Nesting areas</u> National and Subdivisional level GES assessments. <u>Marine areas</u> Subregional GES assessments.	At present, specific demographic parameters are not regularly assessed to a similar level of female/nest counts, due to the data intensive nature of this component. Many programs assess clutch success (i.e., the number of eggs that hatch from a clutch); however, this represents a small component. Research on offspring sex ratios, juvenile sex ratios, adult (operational) sex ratios is intermittent and based on different fieldwork approaches/methods and analytical techniques depending on the objective (usually, aiming towards a journal publication). Most studies that do exist are focused on the breeding areas; thus, greater focus is required at foraging, wintering and developmental areas, with in-water limitations needing to be accounted for in analyses. Therefore, set analyses need to be established that are applicable within and/or across the different habitat types to allow comparison at the Mediterranean level.	<u>Nesting areas</u> Maintenance of suitable hatchling sex ratios and high hatchling emergence success. <u>Marine areas</u> Quantification of bycatch and calculation of bycatch mortality rates. Observations on numbers of turtles in different life-stages and sex ratios to be considered for indications of perturbations in population structure.	No threshold and baseline values have been consistently defined and applied to date.	<u>Nesting Areas</u> 'Good' HES values can be taken from published literature and taken as thresholds with a buffer zone for improved conservation measures. Nest temperature records to be monitored with estimations of over 95% female production as an upper threshold. <u>Marine areas</u> Human-induced mortality as a component of longevity and survivorship is the one factor that can be measured and affected by conservation actions and hence can be considered as an actionable indicator for GES. Numbers of deaths should be used as the indicator with a stable or declining trend in numbers indicating GES.

[5] https://www.medqsr.org/common-indicator-5-population-demographic-characteristics-marine-reptiles

Preamble

Briefly, the Terms of Reference for the consultant undertaking the current contracted activity covered the following four topics:

1 *Revise the existing scale of monitoring* and further work on developing adequate scales of monitoring for the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) Common Indicators (CIs) 3 (Distribution), 4 (Abundance) and 5 (Demography) related to marine turtles;

2 *Establish scales of assessment* and

3 *Establish assessment criteria* for the IMAP CIs 3, 4 and 5 related to marine turtles;

4 *Establish baseline and threshold values* for Ecological Objective 1 related to marine turtles;

Three Deliverables were initially anticipated to be submitted.

D1 Document detailing the consultant's workplan and timetable (completed; August 2020) and;

D2 Document covering topics 1 to 3 above;

D3 Document covering topic 4 above.

However, it was agreed between SPA/RAC and the consultant that D2 and D3 can be combined into a single deliverable document. This report represents that document of the two combined deliverables.

Table of Contents

I. Introduction

1. Two necessarily overlapping sympatric assessment systems have been established covering marine habitats and species within the Mediterranean. On one hand, you have 2 European Union (EU) Directives the EU Marine Strategy Framework Directive (MSFD- Directive 2008/56/EC) and the EU Habitats directive (92/43/EC) both of which apply only to EU Member States (MSs) and the second is the Ecosystem Approach (EcAp) & Integrated Monitoring and Assessment Programme (IMAP) process of the Barcelona Convention (UNEP/MAP 2016; UNEP(DEPI)/MED IG.22/Inf.7) that apply to all Contracting Parties (CPs) of the Mediterranean, noting that all are parties to this Regional Sea Convention, this means *all* the 21 riparian countries that border the Mediterranean Sea and including the European Union.

2. In terms of certain marine species and in this case, sea turtles, both systems intend to report on their conservation status and that of populations with reference to Good Environmental Status (GES), which is determined through elaboration of certain criteria/indicators. Predefined scales of monitoring and assessment are required for these criteria/indicators and findings need to be compared to either baseline or threshold values (whichever is most appropriate) to confirm GES is met, and/or to determine if trends are improving or worsening. EcAp Common Indicators (CI) and their corresponding MSFD Criteria are presented in Table 1.1 below. Both, especially the EcAp definitions, are presented as very simplistic overviews of the Theme, whereas data recording to meet the requirements of each are varied and complex.

Table 1.1 EcAp/IMAP Common Indicators subject to this assessment and their MSFD equivalents.

Theme	**Barcelona Convention EcAp /IMAP** Ecological Objective 1 Common Indicator # UNEP(DEPI)/MED WG.444/6/Rev.1 (marine turtle specific excerpts)	**EU MSFD** Descriptor 1 Criterion # Commission Decision (EU) 2017/848 of 17/05/17
Distribution	**CI 3** Turtle distribution is not significantly affected by human activities *and* turtles continue to nest in all known nesting sites	**D1C4** The species *distributional range* and where relevant, pattern, is in line with prevailing physiographic geographic and climatic conditions
Abundance	**CI 4** No human induced decrease in population abundance	**D1C2** The *population abundance* of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured
Demography	**CI 5** Low mortality induced by incidental catch. Favourable sex ratio and no decline in hatching rate	**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.

3. Guidance for Common Indicators, including specific sections for marine turtles, has been published (UNEP(DEPI)/MEDWG.444/6/Rev.1) and links the EcAp /IMAP process with that of the MSFD. It is clear from the document that there is a need for a coherent regionwide set of assessment standards that apply to all CPs, as each CP currently has defined their own disjointed targets.

4. GES can be assessed in several ways that may combine both baseline and trend-based approaches. A solely baseline approach based on a predetermined threshold value does not permit normalisation of an expanding/improving situation within the indicator, leading to indicators in decline remaining in GES.

5. Conversely a solely trend-based approach does not permit any decrease in an indicator, no matter how much it exceeds the initial level when GES status may have been indicated. Combined baseline and trend-based approaches includes thresholds that evolve in response to improving conditions, hence recognising the new state as GES, and permit small-scale variation in conditions to not immediately throw an improved indicator out of GES (Figure 1.1).

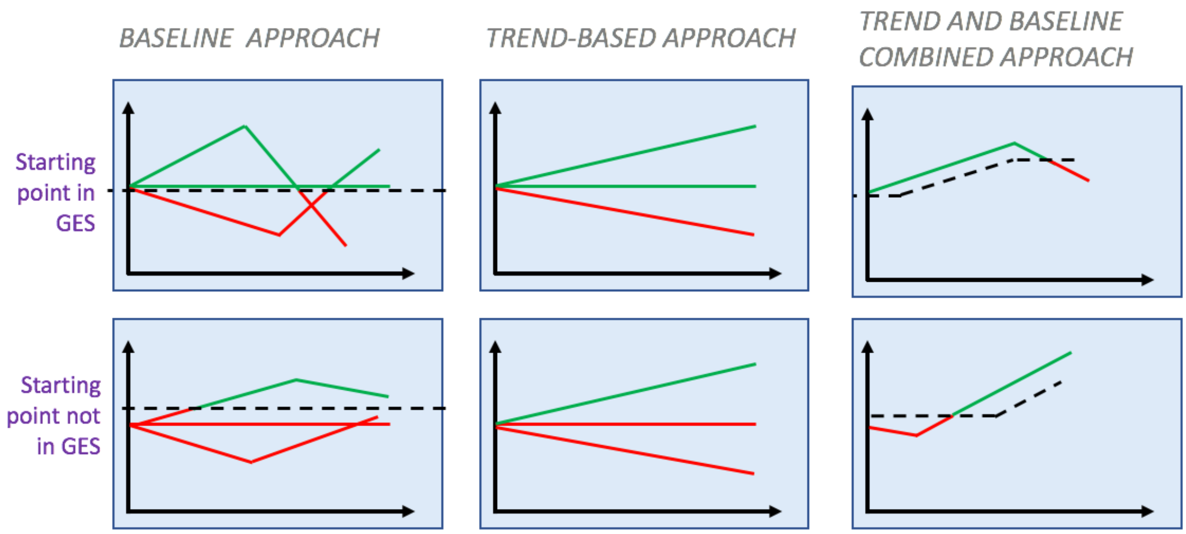

Figure 1.1. Approaches to determination of GES. Green line - GES met. Red line - GES not met. Dashed line - threshold values.

6. The setting of threshold values for an indicator is a complex and imprecise process, that requires detailed understanding of historic or past reference values and their interplay with contemporaneous pressures. An idealised situation equates to reference values being known from a period with no anthropogenic pressures acting upon indicator. Given it is unlikely that data are available from this pristine situation, alternative methods of determining acceptable thresholds are used. These alternative methods have been discussed at length within the EU MSFD context (Palialexis et al. 2019) and yet no single method has been adopted as standard either across the European member states or in any particular EU region or subregion. This is partly to do with lack of compatible monitoring regimes and hence absence of suitable data and partly to do with the differing levels of feasibility of each method.

7. Additionally, though there are likely precise theoretical threshold values that may be adopted, in practice these values can neither be definitively stated nor can data acquired be sufficiently robust to precisely determine which side of a single point threshold the indicator sits. Instead of the hard threshold it is more practical to have a threshold value range that covers the uncertainty of GES assignment. Thus, an indicator falling in this buffer zone will trigger additional measures to improve clarity in the assignment and precautionary-principal conservation measures (Figure 1.2).

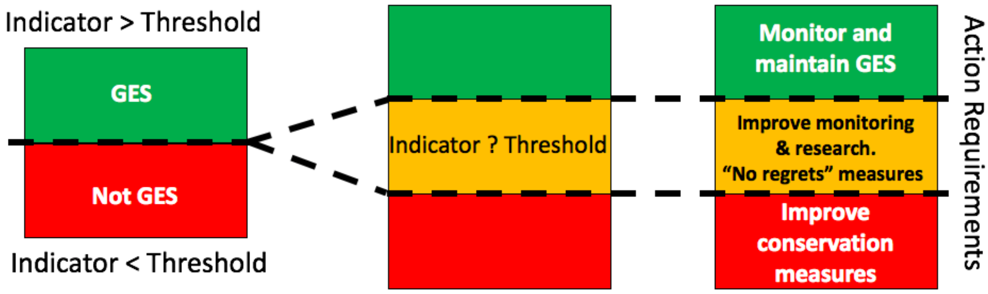

Figure 1.2. Threshold level setting incorporating uncertainty.

8. In order to stimulate progress towards realisation of workable regional assessments for sea turtles, proposals contained herein provide a pragmatic approach to establishing baselines and thresholds using conceptually simple methods for determination and assessment of populations in terms of GES. Given time and increased capacity, following the acceptance of the initial scales and thresholds/baselines determined by the current process, it is foreseen that some adjustment may be required, especially for the threshold and baseline components, to reflect more robust scientific determination of GES, however no adjustment would be expected for the remainder of the current and subsequent IMAP six-year assessment periods.

9. Unlike the situation for sea birds and marine mammals, there are a very limited number of marine turtle species that need to be assessed in the EcAp process. Of the seven species of marine turtle that inhabit the world's oceans only two have established resident breeding populations in the Mediterranean and require assessment. These are the loggerhead turtle (*Caretta caretta*; IUCN (regionally) Least Concern) and green turtle (*Chelonia mydas*; IUCN (globally) Endangered). Loggerheads in the Mediterranean are from two-possibly three globally defined Regional Management Units (RMUs) defined in Wallace et al. 2010. These are the most populous 'endemic' Mediterranean RMU supplemented with fewer turtles that have migrated into the area from the North West Atlantic and possibly the North East Atlantic Ocean RMUs. Loggerhead presence is so widespread across the Mediterranean, shown through tracking, at-sea surveys and stranding records, that they have been chosen to be used by the EU as a bio-indicator species for monitoring marine litter distribution and abundance[6]. Green turtles in the Mediterranean contrast with loggerhead turtles in that they are almost exclusively from the 'endemic' Mediterranean RMU and the vast majority of them remain in the eastern Mediterranean (Figure 1.3). With regard to breeding sites, loggerhead turtle nesting areas are currently concentrated along the shores of the eastern Mediterranean, though new and increased nesting is occurring in the western Mediterranean. Green turtles breed almost exclusively in the north eastern part of the eastern Mediterranean, except for one nest recorded in Tunisia and two recorded on the Island of Crete in Greece (Figure 1.4).

10. It is clear from the differing distributions of the two marine turtle species that each CP will have a distinct subset of the population segments to monitor and assess, with both requiring their own independent assessments of GES that will inform a taxon-wide GES status.

[6] https://indicit-europa.eu/

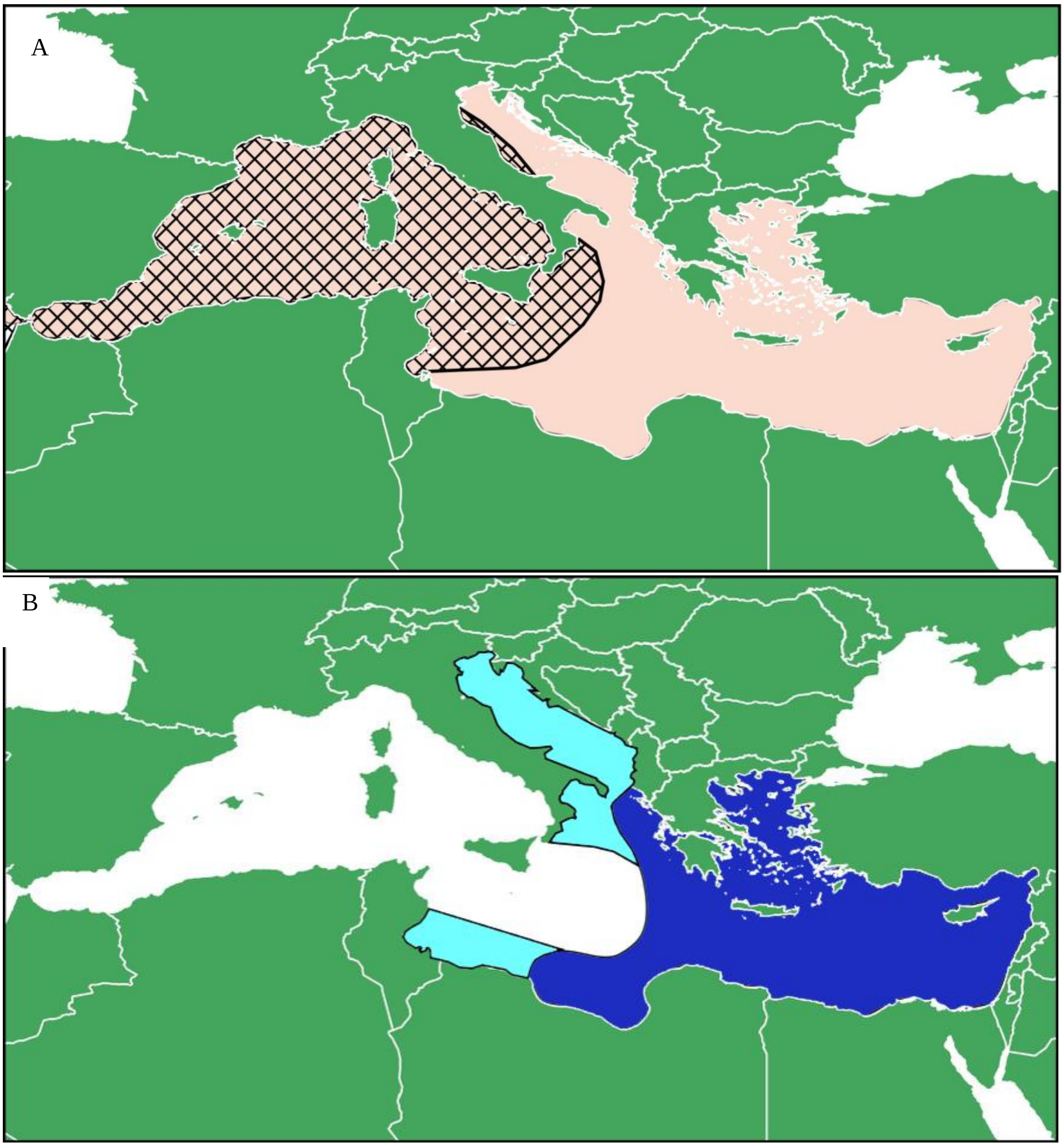

Figure 1.3. Marine turtle RMU limits in the Mediterranean. (A) Loggerhead distribution in the Mediterranean. Beige = Mediterranean RMU, crosshatch = Atlantic RMU. From RMU distribution presented in Wallace et al. (2010). (B) Green turtle distribution in the Mediterranean. Dark blue = established RMU distribution (Wallace et al. 2010). Pale blue (lower polygon) = extension of the distribution confirmed by sat tracking (Stokes et al. 2015) and a single nesting event in Tunisia. Pale blue (upper polygon) = recent records of green turtle captures (Piroli et al. 2020, Bentivegna et al. 2011, Lazar et al. 2004)

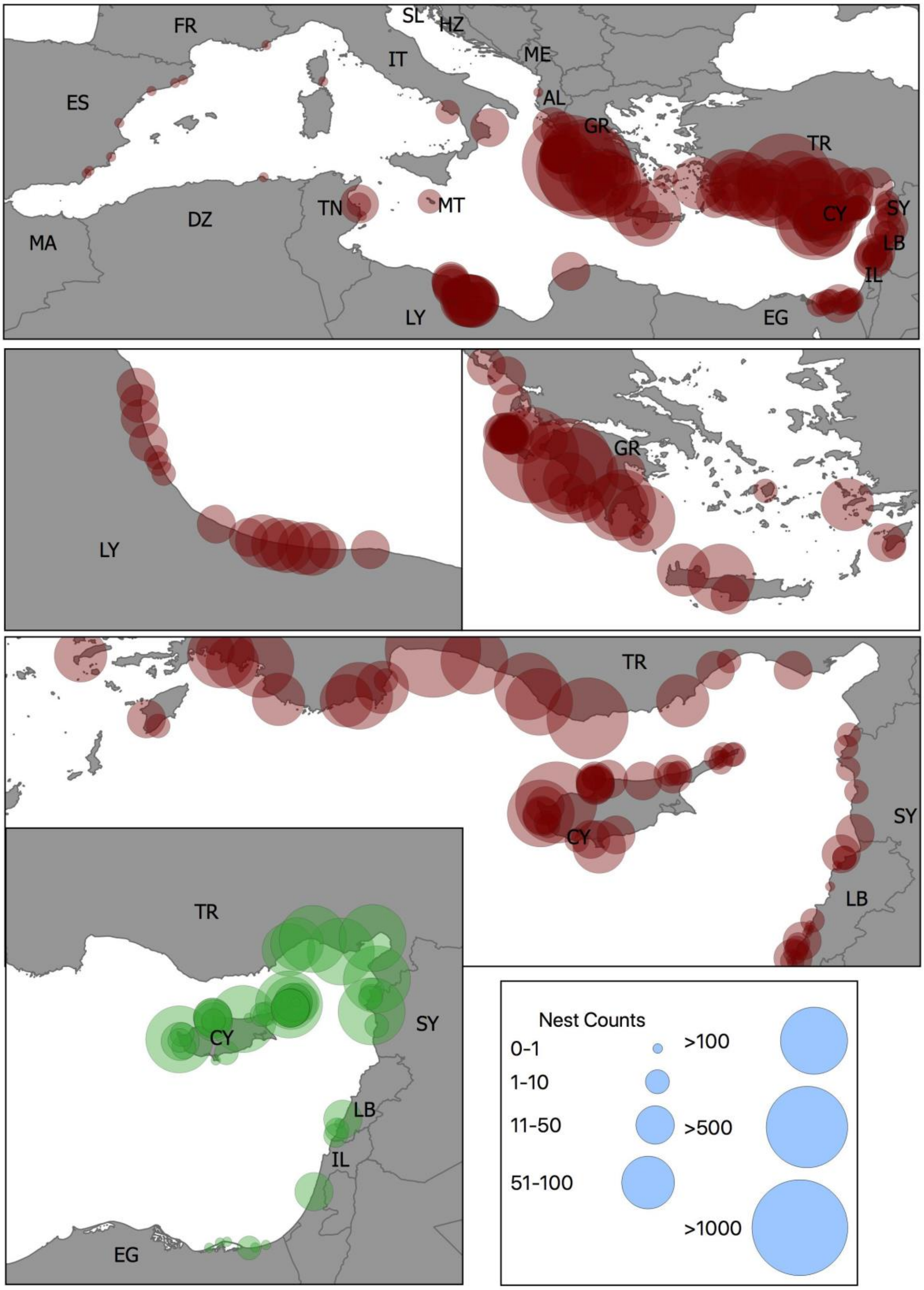

Figure 1.4. Overview of marine turtle nesting across the Mediterranean region. Note that nesting site information from Italy, Israel and Egypt are only available at sub-national levels and are summed and *presented at generalised locations*. Additionally, not all nesting beaches in Libya are represented due to lack of precise beach coordinates. Red circles – Loggerhead nesting sites. Green circles – Green turtle nesting sites. (Reproduced from SPA/RAC-UNEP/MAP 2020)

II. Scales of monitoring

11. Sea turtles occupy three main marine zones and one terrestrial zone during their life cycle. The breeding adults of both sexes congregate **nearshore at *breeding areas*** at predictable periods of time before migrating away to their 'foraging grounds'[7]. Clutches of eggs incubate on **sandy beach *breeding areas*** which are selected by the adult females. The hatchling and early-years turtles move to **deeper epipelagic *offshore habitats*** (>5km[8] from shore) for a number of years before they leave this developmental habitat and, frequently, undergo an ontogenetic shift to **neritic and often *nearshore habitats*** (<5km from shore).
There is a strong need for representation in monitoring data from across the region and from a suitable number of representative sites per habitat type per Contracting Party. Each requirement is elaborated in turn below.

Breeding areas
12. Assessment of nesting levels and distribution around the Mediterranean has progressed well in recent years, at a time when the range of loggerhead nesting areas is expanding. Accordingly, most Contracting Parties can be assigned to one of four categories relating to nesting activity that is independent for both endemic sea turtle species. Nesting prevalence ranges from established and high level to no or only sporadic nesting. The four categories of prevalence are presented in Table 2.1 together with the associated Contracting Parties.

Table 2.1. Classification of nesting status of countries per sea turtle species in 2020

Loggerhead turtles (*Caretta caretta*)	Green turtles (*Chelonia mydas*)
Category 1 - Established: common / dense	
Greece, Turkey, Cyprus, Israel, Libya,	Turkey, Cyprus, Syria
Category 2 - Established: limited / sparse	
Italy, Syria, Lebanon, Egypt, Tunisia	Lebanon, Israel, Egypt
Category 3 - New: emerging / low level	
Spain	NA
Category 4 - Absent: No / sporadic* nesting	
France*, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania*, Malta*, Algeria*, Morocco	Spain, France, Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania, Greece*, Libya, Malta, Tunisia*, Algeria, Morocco

Spatial Scope
13. Countries in which nesting is now well established and plentiful (Category 1 countries) are subject to annual minimum monitoring to record 75% of the nation's nesting per species, or top 7 nesting areas, whichever is achieved first. In the case of extensive single nesting beaches, core areas of approximately 10km may be defined and used as index of nesting at that key site. Countries with established but low-level nesting (Category 2 countries) should identify a minimum of up to 4 index sites recording or recording 50% of the nation's nests (per species), whichever comes first, to monitor annually. Countries with new and emerging nesting (Category 3) should continue dedicated coast monitoring and citizen science monitoring projects to record any nesting across the country. Countries with no sites where regular nesting occurs should incorporate any observations, or lack thereof, from other coastal based actions (e.g., summer beach stranding monitoring), including citizen science reports, as negative results for nesting.

[7] The term 'foraging grounds' is used to cover the location(s) inhabited by sea turtles away from their nesting areas, which is where they reside for the majority of the time.
[8] 5km range distance is indicated as this is the range that can be monitored by drone from the shore and hence separates the marine habitat into two areas of differing simplicity of access for assessment. The offshore zone may still contain demersal/benthic turtle habitats as well as epipelagic ones.

14. All countries should undertake periodic broadscale coastal assessments for nesting to facilitate adaptive monitoring practices that meet the conservation needs of the species at country level. If new nesting areas arise that warrant monitoring, as they contain nationally important nesting levels, the new location should be added to monitoring effort undertaken at all the original index beaches, as long-term datasets provide a better understanding of variation and trends in turtle nesting habits.

Temporal Scope

15. Loggerhead turtles migrate to their breeding areas a month or more prior to the onset of nesting. Male loggerheads depart the nesting areas early in the nesting season when females are no longer receptive (Schofield et al. 2017, 2020), and it is assumed to be the same for green turtles. Female turtles depart the breeding areas after depositing their quota of eggs - normally in one to five clutches. The nesting season in the Mediterranean generally lasts from late May to early August with peak nesting occurring in June and July. Consequently, monitoring in breeding habitats should take place during April/May for at-sea turtle surveys and from late May to August for nest count surveys. Nest monitoring should continue until the end of September to record the fate of the majority of incubating nests and assess annual hatchling production. The broadscale coastal assessments for nesting should be carried out or reviewed every six years to facilitate adaptive monitoring practices that meet the conservation needs of the species at country level.

Data analysis and outputs

16. Monitoring at the index nesting beaches should ideally be undertaken such that nest counts are accurate to within 10% of the actual number of nests and no worse than 20% modelled accuracy. See SWOT (2011) for monitoring methods that can achieve the required level of accuracy of nest monitoring. At sea surveys should be repeated three times over a period of a week in the pre-nesting period to be able to generate confidence limits to numbers of turtles that are present. Ideally the at-sea surveys should produce data in which male and female turtles can be distinguished. See Schofield et al. (2017) for example methodology. Data should be compiled into annual GIS map summaries that facilitate determination of trends in distribution and abundance of nests, for CI 3 and CI 4 respectively, and sex ratios of adults for CI 5.

Nearshore demersal/benthic foraging habitats

17. Data on nearshore habitats used by sea turtles, away from their seasonal use before and during the breeding season, is patchy and based mainly on data from stranding records with very few coastal hotspots recognised in the literature. Examples of known nearshore turtle hotspots are Amvrakikos Gulf, Greece (Rees et al. 2013, 2017), Drini Bay, Albania (White et al. 2013, Piroli et al. 2020), Fethiye Bay (Turkozan & Durmus 2000; Baskale et al. 2018), Iskenderun Bay (Oruç 2001; Turkozan et al. 2013) and Lake Bardawil, Egypt (Rabia & Attum 2020) in which many turtles are located in waters less than 3m deep and some form of capture-mark-recapture study have taken place.

Spatial Scope

18. Given turtles are present in waters of all countries bordering the Mediterranean, each country should establish, as a minimum, a national stranding network to report and record the majority of turtles that strand along the vast majority of the country’s shoreline, as indicate in the updated Mediterranean Action Plan for marine turtles conservation (UNEP/MED IG.24/22 2019). It should be noted that debilitated and dead turtles may drift considerable distances before they strand, and interpretation of their origins needs to be accepted with caution (Santos et al. 2018). This network need not conduct systematic surveys in people-frequented areas, but seasonal surveys remote areas would improve coverage at a national level. Additionally, effort-adjusted turtle bycatch rates should be reported per fishery as well as its fishing effort at several key areas around the country to help quantify presence of turtles at sea and also evaluate the threat that these fisheries present. The General Fisheries Commission for the Mediterranean (GFCM) are encouraging the documenting

of marine turtle and other bycatch in regional fisheries (FAO 2020) and successful implementation of this initiative will contribute greatly to our understanding of the threats that sea turtles are facing.

19. Various datasets such as stranding records, fisheries records, results from local stakeholder questionnaires and tracking data should be used to identify nearshore marine hotspots around the country, with each Contracting Party determining its own criteria to identify hotspots. Up to 4 of these nearshore hotspots (per species) per country should be included in an in-water monitoring program and, if logistically feasible, at least one of these hotspots should also be the location of a capture-mark-recapture study to acquire data relevant to CI 5.

20. All countries are to undertake more broadscale review of turtle presence in neritic waters every six years to facilitate adaptive monitoring practices that meet the conservation needs of the species at country level. If new, important, foraging areas arise, or are discovered, that warrant monitoring, the new location should be added to monitoring effort undertaken at all the original hotspots, as long-term datasets provide a better understanding of variation and trends in turtle numbers.

Temporal Scope

21. Stranding networks and fishery bycatch record taking should operate year-round whilst the in-water hotspot monitoring programme surveys should be carried out in winter and summer with a set of repeated surveys in each season to provide confidence intervals on the number of turtles that are present.

Data analysis and outputs

22. Year-round, national data should be normalised for observer effort, and summarised by month or quarterly to identify seasonal trends and annually to generate year-on-year comparative data. Data should be mapped to the specified grid system in GIS software to standardize presentation in space and over time. The bi-annual hotspot monitoring data should be internally assessed separately to identify trends and combined into an annual summary that is mapped as for year-round data.

Offshore habitats

23. Offshore habitats are the most spatially extensive and logistically challenging to monitor zone in which turtles reside, and the difficulty to monitor turtles there is further exacerbated through the generally lower densities of turtles that are present. However, these habitats are where the majority of turtles reside given a population structure that includes multi-decadal lifespans and a far greater number of juveniles than adults. Given the widespread distribution of loggerhead turtles that entirely overlaps that of green turtles in the Mediterranean, all Contracting Parties should adopt measures to monitor the presence of sea turtles in oceanic habitats.

Spatial Scope

24. One way of monitoring offshore turtle presence *and* quantify threat levels to turtles is to employ national fisheries bycatch reporting mechanisms (see FAO 2020 and FAO, 2019) that incorporate a *sufficient proportion of vessels per area and per fishing gear*. However robust scientific data should be recorded from aerial and boat surveys. To extend coverage and establish regular distance surveys, these dedicated aerial and boat surveys can be supplemented with sightings utilising ferries or tourist boats as survey vessels (e.g., Zampollo et al. 2018, Casale et al. 2020). Effort should be made to identify turtles by species where possible, however outside of breeding migrations it can be assumed that any turtle over 40cm in length observed in offshore habitats will be a loggerhead as almost all green turtles have switched to benthic nearshore foraging habitats by that size class.

Temporal Scope

25. At a minimum periodic basis, such as every six years to match the IMAP cycle, collaborative subregional aerial surveys (e.g., ACCOBAMS Survey Initiative[9]) can be organised to assess turtle and other marine megafauna presence at sea, thus supplying broadscale quantitative data that can contribute to CI 3 and especially CI 4. Until there are repeated validated data from aerial surveys to form a strong baseline these aerial surveys should be carried out more frequently than every six years. Bycatch records and transect survey data should be collected year-round to establish seasonality in turtle presence and abundance etc.

Data analysis and outputs

26. As for nearshore data, year-round, national data should be summarised by month or quarterly to identify seasonal trends and annually to generate year-on-year comparative data. Data should be mapped to the specified grid system in GIS software to standardize presentation in space and over time. This mapping of gridded data also applies to any periodic, national and sub-regional aerial surveys that are performed.

Know Gaps and Uncertainties

27. Gaps and uncertainties for successful assessment of GES occur in both data types held and acquired and in the process for determining GES itself. These were previously listed in UNEP(DEPI)/MED WG.444/6/Rev.1. Here below the list was revised, selecting, with minor revision, those items determined to be the most important for having sufficient data to use in GES assessments, with reference to a recent Gap analysis on the conservation of marine turtles in the Mediterranean (SPA/RAC-UNEP/MAP 2020). Those items that referred to the process of determining GES have been removed as they are being resolved with the acceptance, after review, of proposals presented in this document.

Population distribution data gaps

- Location of all important wintering/feeding and developmental sites of juvenile and adult turtles
- Connectivity among the various sites in the Mediterranean
- Identify possible baselines and index sites
- Generate or update databases and maps of known nesting, feeding, wintering habitats in each Contracting Party.

Population demographic data gaps

- Number of males and females frequenting all breeding/nesting sites each year (operational sex ratio), and the total number of individuals in the breeding populations
- Number of adults and juveniles frequenting wintering/feeding and developmental sites, along with how numbers vary across the season as individuals enter and leave different sites
- *Knowledge on recruitment levels at representative index breeding areas from each relevant contracting party*
- Knowledge on the sex ratios within different components (breeding, *recruiting*, *maturing*, wintering/feeding), overall and across populations.

Pressure data

- Analysis of pressure/impact relationships for these sites, *with special attention to fishing pressure and mortality rates*
- Criteria for a risk-based approach to monitoring and develop harmonized sampling instructions where appropriate.

Data acquisition

- Identify monitoring capacities and gaps in each Contracting Party
- Develop monitoring synergies in collaboration with GFCM for- EO3 (Harvest of commercially exploited fish and shellfish), to collect data on sea turtle by-catch

[9] https://accobams.org/main-activites/accobams-survey-initiative-2/asi-preliminary-results/

• Investigate monitoring synergies with other relevant EOs that will include coast-based fieldwork, in relation to monitoring of new/unknown sea turtle nesting beaches, and of beached/stranded animals, to obtain more widespread information.

III. Scales of Assessment

28. Each country should look at its own data to determine national GES assessments. The **Contracting Party assessment** would take into account data on the CI 3, CI 4 and CI 5 that are obtained through monitoring at selected index nesting and nearshore foraging areas and through national offshore monitoring. In this level of assessment, data will inform the respective country if and where additional conservation measures are required to move towards GES if it is not met, or flag locations where indicators are suggesting worsening situations, whilst GES based on threshold values is still achieved.

29. Each Contracting Party assessment should feed into a **subdivisional scale assessment** in terms of reproductive distribution for two reasons. 1) genetic analyses have indicated several sub-RMU population clades exist for both loggerheads and green turtles (Figure 3.1); and 2) loggerhead turtles are undergoing a range expansion throughout the Mediterranean, probably driven by climate change, which renders a universal threshold value obsolete. Possible emergent regular nesting sites need to be treated differently to long-established major and minor nesting sites (see Section 2). For turtles in their other habitats (nearshore and offshore foraging zones) Contracting Party assessments should feed into subregional assessments. Contracting party assignation to specific subdivisions and subregions is provided in Table 3.1 and Figure 3.2.

30. **Subregional assessment** level is the most suitable scale for turtles in marine habitats for a number of demographically defensible reasons. The western Mediterranean which is the only sub-region to have large numbers of Atlantic loggerheads residing and to a *very* small degree breeding there, with only low-level emergent nesting taking place. The Adriatic Sea has little to no nesting taking place, but a large number of turtles present at sea that are potentially facing high threats from intensive fishing that takes place in the sub-region. The remaining two areas (Central Mediterranean/Ionian and the Aegean/Levant) cover the main nesting sites for both endemic species of sea turtle and the vast majority of the spatial distribution of green turtles with only very low numbers of that species being found in the Adriatic Sea. The Central Mediterranean/Ionian region also hosts important demersal and epipelagic feeding grounds for loggerheads and the Levant contains important migratory corridors for both species.

31. Because of the borders established in the current subdivision / subregion structure, data from several countries, especially Italy, Greece, Turkey and Libya will need to contribute multiple transnational segments. It is possible therefore that a country may not be in GES at national level, but subdivision and subregion areas to which the Contracting Party can be in GES depending on the subnational part of the Contracting Party's assessment, i.e., non-achievement of GES by a Contracting Party does not automatically result in non-achievement of GES of all of the subdivisions and subregions in which that party is situated (Figure 3.3).
Due to the intensity of work required, it is likely that not all Contracting Parties will be able to determine values for all relevant components that combine to make up CI 5. In these cases, demographic values from proximate Contracting Parties, or from any regional Contracting Party where data are scarce, can be used in calculating related demographic values. For example, accurate clutch frequency data (CF; the average number of clutches of eggs laid by a turtle during a single nesting season) are hard to acquire as they necessitate intensive nocturnal fieldwork programs, smaller scale but expensive tracking projects or large scale, technically complex and expensive sampling and genetic studies. Thus, species-specific CF values can be adopted by Contracting Parties from one of the few locations that they have been established in the region (e.g., Broderick et al. 2002, Rees et al. 2020).

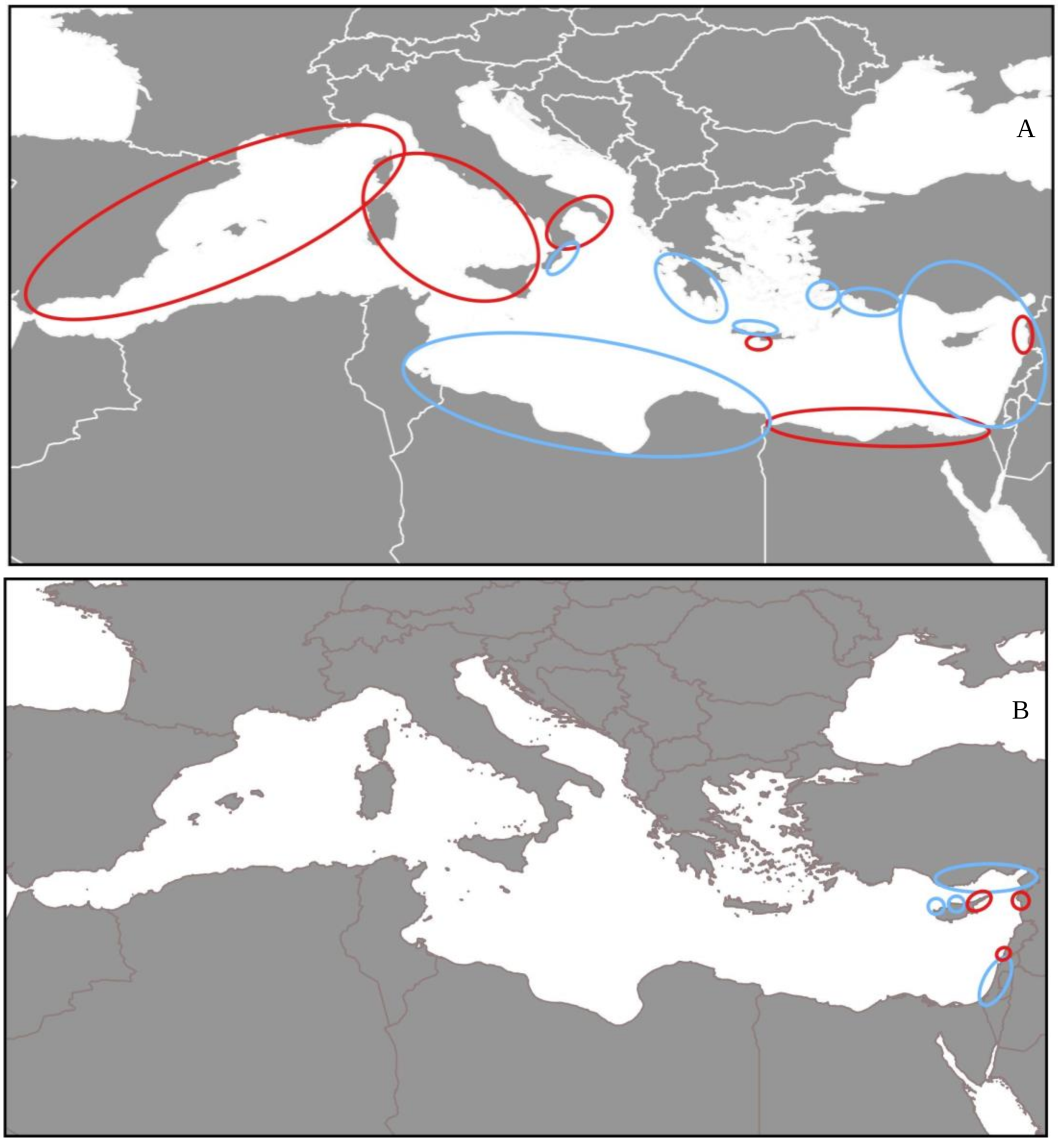

Figure 3.1. Genetic clusters for marine turtles breeding in the Mediterranean. (A) Loggerhead mtDNA genetic clusters (Based on Shamblin et al. 2014) (B) Green turtle mtDNA STR genetic clusters (Based on Tikochinski et al. 2018). Cluster colour codes: blue = defined, red = not processed / unsampled

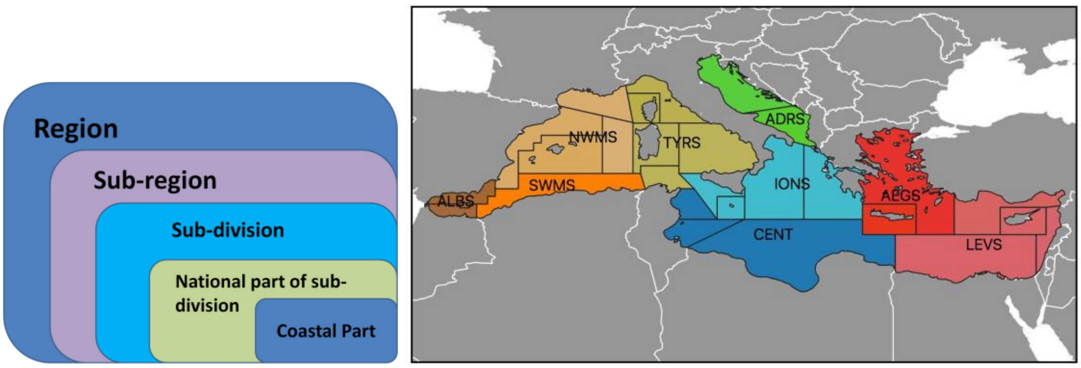

Figure 3.2. The established approximate four Sub-regions (coloured clades on map) and *draft suggested*, nested, nine Sub-division segments of the Mediterranean Sea, based on GFCM boundaries, for marine and nesting area assessment scales respectively. *(See also Table 3.1*)

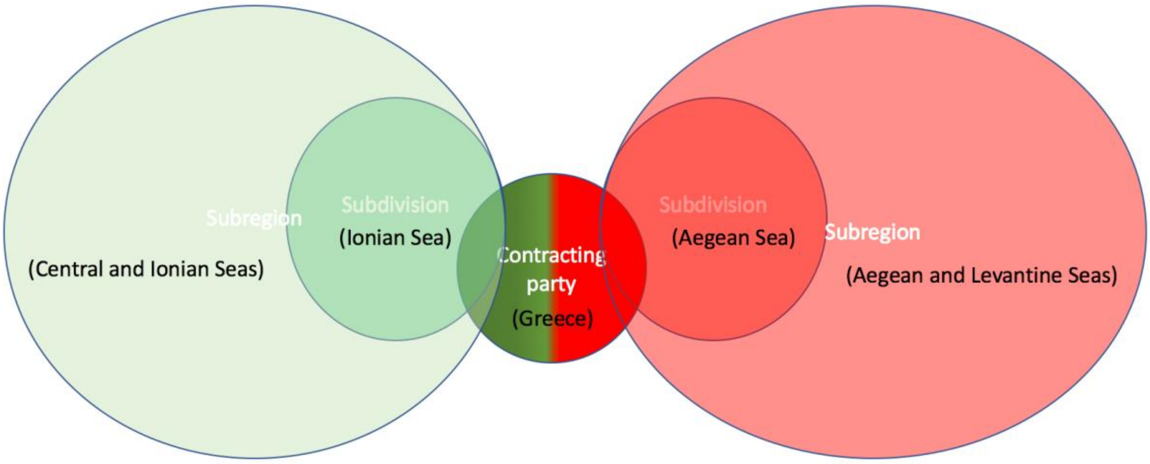

Figure 3.3. A Contracting Party that only partly achieves GES for any specific CI has a non-achieving status but may contribute both positively (GES achieved; green) and negatively (GES not achieved; red) to *draft subdivision* and subregion status based on the relevant prevailing condition at the sub-national level, with the example given of Greece.

Table 3.1. Suggested placement of Contracting Parties into four Subregional & 9 *draft* Subdivisional segmentation of the Mediterranean Sea for marine and nesting area assessment scales respectively. CPs in parenthesis contribute only a small portion of their coast towards the relevant *draft* sub-division. *(See also Figure 3.2*)

Sub-Region	Sub-Division	Contracting Party
Western Mediterranean Sea	North Western (NWMS)	Spain, France
	Alboran Sea (ALBS)	Spain, Morocco
	Tyrrhenian Sea (TYRS)	Italy, Tunisia (France)
	South Western (SWMS)	Algeria
Adriatic Sea	Adriatic Sea (ADRS)	Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania
Central and Ionian Seas	Central (CENT)	Libya, Tunisia (Italy)
	Ionian Sea (IONS)	Italy, Greece, Malta
Aegean and Levantine Seas	Aegean Sea (AEGS)	Greece, Turkey
	Levantine (LEVS)	Turkey, Cyprus, Syria, Lebanon, Israel, Egypt

IV. Assessment Criteria

CI 3 Distribution

32. The distribution criterion is a Boolean characteristic assessed over a predefined spatial grid of occurrence. Turtles are either recorded as present or absent, for nesting on sandy beaches or foraging at in-water locations with a predefined 10km square grid. For the well-defined somewhat one-dimensional nesting beach turtle focal areas their predictable presence at certain times of the year makes the distribution assessment relatively straightforward compared to the expansive two-dimensional marine realm. Nevertheless, with temporally and spatially sufficient monitoring taking place, as defined above, assessment towards GES can be made across the Mediterranean region in all habitats. Table 4.1 lists the various factors that need to be considered to understand sea turtle distribution together with the broad-strokes methods used and what data is to be collected.

Table 4.1. Topics and data gathering requirements for CI 3: turtle distribution per species.

Terrestrial habitat (nesting beach)		
Necessary information	**Methods**	**Data collected**
Actual nesting activity distribution	Foot patrols UAV surveys Plane surveys (Genetics)	Extent of each nesting site. Nesting activity locations. (Haplotyping adults)
Potential nest site distribution (minor / emerging nesting beaches)	Foot patrols UAV surveys Plane surveys	Extent of each potential nesting site. Confirmation of nesting/no nesting every 6 years.
Marine habitat		
Necessary information	**Methods**	**Data collected**
Offshore foraging areas	Plane surveys Telemetry Bycatch Boat surveys UAV surveys (boat based) (Genetics)	Location of turtles Seasonality of presence (Mixed stock analysis)
Nearshore foraging areas	Boat surveys UAV surveys Plane surveys Telemetry Bycatch Strandings (Genetics)	Location of turtles Seasonality of presence (Mixed stock analysis)
Migratory pathways	Telemetry Bycatch	Location of turtles Seasonality of presence
Internesting areas	Telemetry UAV surveys Boat surveys	Location of turtles

Breeding area

33. Each stretch of coast should be classified as nesting beach or not, in 10km blocks following a presence/absence criterion based on both historic and most recent data on the knowledge of nesting locations. From the annual nest count surveys that cover a high proportion of a country’s nesting, based on country category defined in Table 2.1, the spatial distribution of nesting can be determined per year. Every six years, this national situation should be revisited and at least a sample of previously known nesting areas and other potential nesting areas need to be re-assessed. GES should be declared when all monitored index sites are fully maintained as nesting sites and there is little or no degradation of other known sites, that may be monitored to a lesser degree and are not included as index sites.

Nearshore / Offshore habitats

34. Validation of the distribution of turtles in both nearshore and offshore habitats should come from changes in results from monitoring methods described in Section 2. The ubiquitous presence of loggerhead turtles across the entire Mediterranean Sea and current and anticipated patchiness of distribution data mean that their potential presence should be assumed unless persistent absence can be confirmed (e.g., through persistent lack of turtle bycatch records in a fishery and area which previously reported them, or where a monitored nearshore hotspot no longer has turtles). The predefined 10km grid squares should be used for monitored hotspot areas. Other locations should present amalgamated and interpolated distribution data that show a combination of assumed and confirmed at-sea presence. Similar assertions should be made for green turtles within their more restricted eastern Mediterranean range. Given the stipulated existence of monitoring at several key nearshore foraging sites and sufficient reporting of bycatch data per Contracting Party, GES can be argued from persistence of turtles recorded in all areas. Periodic subregional aerial or other survey data can be used to support these assumptions for both turtle species.

CI 4 Abundance

35. The measure of abundance per species of turtle per grid cell covers a scale that includes zeros but is quantified as some measure of density, such as numbers of nests or turtles per 10 km cell. The difficulty in acquiring robust monitoring data from marine habitats highlights the necessary investment of effort and resources required by Contracting Parties in order to properly assess this CI for turtles, and the benefit from maximising data acquisition for multiple taxa from single surveying efforts. Table 4.2 lists the various factors that need to be considered to understand sea turtle abundance together with the broad-strokes methods used and what data these methods collect.

Table 4.2. Topics and data gathering requirements for CI 4: turtle abundance.

Nesting beach		
Necessary information	**Methods**	**Data collected**
Actual nest site locations	Foot patrols UAV surveys Plane surveys	Number of nests/tracks per season per index beach.
Potential nest site locations (minor / emerging nesting beaches)	Foot patrols UAV surveys Plane surveys	Quantification of nesting / no nesting every 6 years.

Marine habitat		
Necessary information	**Methods**	**Data collected**
Offshore foraging areas	Plane surveys Boat surveys UAV surveys Telemetry (Genetics)	Number of turtles (seasonal considerations) Location of turtles (seasonal considerations) (Mixed stock analysis)
Nearshore foraging areas	Boat surveys UAV surveys Telemetry Stranding Plane surveys (Genetics)	Number of turtles (seasonal considerations) Location of turtles (seasonal considerations) (Mixed stock analysis)
Migratory pathways	Telemetry (Genetics)	Number of turtles (seasonal considerations) (Mixed stock analysis)
Internesting areas	Telemetry UAV surveys	Number of turtles (seasonal considerations) Density of turtles

Breeding area

36. As suggested above, abundance of turtles present at a breeding site, in its most basic form, can be inferred from the numbers of nests deposited on the monitored index nesting beaches and subsequently divided by the number of 10 km cells to provide a density value, when required. However, nest numbers do not provide an irrefutable direct indication of the number of adults breeding annually in a population. This is because adult female turtles deposit between one and five clutches in a given breeding season, and successive breeding seasons may be two or more years apart for the nesting turtles. Additionally, given the temperature-determined sex differentiation in sea turtles, sex ratios of populations may significantly differ from 1:1 and furthermore, male turtles are reported to return to breed more frequently than females, often annually. Given these facts, deriving adult population size (abundance) from a nest count from a single year is likely to produce widely erroneous results. Nevertheless, the use of nest count trend data is generally accepted as the most practical way of determining population abundance, e.g., it is this metric used in the IUCN MTSG to determine red list status of regional and global assessments. The underlying demographic factors (assessed in CI 5) need to be incorporated in any determination of adult turtle abundance associated with monitored nest numbers. Additionally, to avoid misinterpretation caused by interannual variation, a time series of at least six years of nest count data should be used.

Nearshore

37. Nearshore abundance data should be collected from the monitored index coastal hotspots (see Section 2) which will give a six-monthly assessment. The two seasonal surveys can be combined to give an annual assessment on abundance per location and the various coastal hotspots combined to give a national value (for monitored index hotspots). Bycatch and stranding records should be analysed annually to identify any locations with increasing rate occurrence (bycatch values adjusted for fishing effort) which may mean increasing populations, or for areas where regular turtle reports are reducing or no longer occurring which may indicate local reduction in population size. However, the main robust and defensible data to contribute to the abundance assessment should come from standardised repeated surveys in the hotspots. The nearshore zone is also utilised by both species of turtle as migratory thoroughfares at regular times of the year (pre- and post- breeding season) and this may affect abundance estimates determined during certain time periods, so monitoring and analysis need to account for this seasonality.

Offshore

38. This region is the one that is hardest or most expensive to survey and produce spatially explicit abundance values. That said, as indicated in Section 2, there are several ways to monitor the presence of- and derive abundance values for- sea turtles in the open seas. Abundance values from dedicated annual or periodic regional or subregional aerial surveys should be used for definitive assessments and to validate opportunistic survey results and can be used to cover gaps in data collection from contracting parties unable to generate their own national abundance data. Sighting data from ferry routes, or touristic boats can additionally contribute to the abundance estimates, if collected systematically over a long period (Zampollo et al. 2018, Casale et al. 2020). These data can be more accurately spatially grouped to provide quantitative turtle abundance estimates along the ferry route. Variability in these data can be investigated to determine what level of sightings are required to identify real increases and decreases in population abundance. The offshore zone is also utilised by both species of turtle as migratory thoroughfares at regular and predictable times of the year (pre- and post-breeding season) and this may affect abundance estimates determined during certain time periods, so monitoring and analysis need to account for this seasonality.

CI 5 Demography

39. Understanding the demography of sea turtle metapopulations helps to identify which pressures may most impact on population stability and which conservation measures are likely to have greatest effect in stabilising or recovering population levels. The basic principle being that the number of turtles recruiting to the population each year needs to be sufficient to sustain the level of reproductive adults in the population given the differing mortality rates affecting the population at each ontogenetic stage / age class. To adequately assess this basic principle requires data on numerous aspects of the sea turtles' life cycle including fecundity rates and their interplay with threats to the turtles' environment and the turtles themselves, for example through fisheries bycatch. Table 4.3 lists the various factors that need to be considered to understand sea turtle demography together with the broad-strokes methods used and what data these methods collect. Data on certain aspects of demography may take decades to acquire and not all Contracting Parties have the capacity to determine them unilaterally. This especially applies for topics such as age at sexual maturity, and longevity etc. In these cases, a Contracting Party can adopt values produced by other Contracting Parties or regional collaborations as proxies for their own populations. However, each nation is strongly encouraged to gather data relating to reproductive output and population recruitment through targeted monitoring of index nesting beaches.

Breeding area

40. The focus on data gathering at nesting sites is on individual and population level reproductive output, population recruitment, sex ratios of hatchlings and adults and adult longevity. Output, recruitment and hatchling sex ratios are relatively simple to determine and should be undertaken at the monitored index beaches that have been selected by each Contracting Party. The other data topics require intensive monitoring regimes to be carried over the well-defined summer breeding season and should carried out where possible.

Nearshore neritic

41. This zone is generally occupied by larger juvenile (>45cm CCL) through to adult loggerhead sea turtles and by small juvenile (>30cm CCL) through to adult green turtles – though green turtles may shift through a series of size-class specific habitats/locations. Data required from this habitat focus on size class distribution, growth rates, sex ratios, survivorship (which can include bycatch and mortality rates) and age at maturity. Several of these topics require intensive and specialised, invasive, research methods, such as determining age at maturity and sex ratio of juvenile turtles, and data from other Contracting Parties or collaborative efforts can be used for these topics, but each Contracting Party should acquire its own data where feasible in terms of expertise and resources.

Offshore oceanic

42. This zone is most commonly inhabited by hatchlings and early-years juvenile turtles, <30cm for both species, though loggerheads of larger size classes – including a large proportion of adults – may remain in the oceanic zone year-round. Data acquisition here broadly follows that for neritic stage turtles, such as size class distribution, growth rates, survivorship (which can include bycatch and mortality rates) and sex ratios with little or no opportunity for direct data on age and size at sexual maturity. Again, if necessary, collaborative data or data from other Contracting Parties can be used where an individual Contracting Party is unable to acquire its own data.

Table 4.3. Topics and data gathering requirements for CI 5: turtle demography. **factors that can be *improved* by direct conservation measures. *factors that can be *improved* by indirect conservation measures.

Breeding areas			
Necessary information	**Methods**	**Data collected**	**Refs.**
Clutch size	Nest excavation	Number of eggs per clutch	1, 12, 14
Incubation duration (ID)	Regular Foot patrols Temperature loggers	Laying/hatching dates Incubation temperature profile	12
**Hatchling emergence hatching success	Nest excavation	Percentage of eggs that produced a hatchling that escaped the nest (considering predation and inundation etc.)	1, 14
Internesting Interval	Telemetry Night patrols (Genetics)	Nesting events identified from movements Nesting events identified by observation of turtle (Nesting events confirmed by individual-specific DNA analysis)	9, 14
Remigration Interval	Telemetry Night patrols (Genetics)	Presence in nesting area confirmed through observation of individual or from tracking	13, 14
Clutch frequency	Telemetry Night patrols (Genetics)	Number of clutches per individual identified from movements Number of clutches per individual identified by observation of turtle (Number of clutches per individual confirmed by individual-specific DNA analysis)	2, 3, 14
**Sex ratio Hatchlings	Regular Foot patrols Temperature loggers (Biochemical analysis -hatchlings)	Derived from laying and hatching dates (ID) Derived from nest/beach temperatures (Assessed from blood sampling / hormone assay)	10, 14
(operational) Sex ratio adults	UAV survey Plane survey Boat survey (Genetics - hatchlings)	Proportion of sexes observed during the pre-nesting season gathering at sea near the nest site (Determined by identification of males from genetic characteristics and inferred from multi-paternity in clutches)	15, 16
Longevity	Foot patrols Capture-Mark-Recapture (CMR)	Reproductive longevity and output of females and repeat presence of males	17, 18

Marine habitat			
Necessary information	**Methods**	**Data collected**	**Refs.**
Oceanic foraging area: size classes / Sex ratio	Boat surveys UAV / Plane surveys Bycatch	Abundance and distribution data separated by size and sex (where sexing individuals is only possible for sub-adult and adult size classes from external morphology)	11, 14
Neritic foraging area: size classes / Sex ratio	Boat surveys UAV / Plane surveys Bycatch / Strandings	Abundance and distribution data separated by size and sex (where sexing individuals is only possible for sub-adult and adult size classes from external morphology)	4, 7, 11, 14
**Oceanic foraging area: threats and survivorship	Bycatch Telemetry CMR	Incidence of bycatch and resulting mortality rates Mortality rate of identifiable individuals	8, 14, 24
**Neritic foraging area: threats and survivorship	Bycatch / strandings CMR Telemetry	Incidence of bycatch and resulting mortality rates Mortality rate of identifiable individuals	8, 14, 24
*Oceanic foraging area: health index	Bycatch CMR	Size/weight Pollutants	20, 25
*Neritic foraging area: health index	CMR Bycatch / strandings	Size/weight Pollutants	19, 20, 21, 22, 23,
Growth rates	Bycatch Strandings CMR	Size at capture	6, 14
Age and size at sexual maturity	Bycatch/ Strandings , CMR	Age (skeletochronology) Maturity (necropsy/ laparoscopy) When mature (from CMR).	5, 8, 12, 14

V. Baseline and Threshold Values for IMAP/EcAp CIs

CI 3 Distribution

Breeding area

43. The most appropriate measure to establish distribution of nesting areas is through accepting a baseline reference year. Baseline spatial distribution to be used should be that recorded in 1992 with the year chosen to align with historic threshold data adopted at the onset of the EU Habitats directive, with this applying to all riparian countries of the Mediterranean, not only those in the EU. Where data are not available for this period the oldest records dated after 1990 can be used. All long-term studies have shown that nesting areas that were present in 1992 are still valid nesting areas today. Using the data from annual monitoring at index nesting sites covering the majority of nesting in each Contracting Party, reduction of the number of 10km blocks with nesting can be identified. This is to be supplemented every six-year cycle with more widespread national reassessments of nesting distribution for a more complete national and regional view.

44. Loggerhead turtles are currently undergoing a relatively rapid expansion of breeding site distribution with new regular nesting sites occurring in Italy and increased number of sporadic nesting in Spain, Albania and Malta. Many of these sites are already heavily developed and are not ideal nesting grounds for turtles, leading to successful establishment of breeding populations likely to be entirely conservation dependent. National programs currently underway to monitor nesting in these countries should be maintained. Green turtles are not yet demonstrated to be undergoing a range expansion in terms of nesting sites, with only three anomalous nesting events recorded as taking place since 2007, namely two nests at widely different locations on Crete, in Greece, and one nest in Tunisia. However, should range expansion been shown, baseline values can be treated in the same way as for loggerheads in emerging nesting sites.
National programs currently underway to monitor nesting in countries with emerging nesting populations should be maintained with the aim to confirm the establishment of these areas as regular nesting sites and implementation of necessary conservation measures.

45. GES can be accepted per Contracting Party for Category 1 and 2 countries (Table 2.1 and Breeding Areas; Fig 1.4), when annual monitoring confirms that nesting is taking place at all the selected index sites. Years without nesting at all established index sites are indicative that GES is not achieved and that reasons for the lack of nesting should be investigated and remedial action, to minimize threats, taken to facilitate return of nesting activity. For Category 3 countries, GES can be assumed if nesting is continuing at a national level for sporadic nesting, but GES is not achieved where no nesting is recorded over six years at a low-level but regular nesting site.

Nearshore

46. Because of the paucity of data and understood general low density of turtle presence in coastal waters, it can be assumed that turtles are still currently distributed in all their natural ranges across the Mediterranean Sea. For loggerheads, this means the entire coastal waters are accepted as part of their baseline distribution (Figure 1.3A). However, green turtle baseline distribution is restricted to the eastern Mediterranean, generally as depicted in the Mediterranean green turtle RMU in Wallace et al. (2010) article but with the south western extent of occurrence of the species reaching to the south of Tunisia as shown by satellite tracking adult turtles (Figure 1.3B).

47. GES status for this part of the Indicator can be lost if monitored nearshore hotspots are shown to no longer have turtles present at any time of the year or if bycatch and stranding (when a turtle washes ashore dead, injured or debilitated) data reveal no more turtles are being recorded in a certain region. The hotspot monitoring presence should be indicated in the relevant blocks of the regional 10km grid, but the stranding

and bycatch data should be applied at sub-national level as the amount of data collected and spatial accuracy of presence records are low.

Offshore

48. There is a greater paucity of data and lower density of turtles present in offshore neritic and oceanic habitats than in nearshore habitats, hence the accurate assessment of turtle distribution in terms of presence/absence is even more difficult to determine. Consequently, effort made to assess turtles in the offshore zone should focus on data collection towards CI 4 and CI 5 as presented in Sparks and DiMatteo (2020). The baseline distribution of loggerhead and green turtles should be accepted as depicted in Figure 1.3.

CI 4 Abundance

49. Determination of abundance baselines and thresholds is more involved than for CI 3 (distribution), with the main issues being: (a) how to set a baseline (e.g., based on a certain historic data or modelled values)?, (b) how to acquire sufficient suitable data that will be used in abundance assessments?, and based on the precautionary principle, (c) how much of a buffer of uncertainty should be assigned to ensure that increased conservation measures are put in place before populations collapse?

50. Setting these values and acquiring relevant requires differing methods and levels of effort and based on the turtle habitat under examination. Assessments based at the nesting areas are simplest as they are restricted spatially and temporally, nearshore habitats are next most accessible for monitoring and offshore oceanic habitats are the most difficult and expensive to assess though have been carried out with notable success of the ASI project of ACCOBAMS in 2018[10].

51. For both species of turtle breeding in the Mediterranean, prior to the potential of GES not being achieved, negative population trends should be used to raise concern and drive increased conservation actions, with a recommended trigger of a greater than estimated 10% decrease in population size over a six-year reporting period.

Breeding areas

52. Baseline values rather than thresholds are suggested to be used for loggerheads to aid determination of GES, with values derived from the average of five years of nest count data centred on 1992. The year is chosen to align with historic threshold data adopted with the establishment of the EU Habitats directive, and five years of data (1990-1994) to determine historical level are shown to be very similar to an average of all nesting data between 1984-1991 – the longest and hence most historic published time series of data from two of the most important loggerhead nesting areas in the Mediterranean (Margaritoulis and Rees 2001, Margaritoulis 2005). Adoption of this timeframe can be further validated with other long-term datasets for Mediterranean loggerhead nesting, if they exist. Where data are not available for this period the oldest records can be used and modelled against other contemporary datasets, as seasonal inter-seasonal variation in nest numbers shows rough correlation across the region, to establish baseline data for those sites extrapolated back to 1992, or a trend-based approach using rolling 6-year datasets and baseline value from start of monitoring dataset. Many loggerhead nesting sites across the eastern Mediterranean in the latter 2010s through to 2020 are showing increased numbers of nests (Pers. Obs.), which may suggest updating baseline values to more recent averages, however it is not known if these increases are part of a multidecadal cycle, as demonstrated for loggerheads in the NW Atlantic (Ceriani et al. 2019) which will include a forthcoming decline in nest numbers not resulting from any specific anthropogenic worsening of habitat conditions and/or effects of climate change and adaptations of turtles to such changes. Consequently, 1992 average or modelled baseline data for long-term datasets should currently be maintained (for at least one more six-year IMAP reporting

[10] https://accobams.org/main-activites/accobams-survey-initiative-2/asi-preliminary-results/

cycle) until the increases in nest numbers is confirmed as a positive trend in population size. National programs currently underway to monitor nesting in countries with new and emerging nesting populations should be maintained and baseline values should be assumed as individual nests. Baselines in these areas should be revised upwards (using a trend-based approach) with every six-year cycle to ensure that spatially stable nest sites with increasing numbers of nest are represented in their best condition and a return to zero is not acceptable.

53. No such historic time-series nest count data exist for Mediterranean green turtles, with only one published dataset originating from late 1989 (Lara-Cyprus) and two from 1993 (Alagadi-Cyprus and Israel). Five- and ten-year rolling average values for these three locations indicate a general increase in nest numbers over time, indicating that adoption of the most historic five-years of data for a given nesting site is a suitable baseline value. It should be noted that these three sites have been subject to long-term nest management and protection measures and are therefore likely to be in better condition, with more positive nest trends, than other sites where conservation actions have not been, or have more recently been put in place. However, the lack of certainty over historic nesting levels at green turtle nesting sites suggests that adoption of the most historic 5 years' worth of data, with periodic trend-based increases, remains most valid.

54. No nesting areas are currently considered at carrying capacity, and hence have the potential to host increased numbers of nests over time. However, no nesting area is known to ever have been at theoretical carrying capacity so that threshold should not be taken into account for determining GES.

Nearshore neritic

55. Abundance estimates in nearshore habitats will mainly be generated through annual hotspot monitoring for both species. It is not anticipated that historic abundance values will be available or calculable, so data from the first monitoring year should be accepted as baseline. Monitoring through the year should be conducted so that the actual number of turtles present with an estimate of variance can be calculated. The sites can then be considered achieving GES if the annual estimate is above baseline minus 1 standard error and all sites need to be in this condition, so that GES at a large site cannot compensate for lack of GES at a lesser site. Lastly, periodic aerial surveys can be used to generate data at subregional scale timed to take place prior to the six-yearly assessment period. It is unlikely that the aerial surveys will cover the same locations as the nearshore hotspot monitoring so both datasets would need to be taken into account in the periodic assessment, together with stranding data if obtained in sufficient levels. Given that across the Mediterranean both species of sea turtle are tentatively regarded as displaying an upward trend in population size (based on increased nest numbers), current levels of turtle abundance in nearshore neritic waters are likely to represent a positive state for GES determination and future assessments that fluctuate above this baseline value should all be considered GES.

Offshore oceanic

56. Where historic records for offshore presence and abundances of sea turtles exist, these can be used as baselines. Such data is lacking and improbable to be accurately modelled for the majority of contracting parties and hence the first year's data collected should act as baseline. Due to the low densities and high motility of turtles in the oceanic realm abundance values should be determined at large subnational or national scales. Broad-scale abundance values derived from sightings data from non-dedicated observation platforms such as systematic observations from ferries/platforms can be used. Ideally this data should be robust enough to allow abundance values with estimates of variance to be calculated. Periodic sub-regional aerial surveys can provide a snapshot of abundance used to calibrate national findings. GES can be accepted unless measurable decreases in abundance below threshold (abundance baseline, minus one standard error) are detected at national level.

CI 5 Demographics

57. Demographic characteristics of populations need to be assessed for accurate modelling of population structure and anticipated resilience to anthropogenic and other stressors. For conservation purposes, these characteristics are better evaluated using threshold values rather than baselines. The values should be constant over time, irrespective of population size, and set at levels that are sufficiently conservative to ensure that positive outcomes result from summary assessments of complex data types.

58. Not all sought-after data are equal in terms of ease of attainment, both in terms of timescales and effort required for their determination. For example, estimations of *clutch size* and *hatchling emergence success* can be obtained from one week's fieldwork whereas determination of longevity or survival of breeding adults requires decades of intense nocturnal fieldwork over several months per year. Consequently, hard to acquire demographic values generated by monitoring and research efforts by one Contracting Party can be used by another Party until they have their own equivalent data. Indeed, in some cases, for example for small nesting populations, the effort required to determine certain values, such as *clutch frequency* and *remigration intervals*, far outweigh the utility of determining Contracting Party-specific data points and other subregional values can be adopted in the Party's national assessment.

59. Certain demographic metrics are useful for understanding population resilience but cannot be affected by conservation measures, e.g., *clutch size*, whereas other metrics can be used to understand population resilience and can be positively affected by conservation measures, e.g., *hatchling emergence success*. It is those metrics that can be manipulated that should be used as main criteria for determining GES relating to CI5.

60. A full list of metrics to understand sea turtle demography, which metrics can be improved through conservation measures and what data need collecting is presented in Table 4.3. Each metric is discussed in turn, below, with regard to established values and the need for Contracting Parties to determine local, up-to-date data values.

Metrics obtained from Breeding Areas

Clutch Size (CS)

61. This is a commonly collected metric obtained from post-hatch excavation of nests or from egg counts during relocation of clutches soon after egg-laying. CS is needed to be able to determine *Hatching Success* and *Hatchling Emergence Success* (see below) and is part of the data that contributes to understanding sea turtle fecundity. Typical CS for loggerheads ranges from 70 to 110 and for green turtles the range is 100 to 115 (Casale et al. 2018). It is not a measure that can be manipulated for conservation purposes, but it should be assessed by each individual Contracting Party.

Incubation Duration (ID)

62. Precise laying and hatching dates are required to calculate an accurate ID. IDs are negatively correlated with nest temperature and hence can be used to produce a rough estimate of the *Sex Ratio of Hatchlings* produced by the nest. This sex ratio feeds into demographic models that predict sex ratios at later life stages which in turn can affect population resilience. It is not a measure that should be directly manipulated, though if there is strong evidence that beach temperatures are frequently exceeding the thermal tolerance of embryos (see *Hatchling Emergence Success*) then management measures such as nest shading can be adopted to reduce the temperature to tolerable levels. ID should be assessed by each individual Contracting Party at each index nesting site.

Hatchling Emergence Success (HES)

63. This is a frequently collected metric and is a measure that combines both egg fertility and suitability of nest conditions that result in a certain percentage of eggs that will successfully develop to produce hatchlings that emerge from the nest. HES may be reduced if the nest is inundated by sea water, when sand infiltrates the air spaces between the eggs, if incubation temperatures lie outside the thermal tolerance range for embryo development, if the nests are plundered by predators or if nests are crushed or trampled by heavy machinery etc., or if the sand conditions are not conducive to successful incubation. Reported HES for loggerheads in the Mediterranean varies greatly and ranges from around 20 to 80% (Casale et al. 2018) and for green turtles it averages around 75% (Casale et al. 2018). The green turtle value (75%) can be accepted as a threshold level for this species in the region and 65% is a suitable target value for loggerhead turtles. This is a measure for which conservation actions can be carried out and as such it is a suitable candidate to have target thresholds assigned, however as HES is only determined at the end of a nest's incubation, conservation measures need to be put in place for the following seasons. For example, if many nests are inundated by storm waves, nest relocation measures can be adopted and if nests are being depredated then nest protection measures or predator management measures can be put in place. To balance out inter-nest variation, all nests should be treated as one single clutch. For example, if HES was averaged across the season per nest then a nest with 30 eggs of which 7 produced hatchlings that emerged (23%) and a nest of 140 eggs with 122 emerged hatchlings (87%) would give a HES of 55% (not meeting GES), whereas if all nests were treated as a single clutch 129 eggs from 170 eggs would be recorded as producing emerged hatchlings with a resulting HES of 76%, which reflects the actual beach-level HES, and GES is met. Obviously, the effect of HES from small clutches reduces as sample size increases, but it may skew results in small samples sizes and should be avoided through treating all nests as a single clutch. Additionally, to assess HES across the beach then stratified sampling of nests needs to be undertaken combining at least three different nest incubation conditions, namely, *in situ* / relocated nests, inundated / non-inundated nests and depredated / non-depredated nests. As not all eggs can be found for depredated nests, the CS for non-predated nests should be used for these nests to standardize their contribution to the final HES value. Exceeding threshold values for HES should be targeted per monitored nesting area per year. Absolute thresholds should be set at 10% lower than average trigger no GES, with a buffer extending from average to this -10% mark indicating additional conservation measures are indicated. This equates to non-achievement of GES threshold values of 55% for loggerheads and 65% for green turtles. HES should be assessed by each individual Contracting Party at each index nesting site.

Internesting Interval (II)

64. This is the elapsed time in days between clutch deposition and the next time the turtle emerges onto the beach to nest- whether successfully or not. Determining II requires intensive night work on a capture-mark-recapture project during the nesting season that needs to be carried out by trained personnel to avoid disturbance to the nesting turtles. II, used together with *Clutch Frequency* (see below) can indicate how long a turtle will be resident in the breeding area, post onset of nesting, however the daily trend in nest numbers is a better indicator of how many turtles may still be in the breeding area. Normal values are from 10 to 20 days (loggerheads; Margaritoulis et al. 2013, green turtles; Broderick et al. 2002). It negatively correlates with sea temperature (Hays et al. 2002) and is not a metric that can or needs to be affected by conservation measures. There is no requirement for a Contracting party to obtain data for II as part of a basic monitoring program.

Remigration Interval (RI)

65. The number of years between successive breeding seasons is known as the Remigration Interval. It ranges from one to five years or more but is commonly two or three years. RI is related to the conditions in foraging grounds experienced by the adult turtles that influence the rate at which the turtles can replenish body condition and build up enough reserves to see them through a breeding period season. Male turtles, requiring fewer biological resources pre breeding season, are thought to have shorter RIs than females, as has been

documented for loggerhead turtles breeding on Zakynthos Island, Greece (Schofield et al. 2020). Accurate determination of RI is important for population modelling (Casale & Ceriani 2020).

Clutch Frequency (CF)

66. This is the average number of clutches deposited by a turtle during a single breeding period. Each clutch is separated by an *Internesting Interval*, during which time the subsequent clutch is ovulated, fertilised and the shells formed on the eggs. CF output of individual females is derived from capture-mark-recapture data (Broderick et al. 2002), tracking studies (Rees et al. 2020) or genetic studies (Shamblin et al. 2017). Knowing CF contributes to the estimations of number of breeding females in a given season. There is limited data on clutch frequency for Mediterranean turtles. The only data for green turtles comes from Cyprus where CF of 2.9 – 3.1 has been estimated (Broderick et al. 2002). Similarly, a CF of 1.8 – 2.2 has been estimated loggerhead turtles nesting on Cyprus, but more recently a value of 3.8 ± 0.7(SD) was calculated from Greece. CF is not a metric that can be affected by conservation measures. Given the difficulty in obtaining accurate population level CF values, published data can be used across the Mediterranean for determining demographic metrics.

Sex Ratio of Hatchlings (SR-H)

67. Sex ratio of hatchlings is roughly obtained from interpreting IDs, nest or beach temperatures or, more accurately, from sampling hatchlings (e.g., Mrosovsky et al. 2002, Tezak et al. 2020). Methods involving hatchling sampling are invasive and is best only carried out on larger populations. Sex ratios feed into the demographic assessment of a population such as higher ratios of females facilitating faster population recoveries or extreme lack of males possibly leading to unsuccessful breeding seasons for individual females. Sex ratios published to date in the Mediterranean are typically female skewed for both loggerheads and green turtles (Casale et al. 2018). However different areas and times of the season may produce closer to 50% ratio or even be male biased (e.g., Katselidis et al. 2012). SR-H is not a metric that should be manipulated, except for the most extreme cases where and HES is consistently being compromised due to thermal extremes. Estimates for SR-H should be assessed by each individual Contracting Party at each index nesting site to understand that sufficient male turtles are still being produced under the influence of climate change. A female threshold of no more than 95% per country can be used, as research has indicated that only a low percentage of male hatchlings are required to maintain populations and there is equal concern over reduced *hatchling emergence success* (Hays et al. 2017) which is also to be monitored and can be mitigated against.

Sex Ratio of Breeding Adults (SR-BA)

68. SR-BA can be determined from surveys of the nearshore marine habitat for approximately one month prior to the onset of the nesting season until nesting begins, i.e., from mid-April to mid-to-late-May. The number of adult male and female turtles observed during the survey produce the season's operational sex ratio (OSR), but this can be taken further to produce functional-OSR when timing of the surveys is taken into account (Schofield et al. 2017). OSR can also be determine through in-depth genetic studies of paternity in multiple nests from a population (Wright et al. 2012). SR-BA is used for demographic analyses and provide insights into any persistence and effects of skewed SR-H. OSR (male:female) for loggerheads is 1:2.7 at Zakynthos, Greece (Schofield et al. 2017) 3:1 for green turtles in Turkey (Turkozan et al. 2019) and 1.4:1 for green turtles in Cyprus (Wright et al. 2012). No other data exist for Mediterranean turtles. SR-BA is not a measure that can be manipulated for conservation purposes but should be assessed periodically by each individual Contracting Party.

Longevity

69. Longevity is best determined from intensive capture-mark-recapture projects, carried out at nesting areas. Understanding how long animals may live provides insight on lifetime reproductive output for adult female turtles that contribute towards population modelling. Current maximum reproductive longevity for

adult female loggerheads in Greece was recently published at 33 years (Margaritoulis et al. 2020). Longevity was analysed for loggerheads and green turtles in Cyprus (Omeyer et al. 2019) with loggerheads breeding up to 25 years and green turtles 24 years. No other data have been published for the Mediterranean. Biological longevity are not metrics that can be manipulated for conservation purposes, but reduction of threats, both marine and terrestrial will aid turtles' abilities to live to reach their natural lifespans and hence their reproductive potential. Due to the length of time required to measure these traits they need not be ascertained for all nesting populations, though they can be an aspirational goal for nascent turtle monitoring projects at index nesting areas per Contracting Party.

Metrics from other marine habitats

Size classes / sex ratios in offshore foraging areas

70. These data are gathered from dedicated surveys, surveys from regular boat traffic, such as ferries, aerial surveys and bycatch records (See Casale et al. 2006). They give an understanding of the population structure in the open seas including data on abundance, distribution and threats. Turtles found in the open seas may range from yearlings to adults for loggerheads and yearlings to around 30cm for green turtles. There will likely be bias in observations as bigger turtles will be easier to spot. In subadult and adult sizes that are observed close-up as with bycaught turtles, sex of individuals can be inferred from tail length. Size classes and sex ratios are not metrics that can be manipulated for conservation purposes, but they should be assessed by each individual Contracting Party for CI 3 & CI 4.

Size classes / sex ratios in nearshore foraging areas

71. Similar to the offshore zone, these data are gathered from dedicated surveys, surveys from regular boat traffic, such as ferries, aerial surveys and bycatch records (e.g., Casale et al. 2014), but additional data can be obtained from strandings (e.g., Maffucci et al. 2013). They give an understanding of the population structure in the nearshore seas including data on abundance, distribution and threats. Turtles found nearshore may generally range from 45cm-juveniles to adults for loggerheads and 30cm-juveniles to adults for green turtles. There will likely be bias in observations as bigger turtles will be easier to spot. In subadult and adult sizes, that are observed close-up as with bycaught turtles or low-flying drones, sex of individuals can be inferred from tail length. Size classes and sex ratios are not metrics that can be manipulated for conservation purposes, but they could be assessed by each individual Contracting Party for CI 4.

Threats and survivorship in offshore foraging areas

72. Data on these metrics are obtained from fisheries bycatch, telemetry and capture-mark-recapture (CMR) studies, with the latter utilising bycaught turtles. Threats are classified as catch per unit effort per fishery that also records direct mortality rates resulting from the bycatch event. Telemetry data can reveal probable mortality events as demonstrated by Snape et al. (2016), which is useful to assess post-bycaught indirect mortality, but sample sizes need to be large to derive population level inferences. Threats and survivorship are metrics that can be influenced for conservation purposes. Efforts to reduce levels of bycatch (through bycatch reduction devices or revised fishing practices) or improve the condition of bycaught turtles (through better handling and release protocols, e.g., Gerosa & Aureggi 2001, FAO & ACCOBAMS 2018) can create positive outcomes at population level. Threat levels and survivorship should be assessed by each Contracting Party and conservation measures put in place as a precautionary measure irrespective of trend in mortality. At national level, each Contracting Party should aim to acquire robust bycatch data that will hopefully show a reduction in mortality, over time, and at the very least to not let the trend in anthropogenic mortality worsen. A stable (from first year of data collection) or negative trend for mortality levels would be required for this metric to not impact achievement of GES. Only when all populations are recovered and turtle numbers are improved should mortality rate be considered as a metric for GES assessment, as even with low mortality rates if the bycatch level is high mortality levels may impact population trends.

Threats and survivorship in nearshore foraging areas

73. Data on these metrics are obtained from fisheries bycatch, strandings, telemetry and capture-mark-recapture (CMR) studies, with the latter utilising both bycaught turtles and those observed during nearshore hotspot monitoring. Threats are classified as catch per unit effort per fishery that also records direct mortality rates resulting from the bycatch event. A more detailed assessment of threats and survivorship can be made with the nearshore hotspot CMR projects, where turtles may be observed over extended periods in which they may be impacted and potentially subsequently recover from local threats such as boat strikes, hooking, entanglement and directed trauma. Telemetry data can reveal probable mortality events as demonstrated by Snape et al. (2016), which is useful to assess post-bycaught indirect mortality, but sample sizes need to be large to derive population-level inferences. Threats and survivorship are metrics that can be manipulated for conservation purposes. Efforts to reduce levels of bycatch (through bycatch reduction devices or revised fishing practices) or improve the condition of bycaught turtles (through better handling and release protocols, e.g., Gerosa & Aureggi 2001, FAO & ACCOBAMS 2018) can create positive outcomes at population level. Threat levels and survivorship should be assessed by each Contracting Party and conservation measures put in place as a precautionary measure irrespective of trend in mortality. At national level, each Contracting Party should aim to acquire robust bycatch data that will hopefully show a reduction in mortality, over time, and at the very least to not let the trend in anthropogenic mortality worsen. A stable (from first year of data collection) or negative trend for mortality levels would be required for this metric to not impact achievement of GES. Only when all populations are recovered and turtle numbers are improved should mortality rate be considered as a metric for GES assessment, as even with low mortality rates if the bycatch level is high mortality levels may impact population trends.

Health index in offshore foraging areas

74. Sea turtles to assess and sample for health assessments may be obtained through bycatch and CMR studies. They are measured and weighed, and injuries recorded. Dead turtles can additionally have various organs sampled and assessed for pollutant load and their gastro-intestinal tract examined for debris ingestion (as required for CI 18 of EO10). Although not currently incorporated in demographic modelling, indices of health status are useful indicators for general state of the environment, with loggerhead turtles specifically chosen as indicators for prevalence of marine litter across the Mediterranean. Health indices are not something that can be improved at population level through direct conservation but lessening the amount of plastic pollution that reaches the sea plays a part in improving the situation. However, conservation actions may contribute directly on individuals through rehabilitation projects. Each Contracting Party should obtain data on animal health, specifically those that may contribute to pan-Mediterranean initiatives such as monitoring debris ingestion (CI 18).

Health index in nearshore foraging areas

75. See Health index in offshore foraging areas, above.

Growth rates

76. Growth rates are determined from repeat measuring of individual turtles over an extended period of time, i.e., from months to years. This involves some form of CMR project, that can be nocturnal monitoring of nesting beaches (though adults do not grow very much; Omeyer 2018) or more helpfully from in-water CMR studies that should be carried out at nearshore turtle hotspots (e.g., Rees et al. 2013) and, to a lesser extent, from repeat captures of bycaught turtles (e.g., Casale et al. 2009). Growth rates are useful for determining general age-at-size and age at maturity values and for understanding how long turtles remain in specific ontogenetic categories such as epipelagic juveniles and demersal/benthic juveniles etc. These data are vital to successful stage-based sea turtle life-history models. Growth cannot be manipulated for conservation

purposes, but each Contracting Party should strive to obtain relevant local data on this topic. However, values from other locations across the region may be used in modelling where local data are lacking.

Age and size at sexual maturity

77. These data points require detailed laboratory studies (necropsy and skeletochronology; Casale et al. 2011, Guarino et al. 2020) or invasive surgical techniques (laparoscopy) for individuals obtained as bycatch or strandings, or long-term CMR projects (Casale et al. 2009) incorporating both foraging and breeding areas to elucidate values for individuals that contribute to wider studies. Values for age and size at sexual maturity contribute to stage- and age- based demographic models which are used to assess a population's resilience to threats and stressors (Casale & Heppell 2016) and identify where targeted conservation can be most efficacious. Reaching sexual maturity cannot be manipulated for conservation purposes, but each Contracting party should strive to obtain relevant local data on this topic, especially as regional variation at size of sexual maturity has been demonstrated (Margaritoulis et al. 2003). However, values from other proximate locations may be used in modelling where local data are lacking.

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Annex XI

Draft Revised guidance fact sheet for the IMAP Common Indicator 6 related to Non-Indigenous Species

I. Introduction and objectives

1. The IMAP Common Indicator Guidance Factsheets share a common template, which is illustrated in Table 1 below. The information gathered in the frame of the “Study on trends and outlook of marine pollution from ships and activities and of maritime traffic and offshore activities in the Mediterranean”, and the additional documents consulted, enabled to update the different sections of the factsheets that were discussed with the members of the informal Online Working Group (19 April 2021).

Table 1. Template of IMAP Common Indicator Guidance Factsheets

Indicator Title			**IMAP Reference No and definition**
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**	
Rationale			**Scientific rationale and marine policy context (including relevant references)**
Justification for indicator selection			
Scientific References			
Policy Context and targets			
Policy context description			
Targets			
Policy documents			
Indicator analysis methods			**Agreed scientific methodologies in use, including detailed monitoring requirements**
Indicator Definition			
Methodology for indicator calculation			
Indicator units			
List of Guidance documents and protocols available			
Data Confidence and uncertainties			
Methodology for monitoring, temporal and spatial scope			
Available Methodologies for Monitoring and Monitoring Protocols			
Available data sources			
Spatial scope guidance and selection of monitoring stations			
Temporal Scope guidance			
Data analysis and assessment outputs			**Data reporting, analysis and aggregation (outpout)**
Statistical analysis and basis for aggregation			
Expected assessments outputs			
Known gaps and uncertainties in the Mediterranean			
Contacts and version Date			**Document Registration**
Key contacts within UNEP for further information			
Version No	**Date**	**Author**	

2. The revised Guidance Factsheet of CI6 is reproduced in the Sections II in highlights and strikethrough.

II. Revision of the Guidance Factsheet of CI6

Indicator title	Common Indicator 6: Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species (NIS) particularly invasive, non-indigenous species notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species)	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**
Decreasing abundance of introduced NIS in risk areas	Invasive NIS introductions are minimized	Abundance of NIS introduced by human activities reduced to levels giving no detectable impact.
Rational		

Justification for indicator selection

Marine invasive alien species[1] are regarded as one of the main causes of biodiversity loss in the Mediterranean, potentially modifying all aspects of marine and other aquatic ecosystems. They represent a growing problem due to the unprecedented rate of their introduction and the unexpected and harmful impacts that they have on the environment, economy and human health. According to the latest regional reviews, more than 6% of the marine species in the Mediterranean are now considered non-native species as around 1000 alien marine species have been identified. Around 12% of all of NIS in the Mediterranean are today considered as invasive, or potentially invasive (Rotter et al., 2020)[2]. Macrophytes (macroalgae and seagrasses) are the dominant NIS group in the western Mediterranean and Adriatic Sea. Polychaetes, crustaceans, molluscs and fishes are the dominant NIS group in the eastern as well algae for the central Mediterranean (Zenetos et al., 2010, 2012). Although the highest alien species richness occurs in the eastern Mediterranean, ecological impact shows strong spatial heterogeneity with risk areas in all Mediterranean sub-basins (Katsanevakis et al. 2016). Besides, these numbers should be modulated acknowledging that there is no exhaustive knowledge (neither standard monitoring) of all introduced species in most areas of the Mediterranean Sea.

To mitigate the impacts of NIS on biodiversity, human health, ecosystem services and human activities there is an increasing need to take action to control biological invasions. With limited funding, it is necessary to prioritise actions for the prevention of new invasions and for the development of mitigation measures. This requires a good knowledge of the impact of invasive species on ecosystem services and biodiversity, their current distributions, the pathways of their introduction, and the contribution of each pathway to new introductions.

Common indicator 6 is a trend indicator that summarizes data related to biological invasions in the Mediterranean into simple, standardized and communicable figures and is able to give an indication of the degree of threat or change in the marine and coastal ecosystem. Furthermore, it can be a useful indicator to assess on the long-run the effectiveness of management measures implemented for each pathway but also, indirectly, the effectiveness of the different existing policies targeting alien species in the Mediterranean Sea.

However, the overall ecological impact of NIS on the Mediterranean Sea remains relatively difficult to quantify, and it evaluation is mainly qualitative; nevertheless, there have been some good attempts at quantification (Katsanevakis et al., 2014, 2016; Gallardo et al., 2016). In particular, the analyses of

[1] Invasive alien species (IAS) are a subset of established NIS which have spread, are spreading, or have demonstrated their potential to spread elsewhere, and which have an effect on biological diversity and ecosystem functioning (by competing with and on some occasions replacing native species), socio-economic values, and/or human health in invaded regions. (Decision IG.22/7)

[3] Text amended to reflect the latest EU Decisions

Katsanevakis et al. (2014) have led to the conclusion that the majority of the recognized invasive species in the European seas (72%) have both positive and negative effects on the native ecosystem.

To take effective actions against biological invasion, knowledge about the-vectors and associated pathways of introduction of NIS is crucial. Corridors and shipping represent the main pathway of introduction for NIS in the Mediterranean, though the relative importance of pathways vary among individual countries and current knowledge on vectors and pathways.

Scientific References

Galil BS, Marchini A, Occhipinti-Ambrogi A, Minchin D, Narščius A, Ojaveer H, Olenin S. (2014). International arrivals: widespread bioinvasions in European Seas. Ethol Ecol Evol. 26(2–3):152–171. doi:10.1080/03949370.2014.897651.

Galil BS., Agnese Marchini and Anna Occhipinti-Ambrogi (2018). Mare Nostrum, Mare Quod Invaditur—The History of Bioinvasions in the Mediterranean Sea. In: Queiroz Ana Isabel & Simon Pooley Eds. Editors. Histories of Bioinvasions in the Mediterranean. Springer.

Gallardo, B., Clavero, M., Sánchez, M. I., and Vilà, M. (2016). Global ecological impacts of invasive species in aquatic ecosystems. Glob. Chang. Biol. 22, 151–163. doi: 10.1111/gcb.13004

Katsanevakis, S., Wallentinus, I., Zenetos, A., Leppäkoski, E., Çinar, M. E., Oztürk, B., et al. (2014). Impacts of marine invasive alien species on ecosystem services and biodiversity: a pan-European review. Aquat. Invas. 9, 391–423. doi: 10.3391/ai.2014.9.4.01

Katsanevakis, S., Tempera, F., Teixeira, H., 2016. Mapping the impact of alien species on marine ecosystems: the Mediterranean Sea case study. Diversity and Distributions 22, 694–707.

REMPEC (2020). Study on trends and outlook of marine pollution from ships and activities and of maritime traffic and offshore activities in the Mediterranean".

Rotter Ana, Klun Katja, Francé Janja, Mozetič Patricija, Orlando-Bonaca Martina (2020). Non-indigenous Species in the Mediterranean Sea: Turning from Pest to Source by Developing the 8Rs Model, a New Paradigm in Pollution Mitigation. Frontiers in Marine Science 7: 178. 10.3389/fmars.2020.00178

Zenetos A., Gofas, S., Verlaque, M., Cinar, M. E., García Raso, E., et al., 2010. Alien species in the Mediterranean Sea by 2010. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part I. Spatial distribution. Mediterranean Marine Science, 11, 2, 381-493.

Zenetos A., Gofas, S., Morri, C., Rosso, A., Violanti, D., et al., 2012. Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways. Mediterranean Marine Science, 13/2, 328-352.

Policy Context and targets (other than IMAP)

Policy context description

The Convention on Biological Diversity (CBD) recognised the need for the "compilation and dissemination of information on alien species that threaten ecosystems, habitats, or species to be used in the context of any prevention, introduction and mitigation activities", and calls for "further research on the impact of alien invasive species on biological diversity" (CBD, 2000). The objective set by Aichi Biodiversity Target 9 is that "by 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment". This is also reflected in Target 5 of the EU Biodiversity Strategy (EU 2011). The EU Regulation 1143/2014 on the management of invasive alien species seeks to address the problem of IAS in a comprehensive manner so as to protect native biodiversity and ecosystem services, as well as to minimize and mitigate the impacts that these species can have on the human health or economy. The Regulation foresees three types of interventions; prevention, early detection and rapid eradication, and management and includes a list of 66 (as per second update) Invasive Alien Species (IAS) of European concern for which direct management measures are solicited.

The Marine Strategy Framework Directive (MSFD), which is the environmental pillar of EU Integrated Maritime Policy, sets as an overall objective to reach or maintain “Good Environmental Status” (GES) in European marine waters by 2020. It specifically recognizes the introduction of marine alien species as a major threat to European biodiversity and ecosystem health, requiring Member States to include alien species in the definition of GES and to set environmental targets to reach it. Hence, one of the 11 qualitative descriptors of GES defined in the MSFD is that “non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem” (Descriptor 2).

The updated EU Decision 2017/848, defined a set of Criteria, including criteria elements, and methodological standards are defined, for each descriptor. Under descriptor 2, the following criteria are defined 1) Newly introduced non-indigenous species, 2) Established non-indigenous species, particularly invasive non-indigenous species, which include relevant species on the list of invasive alien species of Union concern adopted in accordance with Article 4(1) of Regulation (EU) No 1143/2014 and species which are relevant for use under criterion D2C3.

Member States shall establish that list through regional or subregional cooperation and 3) Species groups and broad habitat types that are at risk from non-indigenous species, selected from those used for Descriptors 1 and 6. Although Ecological Objective 2 and the Common Indicator 6 were in line with the MSFD descriptor 2 objectives and targets, defined in the EU Decision 2010/477/EU, there is significant difference with the update directive 2017/848. Assessment of CI6 is complementary to first two criteria under D2, however, no assessment of adverse impacts on species and habitats is yet elaborated under IMAP.[3]

Indicator/Targets

Aichi Biodiversity Target 9

EU Biodiversity Strategy Target 5

EU Regulation 1143/2014 targets

MSFD Descriptor 2 and related criteria, indicators and environmental targets

Policy documents

Aichi Biodiversity Targets - https://www.cbd.int/sp/targets/

Action Plan concerning Species Introductions and Invasive Species in the Mediterranean Sea. UN Environment/MAP Athens, Greece 2017.- https://www.racspa.org/sites/default/files/action_plans/pa_alien_en.pdf

EU Biodiversity Strategy - https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en#ecl-inpage-324

Marine Strategy Framework Directive - http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN

Commission Decision EU 2017/848 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017D0848&from=EN

EU Regulation 1143/2014 - http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1143&from=EN

[3] Text amended to reflect the latest EU Decisions

Indicator analysis methods
General definitions (according to Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria) 'Non-indigenous species' (NIS; synonyms: alien, exotic, non-native, allochthonous) are species, subspecies or lower taxa introduced outside of their natural range (past or present) and outside of their natural dispersal potential. This includes any part, gamete or propagule of such species that might survive and subsequently reproduce. Their presence in the given region is due to intentional or unintentional introduction resulting from human activities. Natural shifts in distribution ranges (e.g. due to climate change or dispersal by ocean currents) do not qualify a species as a NIS. However, secondary introductions of NIS from the area(s) of their first arrival could occur without human involvement due to spread by natural means. 'Invasive alien species' (IAS) are a subset of established NIS which have spread, are spreading or have demonstrated their potential to spread elsewhere and have an effect on biological diversity and ecosystem functioning (by competing with and on some occasions replacing native species), socioeconomic values and/or human health in invaded regions. Species of unknown origin which cannot be ascribed as being native or alien are termed cryptogenic species. They also may demonstrate invasive characteristics and should be included in IAS assessments. In order to provide basis for development of relevant policies to address NIS, assessment of pathways of introduction is needed. **Indicator Definition** For the needs of Common Indicator 6, the following definitions apply: - 'Trend in abundance' is defined as change between assessment periods in the estimated population density/ranks of a non-indigenous species in a specific marine area. - 'Trend in temporal occurrence' is defined as the change between assessment periods in the estimated number of new introductions and the total number of non-indigenous species in a specific country or preferably the national part of each subdivision, preferably disaggregated by pathway of introduction. - 'Trend in spatial distribution' is defined as change of the total marine 'area' occupied by non-indigenous species. This area should be defined according to the scale of assessment. In order for this trend indicator to become operational, at least two assessment periods of relevant data are necessary, in order to allow a minimal comparison of two annual datasets.
Methodology for indicator calculation To estimate Common Indicator 6, a trend analysis (time series analysis) of the available monitoring data needs to be performed, aiming to extract the underlying pattern of NIS number variability over time, which may be hidden by noise. A formal regression analysis is the recommended approach to estimate such trends. This can be achieved through a simple linear regression analysis or through more sophisticated modelling tools (when extensive datasets are available), such as the generalized linear or additive models (GLM/GAM). See details in document "S*cales of monitoring & assessment, assessment criteria and thresholds values of the IMAP EO2/CI6: non-indigenous species"*

Indicator units

'Trends in abundance': absolute value and % change per assessment period

'Trends in temporal occurrence': number and % change in new introductions or number and % change in the total number of alien species per assessment period.

'Trends in spatial distribution': absolute value and % change in the total marine surface area occupied or absolute value and % change in the length of the occupied coastline (in the case of shallow-water species that are present only in the coastal zone).

List of guidance documents and protocols available

As provided for in the Decision IG.23/6 on the 2017 MED QSR (COP 20, Tirana, Albania, 17-20 December 2017), Monitoring Protocols for IMAP Common Indicator related to Non-Indigenous species were approved by the 7th Meeting of the Ecosystem Approach Coordination Group (Athens, Greece, 9 September 2019)[4].

Consistent NIS monitoring protocols are already implemented in many Mediterranean countries, in relation to several monitoring obligations linked with the Ballast Water Convention, the EU Water Framework Directive, and the EU Marine Strategy Framework Directive, and as provided by specialised agencies or institutions (e.g. IUCN for MPAs, CIESM). These methods may be useful to complement the estimation of Common Indicator 6.

Several guidelines for NIS monitoring and assessment are available at: European and Regional Sea conventions https://mcc.jrc.ec.europa.eu/main/dev.py?N=20&O=407&titre_chap=D2%20Non-indigenous%20species&titre_page=Monitoring%20&%20assessment (accessed 13/04/2021). Some guidance on the monitoring of biodiversity (including for monitoring non-indigenous species) within the context of the MSFD is provided in:

- Zampoukas et al. (2014) Technical guidance on monitoring for the Marine Stategy Framework Directive;
- JRC Scientific and Policy Reports (EUR collection), Publications Office of the European Union, EUR 25009 EN – Joint Research Centre, doi: 10.2788/70344, ISBN: 978-92-79-35426-7, 166p;
- Olenin, S., Alemany, F., Cardoso, A.C., Gollasch, S., Goulletquer, P., Lehtiniemi, M., McCollin, T., Minchin, D., Miossec, L., Ambrogi, A.O. and Ojaveer, H., 2010. Marine Strategy Framework Directive–Task Group 2 Report–Non-indigenous Species, vol. 10.

HELCOM (Helsinki Commission, the RSC for the Baltic Sea) has published online guidance notes for the application of eRAS (extended Rapid Assessment Survey) in the monitoring of NIS (https://helcom.fi/media/publications/Guidelines-for-monitoring-of-non-indigenous-species-by-eRAS.pdf)

The EU Project BALMAS has provided guidelines for the monitoring of NIS in ballast water:

- David M. and Gollasch S. 2015. BALMAS Ballast Water Sampling Protocol for Compliance Monitoring and Enforcement of the BWM Convention and Scientific Purposes. BALMAS project, Korte, Slovenia, Hamburg, Germany. 55 pp

Data confidence and uncertainties

The trend analysis should be accompanied by an evaluation of confidence and uncertainties. Standard regression methods (simple linear regression, generalized linear or additive models, etc.) provide estimates of uncertainty (standard errors and confidence intervals of estimated trends). Such uncertainty estimates should accompany all reported trends. Only long-term follow-ups of all the relevant parameters (states and pressures), will ultimately make it possible to precisely quantify the GES and gradually

[4] UNEP/MED WG.467/16, Monitoring Protocols for IMAP Common Indicators related to Biodiversity and Non-Indigenous species.

reduce the amount of uncertainty between the changes due to natural variations and those resulting from anthropogenic pressures.

Furthermore, the issue of imperfect detectability should be properly addressed, as it may cause an underestimation of the relevant state variables (abundance, occupancy, geographical range, species richness). Many available methods properly tackle the issue of imperfect detection when monitoring biodiversity, by jointly estimating detectability (see Katsanevakis et al. 2012 for a review).

Methodology for monitoring, temporal and spatial scope

Available methodologies for monitoring and monitoring protocols

It is recommended to use standard monitoring methods traditionally being used for marine biological surveys, including, but not limited to plankton, benthic and fouling studies described in relevant guidelines and manuals. However, specific approaches may be required to ensure that alien species are likely to be found, e.g. in rocky shores, port areas and marinas, offshore areas and aquaculture areas.

As a complimentary measure and in the absence of an overall NIS targeted monitoring programme, rapid assessment studies may be undertaken, usually but not exclusively at marinas, jetties, and fish farms (e.g. Pederson et al. 2003). Besides, a review (as exhaustive as possible) of all scientific publications on (more or less) recent new introductions of species, besides the taxonomic status of these NIS, is pre-required to have the minimum basis of knowledge. This is also very often the main and only data sources for assessment when monitoring is not in place.

[With rigorous quality control in place, national and regional citizen science campaigns are ideal for NIS monitoring purposes. Members of local communities, due to their broad geographic distribution and familiarity with their natural environment, can in fact, be of great help to track invasive species in both terrestrial and aquatic systems (Delaney et al., 2008). A renewed drive to identify components of the natural world, through 'bioblitz'[5] events organized round the globe, is bolstering the interaction between formal scientists and informal/citizen ones, also through the availability of low-budget underwater photography and video-capture hardware on the market.]

For the estimation of Common Indicator 6, it is important that the same sites are surveyed each monitoring period, otherwise the estimation of the trend might be biased by differences among sites. The exact geographical location of each selected sampling station in both risk areas and MPAs should be recorded through GPS coordinates, so as to enable consistent sampling on successive occasions.

Standard methods for monitoring marine populations include plot sampling, distance sampling, mark-recapture, removal methods, and repetitive surveys for occupancy estimation (see Katsanevakis et al. 2012 for a review specifically for the marine environment).

To provide guidance to the Contracting Parties to the Barcelona on field methodologies for monitoring NIS CI6 in identified risk areas and MPAs, guidelines for monitoring NIS in the Mediterranean (UNEP/MED WG.467/16, 2019) was developed by reviewing recognised good practices in the field of NIS monitoring protocols:

1. UNEP/MED WG.467/16, 2019, Monitoring Protocols for IMAP Common Indicators related to Biodiversity and Non-Indigenous species, 7th Meeting of the Ecosystem Approach Coordination Group, Athens, Greece, 9 September 2019. p.118-130
2. Katsanevakis S, et al., 2012. Monitoring marine populations and communities: review of methods and tools dealing with imperfect detectability. Aquatic Biology 16: 31–52.

[5] A BioBlitz is a celebration of biodiversity. It's an event that focuses on finding and identifying as many species as possible in a specific area over a short period of time. Students, scientists, naturalists, and community members join together in these events to explore the natural world. Typically led by educators, scientists, or Park/MPA rangers, BioBlitzes are an opportunity to take a snapshot of the biodiversity of a place. Participants of all ages can learn techniques for observing and collecting data within a designated area and time frame.

3. Pederson J, et al., 2003 Marine invaders in the northeast: Rapid assessment survey of non-native and native marine species of floating dock communities, August 2003 (available in https://dspace.mit.edu/bitstream/handle/1721.1/97032/MITSG_05-3.pdf?sequence=1)

Available data sources

Marine Mediterranean Invasive Alien Species database (MAMIAS) - http://dev.mamias.org/ [Version Beta]

European Alien Species Information Network (EASIN) - http://easin.jrc.ec.europa.eu/

CIESM Atlas of Exotic Species in the Mediterranean - http://www.ciesm.org/online/atlas/

World Register of Introduced Marine Species (WRiMS) - http://www.marinespecies.org/introduced

Global Invasive Species Database - http://www.iucngisd.org/gisd/

CABI Invasive Species Compendium - https://www.cabi.org/isc

AquaNIS - http://www.corpi.ku.lt/databases/index.php/aquanis

For taxonomic status: World Register of Marine Species (WoRMS) - http://www.marinespecies.org/

NEMESIS - Smithsonian Environmental Research Center's National Estuarine and Marine Exotic Species Information System - https://nemesis.nisbase.org/nemesis/

Spatial scope guidance and selection of monitoring stations

[It is recommended that NIS surveys are conducted within both risk areas (harbours, ports, marinas, marine culture, etc.) and within vulnerable marine areas (where the environmental conditions promote the establishment of NIS) and Marine Protected Areas (MPAs).

Risk areas are defined as the most feasible entry/introduction points for NIS by virtue of:

(i) a preliminary desk study which identifies particular site-specific features (e.g. a harbour frequented by a number of vessels at risk of introduction of NIS, or marine culture) or

(ii) a high number and/or abundance of NIS already established within the confines of risk and vulnerable areas

Typically, Risk areas would include site typologies such as harbours, ports, yacht marinas, mariculture cages, offshore structures and thermal effluent discharge locations. Sites not necessarily in close proximity to these 'conventional' risk areas could also be considered within this same category, including locations subject to intense anchoring pressure during the tourist season.

In terms of NIS risk areas, UNEP/MAP (2019)[6] recommends that NIS monitoring is conducted following the provided guidance at least in two risk areas locations per potential introduction pathway, most notably commercial shipping, recreational boating and aquaculture. The same report provides guidance in the form of criteria, which should be applied when selecting candidate hotspot locations, as follows:

- Past research has shown them to be hotspots for non-indigenous species that can be transported with the transport vector concerned;
- The species communities at the two risk areas have minimal direct influence each other;
- Vulnerable areas with prospects for invasion by new introductions.

In terms of MPAs, a minimum of two sampling stations per MPA are recommended, with the two stations being located within different management zones within the same MPA. In terms of the specific positioning of the two NIS monitoring stations within each MPA, it is recommended to ensure a high

[6] UNEP/MED WG.467/16 Monitoring Protocols for IMAP Common Indicators related to Biodiversity and Non-Indigenous species, 7th Meeting of the Ecosystem Approach Coordination Group, Athens, Greece.

degree of geographical and ecological representability. This can be ensured in a variety of ways, including:

a) opting for a minimum threshold of physical distance between the two sampling stations, expressed as a percentage of the total lateral extent of the MPA in question (e.g. the distance between the two sampling stations should not be inferior to 25% of the total lateral extent of the MPA);
b) opting for sampling stations dominated by different marine biocoenoses (e.g. algal-dominated rocky reef versus seagrass meadow);
c) opting for sampling stations incorporated within anthropogenic or ecological features of interest, with potential candidates including wrecks (which are considered as promoting the establishment of NIS – e.g. Bariche [2012]), a benthic area heavily impacted by anchoring or a sea urchin barren.]

It is important to establish a network of monitoring sites at regional level in which common protocols are applied so that Common Indicator 6 can be assessed at national, sub-regional and regional levels.

The use of Habitat Suitability Models and Ecological Niche Modelling (ENM) may be considered at a later stage of IMAP to identify priority monitoring sites and to predict the spread of NIS.

A revision and agreement on the nested areas (bottom-up approach) is needed that includes integration of monitoring scales based on nested approach, proposing the list of monitoring and reporting units in the Mediterranean Sea. The geographical distribution of NIS, showing a higher presence in the Aegean and Levantine basin, should be taken into consideration when defining monitoring stations. The nested approach has to consider the differences in NIS occurrence in the different sub-basins.

Temporal Scope guidance

Sampling should be done on an annual / seasonal basis depending on the species group or target habitat's types. See details in document "Scales of monitoring & assessment, assessment criteria and thresholds values of the IMAP EO2/CI6: non-indigenous species".

Data analysis and assessment outputs

Statistical analysis and basis for aggregation

Standard statistics for regression analysis should be applied to estimate trends and their related uncertainties.

Expected assessments outputs

- Graphs of the time series of the calculated metrics (abundance, occurrence, spatial extent), including confidence intervals;
- Distribution maps of the selected NIS, highlighting temporal changes in their spatial distribution;
- National ~~annual~~ inventories (and also by the national part of each marine subdivision, if relevant) of non-indigenous species and respective year of introduction if known;
- National inventories clustering NIS according to main pathways of introduction (e.g. seaways, shipping, mariculture, etc.) if known;

Known gaps and uncertainties in the Mediterranean

The lack of regular dedicated and coordinated monitoring at national and regional scale implies a low confidence in the assessment of NIS, even if the continuous and regular occurring of new introductions are demonstrated~~.~~

NIS identification is of crucial importance, and the lack of taxonomical expertise has already resulted in several NIS underestimated for certain time periods. The use of molecular approaches including bar-coding are sometimes needed to confirm the results of conventional taxonomic species identification. Sampling effort currently greatly varies among Mediterranean countries and thus on a regional basis current assessments and comparisons may be biased. Evidence for most of the reported impacts of alien species is weak, mostly based on expert judgement; a need for stronger inference is needed based on experiments or ecological modelling. The assessment of trends in abundance and spatial distribution is largely lacking.
Contacts and version Date
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Version No	**Date**	**Author**
V.1	20/07/2016	SPA/RAC
V.2	14/04/2017	SPA/RAC
V.3	30/09/2020	SPA/RAC-REMPEC

Annex XII

Draft Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO)

POST-2020 SAPBIO

Strategic Action Programme for the **Conservation of Biodiversity** and **Sustainable Management of Natural Resources** in the **Mediterranean Region**

Draft Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region

(Post-2020 SAPBIO)

Draft Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO)

EXECUTIVE SUMMARY

Introductory remarks

1. In 2003, the Contracting Parties to the Barcelona Convention adopted the SAPBIO; its evaluation in 2018 concluded that, besides some gaps in its implementation, it played an important regional role in terms of harmonization and alignment of planning for biodiversity conservation, and in facilitating exchanges among departments, within and among countries.

2. Throughout the last decade, regional cooperation on environmental matters delivered significant progress, to which the Barcelona Convention system has largely contributed. Contracting Parties adopted common objectives, monitoring and assessment frameworks, aiming at Good Environmental Status (GES). Transboundary collaboration increased around migratory species, NIS/IAS monitoring, MPA management, assessing fish stock, multiannual fisheries management plans, minimization of discards and incidental catches, and reducing marine litter. All Mediterranean countries have adopted frameworks for ex- ante environmental impact assessment (EIA), and the role of international non-governmental organizations and stakeholder networks has strengthened sharply, improving the opportunities for participation and engagement.

3. In 2019 the Barcelona Convention COP 21 requested to prepare the Post-2020 SAPBIO to be harmonised with the CBD [Post-2020 Global Biodiversity Framework *[CBD/GBF]*] and aligned with the UN Sustainable Development Goals.

4. Along the period 2020-2021, following a strong bottom-up elaboration process, the Post-2020 SAPBIO was built over the main needs expressed by the Mediterranean countries, through 21 ad-hoc national reports which involved the relevant authorities and stakeholders, and were discussed in national workshops. Given the transboundary nature of most of the biodiversity concerns, the national results were harmonised and the needs prioritised through sub-regional assessments and workshops. Subsequently, several regional drafts were produced and circulated, and recommendations for its elaboration and strategic elements, were provided in draft reviews and meetings of the SAPBIO Advisory Committee and of the SAPBIO National Correspondents, to be finally endorsed by the 15th meeting of SPA/BD Focal Points (June 2021) and MAP Focal Points (September 2021).

Gaps and challenges

5. Despite notable progress, the environmental status of the Mediterranean Sea is in 2020 far from where expected to be; countries are not on the track to achieve and fully implement the agreed upon goals, including the SDGs and the Ecological Objectives for GES. Most trends show some progress towards the set targets, but at an insufficient rate, unequally across the countries, or even moving away from the targets.

6. The Mediterranean Sea is subject to severe pressure from human use: intense fisheries and maritime traffic, marine litter, land-based pollution, the introduction and spread of alien invasive species, underwater noise, and their cumulative impacts with all sources of physical and chemical pollution. Because of its geographical situation it also suffers most from the impacts of climate change, warming 20% faster than the rest of the world. Altogether, it represents the highest proportion of threatened marine habitats.

7. For the time being, knowledge, data availability and sharing, were found insufficient and very patchy. National reports note a great disparity between the northern and the southern shores of the Mediterranean in terms of inventories, mapping and ecological monitoring. The coverage of marine protected areas, even very close to the 10% Aichi target at the regional level, is far from being representative of the Mediterranean Sea biodiversity, while the majority of these protected areas are still ineffectively managed and largely underfinanced.

8. Ambitious regional and international environmental agreements are rarely fully implemented on the ground, and important gaps persist in enforcing them. All the Post-2020 SAPBIO subregional reports, and the most recent and comprehensive studies both at the global and Mediterranean levels, identify a series of gaps and critical barriers to biodiversity conservation, which are basically consistent across every assessment. Recurrently underlined is the fact that, even when national legislation is fit for purpose, the implementation on the ground is lagging behind; the political influence of the environmental sector remains generally weak, and its Ministries are still under-resourced to deliver the agreed commitments.

9. Among the drivers that should be addressed to relief the pressure on biodiversity, some overarch beyond the strict environmental sector, for example, adequate incentives for the efficient use of marine and coastal natural resources, reducing conflicts among overlapping uses, developing marine spatial planning and integrated coastal management; and to mainstream biodiversity into sector/cross-sector policies, including the accounting of natural capital and ecosystem services. The sub-regional assessments also underline enabling conditions that need be strengthened, such as improving governance and management systems, closing knowledge gaps to efficiently monitor changes, building capacities, sharply increasing the funding conditions from national sources, and largely reinforcing cooperation between countries and from international actors.

The Post-2020 SAPBIO

10. To address the complexity of drivers that impact the Mediterranean Sea and coasts, the Post-2020 SAPBIO proposes a long-term Vision 2050, adapted from the new [CBD/GBF] (draft) to the Mediterranean context: "By 2050, marine and coastal biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy Mediterranean Sea and coast, and delivering benefits essential for nature and people".

11. The proposed Mission to 2030, defines what is the strategy's purpose and approach to reach the Vision: "By 2030 start to reverse the loss of biodiversity and put the Mediterranean marine and coastal biodiversity on the path to recovery [for the benefit of nature and people]".

12. The logic of the Post-2020 SAPBIO develops through a hierarchical pattern and terminology analogous to that proposed by the (draft) [CBD/GBF]:

13. Vision (to 2050) / Mission to 2030 / Goals to 2030 / Targets / Actions

14. The Post-2020 SAPBIO is action-oriented, scientifically based, and built through concise realistic Targets and Actions. It tries to avoid any additional layer of commitments for countries, taking advantage of the plans and strategies already adopted at national and international level. Harmonization has been ensured with the [CBD/GBF] (draft), the UN-SDGs, and the UNEP Marine and Coastal Strategy (2019); at the Mediterranean level, with the UNEP/MAP Strategies, including the MSSD 2016-2025 and the MAP/MTS (2022-2027), and all the regional strategic documents and frameworks with a Mediterranean significance. It was developed in parallel to the Post-2020 Regional Strategy on MCPAs and OECMs, which goes into the details on all aspects related to MCPAs and OECMs

15. The Post-2020 SAPBIO subregional assessments proposed 10 priority axes based on the main needs expressed by the countries, which accurately capture the Mediterranean needs, and can be found within the goals, targets, programs, of the [CBD/GBF], and within all the main and most recent regional biodiversity agreements. Clustered under 3 overarching Goals (adapted from the [CBD/GBF]), these 10 headings have been kept in the Post-2020 SAPBIO to follow the "theory of change" that also inspires the [CBD/GBF] (draft) and the UNEP/MCS (2019), methodologically facilitating the precise description of a series of Targets (as outputs) which add up to achieve the Goals and the Mission (the outcome). The Post-2020 SAPBIO Targets directly contribute to the SDGs, [CBD/GBF], UNEP (MCS, MAP/MTS), EU BD Strategy to 2030, and GFCM most recent developments (Annex II.b).

16. The Strategy is focused on narrowing the gap between most and less developed countries and promotes mainstreaming biodiversity into all environmental and sectorial policies relevant for the protection and sustainable use of marine living resources. It incorporates the main emerging issues, such as challenges from climate change, the ecosystem approach, ecosystem services, nature-based solutions, and the need for ecosystem restoration, regarding not only marine but also coastal habitats, such as estuaries, wetlands and dunes.

17. Targets are, as possible, specific, measurable, achievable, relevant and time-bound (SMART); also flexible enough to allow that implementation considers the precise conditions and opportunities of each national context. A total of 27 Targets adress the accessible, direct drivers of biodiversity loss. The Post-2020 SAPBIO is not aimed at coping with the indirect drivers of un-sustainability (e. g. trade and financial principles, business models, production and consumption, mitigating greenhouse gases, chemical pollution, etc) although its Targets and Actions consider those that can be readily influenced by the Strategy.

Goals

18. The Goals, and the summarized statement of their respective Targets, are:

Goal 1 Reduce the threats to biodiversity

ADDRESSING PRESSURES

Target 1.1. on specific and urgent pressures over protected species and habitats
T 1.2 on alien invasive species, sharing databases and controlling introduction pathways, and impacts in the most vulnerable areas
T 1.3 on pollution control, particularly plastics, nutrient leakage, and noise

MARINE AND COASTAL PROTECTED AREAS[1]

T 1.4. on effective systems of MCPAs and OECMs
T 1.5. on areas with enhanced protection levels ~~sea~~

ECOSYSTEM HEALTH

T 1.6. on ecosystem restoration, most of those with the highest relevance and potential
T 1.7. on the achievement of the Good Environmental Status
T 1.8. on climate change mitigation, adaptation, and nature-based solutions

Goal 2 Ensure that biodiversity is preserved and maintained or enhanced in order to meet people's needs

IMPROVED KNOWLEDGE

T 2.1. on the distribution and status of species protected under the SPA/BD Protocol
T 2.2. on sea-floor cartography, status and integrity of threatened habitats
T 2.3. on knowledge sharing (Mediterranean Biodiversity Platform).

SUSTAINABLE FISHERIES

T 2.4. on halting by-catch and illegal, unreported and unregulated fishing
T 2.5. on small-scale fisheries (professional, recreational), particularly in MPAs
T.2.6. on sustainable and biodiversity-friendly aquaculture.

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[1] These targets are in line with what was agreed and elaborated on under the [Draft] Post-2020 regional strategy on MCPA and OECM

MAINSTREAMING BIODIVERSITY

T.2.7. on the ecosystem approach, and marine and coastal spatial planning
T 2.8. on cross-sectoral integration, including tourism, mining, energy
T 2.9. on reinforced governance, compliance, and stakeholder participation

Goal 3 Enable the necessary transformative change, putting in place tools and nature-based solutions for implementation and mainstreaming

IMPLEMENTATION, MONITORING AND REPORTING

T 3.1. on the IMAP refinement and full compliance
T 3.2. on the Post-2020 SAPBIO assessment and reporting mechanisms
T 3.3. on adequate means to run the Post-2020 SAPBIO.

CAPACITY BUILDING AND NETWORKING

T 3.4. on capacity building, particularly in the less developed countries
T 3.5. on networking and knowledge sharing (NIS, migratory species, MPAs, GES…).

OUTREACH AND AWARENESS

T 3.6. on raising awareness, targeting decision-makers, media, and general public
T 3.7. on integrating marine biodiversity into school, higher education, and professional training.

MOBILIZING SUFFICIENT RESOURCES

T 3.8. on employment, notably public, in direct relation to biodiversity conservation
T 3.9. on sustainable funding, national commitments and innovative sources
T 3.10. on international cooperation and increased north/south financial flows

Strategic actions

19. To achieve these Targets, the Post-2020 SAPBIO addresses clear Actions that countries can reasonably attain with the coordination of relevant international organizations and the support of donors and funding agencies. In the spirit of the Barcelona Convention, most of the Post-2020 SAPBIO Actions are designed to support the needs of the less advanced countries, optimizing the north/south collaboration opportunities; the Strategy aims at narrowing the gap between subregions, on underlying concerns such as data availability, GES status, MPA coverage, institutional capacities, disparities in human and financial resources.

20. The proposed Actions build on existing plans and strategies and try to avoid additional layers of institutional requirements. Actions are ambitious and transformational, but realistic, focused and timely to achieve the Targets. Most of the Actions are cross-cutting and serve different Targets. Given the strict selection criteria and the relatively short number of Actions (46 in total), their relevance is defined in just 2 levels of priority: High, or Very High.

21. The expected results of the SAPBIO, through its 42 Actions, are set to 2027 and to 2030, aligning with the timeframes of the [CBD/GBF] (2030) and the BC/MAP/MTS (2027). Each Action, considering not only what needs to be done, but how to achieve it, explains itself and includes a start-up, preparatory activity, e. g. setting the baseline to assess progress (as there may initially be gaps in indicators for new and important subjects in the framework).

22. About one third of the Actions has a regional scope; a larger part is recommended for the National level, where most of the implementation actually takes place; other Actions may have both a Regional and a National scope, or taking account of specificities, a sub-regional or transboundary character.

Strategy implementation and monitoring

23. An effective implementation mechanism is proposed to promote responsibility, accountability and transparency from all actors involved in its implementation, ensuring that all countries define national contributions that add up to the regional Goals and Targets.

24. The Strategy will be monitored as an alive/dynamic document, so the monitoring framework will need flexibility to allow some adaptation at the national level. Countries will identify their monitoring needs for the Post-2020 SAP BIO targets, requesting regional support as appropriate, updating their national monitoring programmes in light of the new elements, to ensure reporting quality data, duly harmonized with IMAP and other UNEP/MAP monitoring frameworks. The Strategy's implementation status will be periodically reviewed at the Conference of the Parties of the Barcelona Convention, through systematic national reporting of progress, facilitated by the relevant MAP Regional Activity Centres.

25. SPA/RAC is assisted by an institutional governance body, the network of Post-2020 SAPBIO National Correspondents, who will assess the progress made in implementing the Strategic Action Programme, suggesting recommendations to be submitted to SPA/BD Focal Points Meetings and, where necessary, proposing amendments to the work schedule. SPA/RAC is also assisted by the Advisory Committee, including nominated representatives by international and regional bodies with technical and scientific expertise in marine and coastal Mediterranean biodiversity issues, science, monitoring, cross-sectorial integration, fisheries, networking, outreach, funding, governance, and policies.

1. INTRODUCTION

26. In 2003, the Contracting Parties to the Barcelona Convention adopted the Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region (SAPBIO). In 2008-2009, SPA/RAC updated the SAPBIO to include the Climate Change component.

27. An evaluation covered the period 2004-2018 and concluded that, besides a series of gaps in its implementation, the SAPBIO constituted a major contribution to the preservation of the natural heritage in the Mediterranean marine and coastal zones; it played an important role as a strategic framework for implementation of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) at national and regional levels in terms of harmonization and alignment of planning for biodiversity conservation. It also played a role in facilitating exchanges among departments within and among countries on common concerns in biodiversity conservation.

28. Protecting biodiversity is a global challenge and the next decade will be decisive. Nature cannot afford any half measures or lack of ambition, as global efforts under the United Nations Convention on Biological Diversity have largely been insufficient. The Barcelona Convention COP 21 requested to prepare in 2020-2021 the Post-2020 SAPBIO to be harmonised with the CBD [Post-2020 Global Biodiversity Framework [GBF]] and aligned with the Sustainable Development Goals. The elaboration process has been conducted during the biennium 2020-2021 with the view of submitting the Post-2020 SAPBIO for consideration by the Contracting Parties at their COP 22 in December 2021.

29. The [Draft] Post 2020-SAPBIO has been developed in parallel to the [Draft] Post-2020 regional strategy on MCPAs and OECMs in the Mediterranean, which was also requested by the COP 21 to the Barcelona Convention. All matters related to MPAs and OECMs are detailed under that strategy.

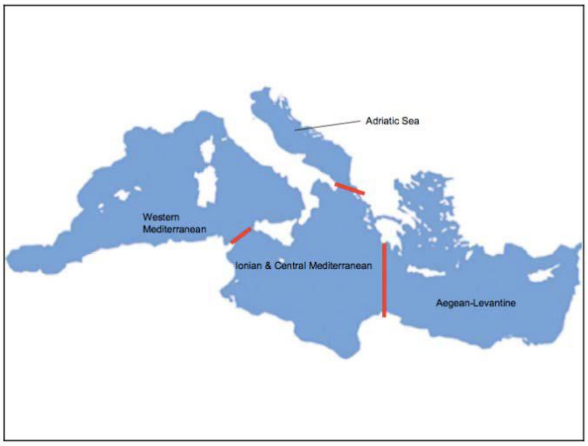
30. While ambitious, the Post-2020 SAPBIO tries to be realistic, concise, and action oriented. It builds on the main needs expressed by the Mediterranean countries at national and sub-regional levels, avoiding additional layers of institutional commitments, to minimize the burden on Parties, the Secretariat and other concerned entities. It aspires to mobilize the existing capacities and to mainstream biodiversity beyond the limits of the conservation community, sharing responsibilities with other marine and coastal governmental departments, civil society organizations, and socio-economic sectors.

31. With a timeframe to 2030, the Post-2020 SAPBIO considers the main emerging issues, as the challenges from climate change, the ecosystem approach, the ecosystem services, the nature-based solutions, and the need for ecosystem restoration, considering marine coastal habitats, such as estuaries, wetlands, and coastal dunes.

2. METHODOLOGICAL PROCESS

32. To deliver this mandate, during 2020 and 2021 SPA/RAC followed a bottom-up approach: the national needs and priorities were identified through 21 country ad-hoc national reports, involving the relevant authorities and stakeholders, and discussed in national workshops.

33. Given the transboundary nature of most of the issues relating to the conservation and sustainable use of marine and coastal biodiversity, the national results were harmonised and the needs prioritised through sub-regional analyses which fed sub-regional workshops. The subregions were agreed by the Contracting Parties within the framework of the Ecosystem Approach process (2) and used for the purpose of the Post-2020 SAPBIO elaboration process Aegean-Levantine; Ionian and Central Mediterranean; Adriatic Sea; and Western Mediterranean. Aegean-Levantine; Ionian and Central Mediterranean; Adriatic Sea; and Western Mediterranean.



34. Each sub-regional workshop delivered an assessment of marine and coastal biodiversity in the concerned sub-region, of the existing or potential threats including interaction with fisheries; and identified priorities for the conservation and sustainable use of marine and coastal biodiversity in each subregion.

35. The Post-2020 SAPBIO indicates the goals and targets to achieve at the regional level and integrates the priority actions identified at the national and sub-regional levels. It also proposes the actions needed at the regional level to support, accompany and coordinate the implementation of the priority actions to be implemented by the countries at the national level. It considers, as appropriate, the lessons learned from the implementation of SAPBIO during the period 2004-2018.

36. Following the mandate from the Contracting Parties, the Post-2020 SAPBIO, while being adapted to the natural specificities, the socio-economic and political contexts of the region, is aligned with the SDGs relevant overarching frameworks and processes at the global level, in particular, the CBD [Post-2020 Global Biodiversity Framework [GBF]]. Harmonization has been ensured with the 2030 Agenda and the UN-SDGs (applicable Goals 3,8,11,13,14,15 17), the Aichi targets (applicable targets 2,4,5,6,7, 10, 11,12,14,15), and the UNEP Marine and Coastal Strategy (2010). At the Mediterranean level, with the UNEP/MAP Strategies, decisions and agreements, including the MSSD 2016-2025 and the MAP/MTS (2022-2027), the ICZM-CRF (2016), the assessments agreed by the Barcelona Convention Contracting Parties in the framework of IMAP and the elaboration of the MED QSR (2017) and SoED (2020), the draft post-2020 strategy for marine and coastal protected areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean, and the regional Action Plans. Also were considered the EU Biodiversity Strategy for 2030, and the related Directives on Marine Framework, Habitats, Birds, and MSP; the GFCM draft strategy to 2030; the ACCOBAMS Strategy 2014-2025; the IUCN (2021) and the WWF (2021) papers for 2030, the 2019-2023 and beyond MedPAN strategy , and the Post 2020 Mediterranean MPA Roadmap that

2 Ecosystem Approach Rodmap: Ecosystem approach, defined by the CBD as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" and complemented by UNEP (2019) as "aiming to manage in an integrated and precautionary manner human uses and their cumulative impacts on marine and coastal ecosystem function at ecological scales, rather than confined to jurisdictional boundaries"

is in development through the Med MPA Forum process.; among others with a Mediterranean significance and several basic scientific papers as detailed in the attached Literature Cited.

37. The content of the Post-2020 SAPBIO is scientifically based and built on concise realistic targets. It avoids any additional layer of commitments for countries, prepared as a tool to streamline the implementation of the plans and strategies already adopted at national and international level. It also promotes the mainstreaming of biodiversity into all environmental and sectorial policies relevant for the sustainable use of marine living resources, such as fisheries.

38. Previous drafts of the Post-2020 SAPBIO were circulated, and recommendations provided on its elaboration and strategic elements, in three meetings of the SAPBIO Advisory Committee (April 2020; April 2021; and May 2021), and a workshop of the SAPBIO National Correspondents (May 2021). The draft Post-2020 SAPBIO will be submitted for consideration by the Barcelona Convention COP 22 in December 2021, after having been reviewed and endorsed by the 15th meeting of SPA/BD Focal Points (June 2021) and MAP Focal Points (September 2021).

3. WHERE ARE WE NOW?

3.1. Mediterranean Sea values

39. The Mediterranean Sea is a hotspot for marine biodiversity and endemism. Seagrass meadows, coralligenous assemblages and dark ecosystems are the most representative marine ecosystems particular to the Mediterranean Sea. Though it covers less than 1% of the ocean surface, it hosts more than 17,000 marine species and contributes to an estimated 4-18% of the world´s known marine species; of these, over 25% are found nowhere else on Earth. Below the 200m it includes a series of unique deep-sea habitats associated to volcanoes, seamounts and mud plains (IUCN 2019). It is a low primary productivity ecosystem due to limited nutrient inputs from fluvial and Atlantic origins; primary production is on average three times lower in the eastern basin than in the western part.

40. The Mediterranean Sea is home to a large share of the world's marine biodiversity but it is also the victim of decades of unsustainable use despite the efforts for an effective management. It is also unique by the severe pressure from human use, intense fisheries, maritime traffic, land-based pollution, the introduction and spread of non-indigenous and invasive alien species. Because of its geographical situation it also suffers most from the impacts of climate change, warming 20% faster than the rest of the world according to the MedECC (2020). Altogether, it represents the highest proportion of threatened marine habitats, with 21% listed as vulnerable and 11% as endangered in the Red List category in the EU28 (Gubai et al 2016), with seagrass ecosystems experiencing the most rapid decline.

3.2. Progress in marine conservation

41. Regional cooperation on environmental matters has remained active in the Mediterranean despite unfavourable geopolitical circumstances. Throughout the last decade, significant progress in addressing sustainability issues in the Mediterranean was achieved, to which the Barcelona Convention system has largely contributed. Contracting Parties have adopted common objectives, monitoring and assessment frameworks.

42. Integration and regional system-based approaches are increasingly recognized as the most efficient way to address systemic factors, and combined pressures and impacts. Progress has been made on integrating the environment into sectoral policies thanks to the Barcelona Convention and the establishment of integrated tools, including the ICZM Protocol, the ecosystem approach, the Mediterranean Strategy for Sustainable Development (MSSD), and the Sustainable Consumption and Production (SCP) Action Plan. Prominently, a Conceptual Framework for Marine Spatial Planning (MSP) was adopted in 2017 for the implementation of the Ecosystem Approach Roadmap, recognising MSP as the main tool for the implementation of ICZM in the marine area of coastal zones.

43. Since 2008, the Contracting Parties to the Barcelona Convention and its Protocols have agreed to gradually apply the ecosystem approach to manage human activities in the Mediterranean, with the ultimate aim of achieving Good Environmental Status (GES) (Decision IG.17/6; 2008). At the same time, Mediterranean countries have adopted common monitoring and assessment frameworks to improve information-based decision-making. An Integrated Monitoring and Assessment Programme (IMAP), as a Mediterranean information system to support data collection, reporting and assessment, is being developed in the context of the MAP system to assess progress towards GES.

44. MPA coverage is in 2021 very close to the 10% Aichi target (9.3% of MPAs and potential OECMs, MAPAMED 2019) at the Mediterranean level, yet weak in effective management for its majority. Recovery of species population and improvement of marine habitats has been recorded, notably in marine protected areas (MPAs) and in the no-take zones (NTZs) that are well managed and enforced.

45. The PSSA and International Marine Park in the Strait of Bonifacio, the Pelagos Sanctuary for Mediterranean marine mammals and the Intercontinental Biosphere Reserve of the Mediterranean are examples of cooperation between neighbouring countries. Transboundary collaboration is increasing around migratory species, NIS/IAS monitoring, MPA management, and fish stock assessments. Multiannual fisheries management plans have also been drawn up between various partners considering the overlap of shared stocks.

46. Based on the Memorandum of Understanding (MoU) between UNEP/MAP and GFCM, collaboration, together with ACCOBAMS, IUCN, Birdlife and MEDASSET, is covering the minimization of discards and incidental catches. GFCM has also collaborated in a strategy to reduce marine litter and underwater noise and put new emphasis on the monitoring of Fishery Restricted Areas (FRAs). A MoU was signed between SPA/RAC and ACCOBAMS for the conservation of cetaceans.

47. All Mediterranean countries have adopted frameworks for ex-ante environmental impact assessment (EIA), whereas 72% have enacted a legal framework for Strategic Environmental Assessment (SEA). Both are also tools for stakeholder information.

48. Stakeholder networks have also expanded and diversified. Programmatic coherence, institutional stimulus, complementarity and coordination have strengthened the role of international non-governmental organizations and stakeholder networks, sharply improving the opportunities for participation and engagement. A growing number of science-based public and citizen organizations actively participate in the implementation of the SPA/BD Protocol and its related programmes and projects, example of which are the Adriatic networks, the MedPAN network; plus the private-public donor trust fund (The MedFund). In addition, a Regional Cooperation Platform on Marine Litter was established in 2016 to exchange best practices, share information and seek solutions.

3.3. **Main problems for the conservation of marine biodiversity**

49. Despite notable progress, Mediterranean countries are not on track to achieve and fully implement the agreed upon goals, including the Sustainable Development Goals (SDGs) and Ecological Objectives for GES. Most observed trends show developments that are either progressing towards the set targets, but at an insufficient rate or unequally across the countries, or even moving away from the target (SoED 2020). Out of 17 SDGs, 11 remain unachieved in all Mediterranean countries, including SDG 13 “climate action”, SDG 14 “life below water”. Nine out of the 21 Mediterranean countries had achieved none of the SDG 2030 targets in 2019 and the maximum number of SDGs achieved by a country is two (Sachs et al. 2019).

50. Administrations in charge of the environment often lack the institutional strength to enforce environmental policy integration. Much remains to be done, as ambitious regional and international environmental agreements are rarely fully implemented on the ground, and important gaps persist in enforcing them. Environment ministries remain generally weak and underfunded. In addition, competition between different economic sectors for the use of marine space is strengthening this lack of intersectoral administrative cooperation.

51. The subregional assessments show that even when legislation is fit for purpose, the implementation on the ground is lagging behind. The main short comes underlined are synthesized below.

52. Every country, and subregion, has identified knowledge gaps for implementing IMAP and for the identification of protection measures for the conservation of species. Knowledge, data availability and sharing, are insufficient and very patchy, due to limited financial (national or regional), technical and institutional capacities. National reports note a great disparity between the northern and the southern shores of the Mediterranean in terms of inventories, mapping and ecological monitoring. Particularly the information about deep-water habitats in the southern part of the basin is very incomplete or missing.

53. Marine mammal populations negative trends persist, falling by over 40% in the last 50 years. More than half of the shark and ray species found in the Mediterranean are classified as endangered. Only around 400 monk seals remain in the Mediterranean (Karamanlidis et al 2015).

54. Seagrass meadows and coralligenous assemblages generate a remarkable natural productivity that contributes to climate change mitigation and adaptation, and the maintenance of fisheries resources, but are threatened by destructive fishing gear, boat anchoring, invasive species, pollution, with reported cases on species’ mass mortality events and slower growing rates (e. g. Otero et al 2013). Coastal wetlands and dune areas also continue to decline as Mediterranean countries increase the built-up area within 1 kilometre of the coastline.

55. Climate change, together with a limited success of control for mitigation and adaptation mechanisms, has accelerated the spread of non-indigenous species, leading to a shift in species composition and the functioning of ecosystems. Changes in the marine food-web are registered throughout. The abundance of top predators, including a number of marine mammals, fell by 41% and fish species declined by 34%, including commercial and non-commercial species, while there is an increase of around 23% of the organisms at the bottom of the food web (e. g. jellyfish) (Piroddi et al. 2017).

56. The invasive alien species, a side effect of shipping (by means of ballast waters and hull fouling), corridors, maritime transport and water ways, aquaculture, trade in live marine organisms (aquarium trade and fishing bait) and others (e. g. fishing activities and aquarium exhibits), enhanced by global warming, are today among the main threats to marine biodiversity in the Mediterranean. More than 1,199 non-indigenous marine species have been recorded in the Mediterranean, 618 of which are established (QSR, UNEP/MAP 2017). Particularly in the Levantine basin, some are causing a huge impact, with the decrease or collapse in native species populations. Marine diseases caused by pathogens are regularly reported, e. g. the massive mortality (over 99%) of the endemic and protected large mother-of-pearl Pinna nobilis, or the harmful phytoplankton blooms which are fatal for shellfish of socio-economic interest. NIS/IAS are a major issue in the Mediterranean, cooperation by all countries is needed to prevent their introduction and spread, within the principle of sharing responsibility.

57. On top of the growing impacts from climate change and the spread of alien species, new challenges arise such as the leakage of marine litter, particularly plastics; while the incidence of underwater noise and the cumulative impacts from these together with all sources of physical and chemical pollution, are still poorly documented and controlled (UNEP / MAP-Plan Bleu, 2020).

58. The MPA coverage is now very close to the 10% target at the Mediterranean level but the current system is still not connected, nor representative of the Mediterranean ecoregions, as most are located in EU waters and in coastal waters, resulting in an under-representation of deeper ecosystems in areas both within and beyond national jurisdiction; while just a tiny 0.06% of the Sea is covered by fully protected areas. The main concern, however, persists in that less than one fourth of the Mediterranean MPAs has a management plan, and less than half of these are effectively implemented (MAPAMED 2019; WWF 2020; UNEP/MAP SPA/RAC 2021). Human, material and financial resources are inadequate, resulting in weak enforcement; regular monitoring activities are almost limited to a few MPAs mainly in some EU countries. The financial gap of marine protected areas in the Mediterranean, as compared to their conservation objectives, is of 700 million euros per year (Binet et al 2016).

59. The 78% of Mediterranean and Black Sea fish stocks are fished at biologically unsustainable levels (FAO/GFCM 2020). The pattern of exploitation and the state of different fish stocks is critical in all Mediterranean subregions. Bycatch of vulnerable marine species threatens the conservation of a variety of marine taxa, including mammals, birds, sea turtles, sharks and rays. Likewise, bycatch of coral, sponge, and other benthic species can also cause damage to important habitats. Illegal, unreported and unregulated fishing (IUU) are still a common factor. Concerns are rising also as related to recreational fisheries, which in some coastal areas exceed in biomass capture to commercial fisheries (e.g. Venturini et al 2017). Annual discards in the Mediterranean are estimated at around 230 000 tonnes (18 percent of the total catch), mainly due to bottom trawl fishery, while small-scale fisheries, by contrast, tend to show discard rates of below 10 percent (FAO/GFCM, 2020). Aquaculture also creates additional pressures on fish stocks, due to the use of wild fish for feed and the transfer of non-indigenous species.

60. Finally, funding sources for marine conservation keeps being a recurring obstacle in all countries, prominently in Southern and Eastern Mediterranean areas. National sources of funding remain largely irregular and insufficient, while development aid levels are falling and donor countries have not lived up to their pledge to ramp up development finance for marine conservation.

4. NEEDS, GAPS AND CHALLENGES

61. The subregional reports concurred in priority needs (Annex I), which have been clustered in the four sections ahead:

4.1. Addressing current pressures and threats

62. All subregional reports underline the need to reach the Good Environmental Status (GES) of the Mediterranean Sea, in contribution to the Ecosystem Approach as an overarching principle. Two key components, consistently underlined, are addressing pressures on biodiversity, and monitoring changes.

63. To ensure that the trends in conservation are reversed by 2030, the patchy knowledge on the distribution and status of protected species and habitats under the SPA/BD Protocol must be improved throughout. There is still strong need to map and inventory habitats, particularly coralligenous, seagrasses, and dark ecosystem to ascertain their status; and to better clarify the status of most sharks, turtles, marine mammals, seabirds, and endangered invertebrates, in order to develop and implement recovery plans for all threatened species, in particular those whose survival depends on such actions, including measures to eliminate all intentional or accidental killing, capture and trade; plus the status of coastal habitats such as wetlands, estuaries and coastal dunes requiring protection measures (Art. 10 of the ICZM Protocol).

64. While countries should hold to their commitment to substantially reduce their CO2 emissions (55% reduction in the EU by 2030, EU 2021), there is strong need to improve knowledge on the impacts and consequences of climate change over coastal and marine ecosystems, and to monitor acidification and its effects on sensitive habitats and species, most appropriately through a network of pilot and representative MPAs. Candidate areas for restoration of carbon-rich ecosystems, areas vulnerable to climate change, as well as important fish spawning and nursery areas should be listed, and restoration activities launched between local, regional, and national authorities, together with citizens, businesses, social partners and the research and knowledge community.

65. Invasive alien species and pathways must be regularly identified in all countries, listing priority species to be controlled or eradicated. Together with the ratification and implementation of the Regional Strategy addressing ballast water management, measures must be established to manage pathways to prevent their introduction, and in support of Mediterranean information networks (e.g. MAMIAS) to share data on alien species and to continuously monitor their trends. Given the wide gaps in research efforts across the countries, knowledge sharing in other biodiversity fields (cartography, threatened species and habitats, MPA management) requires the development or reinforcement of platforms and mechanisms for the exchange of information specific to marine and coastal biodiversity across subregions and the entire Mediterranean. Examples are the very active MedPAN network of Mediterranean MPA managers, and the NETCCOBAMS, the ACCOBAMS online database under construction.

66. Chemical pollution topics in general are addressed separately at MAP level through MEDPOL and related planning and management, with which the Post-2020 SAPBIO will keep synergy and alignment. Regarding the direct physical effects of pollution in species and ecosystems, all subregions share the need to minimize and mitigate every form of solid waste pollution from land-based sources and from the activity of the fishing sector, in particular abandoned, lost or otherwise discarded fishing gear, as well as reducing the level of plastic leakage, by changing how waste is collected and managed in cities and touristic destinations around the Mediterranean. Three subregions also seek responses to reduce the impact of maritime traffic (noise and collision) on sensitive marine species (cetaceans, turtles, others) implementing quieter technologies and designating restricted areas, as proposed by ACCOBAMS. Cumulative impacts should be considered as a main operational requirement for the implementation of the ecosystem approach in the Mediterranean.

4.2. Spatial protection measures

67. Aimed to promote the conservation of biodiversity under the ecosystem approach, all subregions prioritize the reduction of conflicts among overlapping uses by developing marine spatial planning (MSP), integrated coastal zone management (ICZM), and the efficient use of natural resources.

68. Marine protected areas (MPAs) are considered as effective means and pilot sites with real experience on improved marine planning and governance, zoning, sustainable small-scale fisheries, stakeholder participation, and long-term research and monitoring. All subregions propose the enlargement of the marine protected area network, setting up ecological corridors to prevent genetic isolation and to allow for species migration, while making it more representative of the Mediterranean Sea ecoregions, particularly extending to the Southern and Eastern coasts, incorporating Other Effective Area Based Conservation Measures (OECMs), in line with the CBD definition and criteria for OECMs (CBD Decision 14/08), such as protected cultural areas, and military zones where appropriate; also expanding into the open seas through Fisheries Restricted Areas (FRAs of GFCM) and candidate areas in Vulnerable Marine Ecosystems (VME of FAO), Particularly Sea Sensitive Areas (PSSAs of IMO), in all cases when ensuring effective management; favouring their setting within Ecologically or Biologically Significant Marine Areas (EBSAs listed in the CBD repository).

69. Every assessment warns about the weak management situation in most of the already established MPAs and underlines the urgent need for a proper management planning ensuring the effective collaboration between different administrations and stakeholders, the enforcement of regulations, supporting capacity building and the sustainability of human and financial resources for MPAs.

4.3. Mainstreaming biodiversity in other sectors

70. The most recent and comprehensive assessments on the global (UNEP/MCS 2019) and Mediterranean marine biodiversity (MAP/MTS 2020; QSR 2017; SPA/RAC 2019 and 2021; SoED 2020; WWF 2021) identify a series of critical barriers for biodiversity conservation, which are basically consistent across documents, and again with the main gaps and needs identified by the Post-2020 SAPBIO subregional assessments.

71. Although legislation is fit for purpose, implementation on the ground is lagging. The gap between the ambition of international agreements and their implementation at the national and local levels, is sustained because of the insufficient political interest and the limited awareness and engagement in decision-making at the national level where most of the implementation needs to take place.

72. Subregional assessments concur that the administrations in charge of the environment often lack the institutional strength to enforce environmental policy integration. Environment ministries remain generally weak and underfunded. The ambition of specific environmental regulations would benefit from them being upgraded. Beyond marine protected areas, biodiversity conservation needs to share responsibilities with Ministries and socio-economic sectors such as economy, taxation, fisheries, agriculture, tourism, security, energy, academia, coastal cities, and mass communication media.

73. Understanding bycatch and adopting effective measures to reduce its levels represent essential steps towards minimizing discards as well as fisheries' impacts on vulnerable species, and on the marine ecosystem more generally. To support this, mitigation measures and data collection on by-catch for all sensitive species needs to be stepped up. Overfishing should also be urgently phased-out, opposing any illegal, unreported and unregulated fishing. The use of long-lines and of bottom-contacting fishing gear must be reconciled with biodiversity conservation goals. Numerous countries have also expressed concerns about the impacts from the intensive and expanding aquaculture facilities over aquatic health and biosecurity, encouraging the responsible and prudent use of antimicrobials.

74. Inside protected areas, underlining the MPAs recently established, fisheries-management measures must be established, according to conservation objectives incorporating traditional ecological knowledge, to be defined with the local fishers and on the best available scientific advice. Management plans should take into account recreational fisheries, the impacts they generate on resources and ecosystems, and the conflicts arising with professional fishers.

75. The fast expanding coastal and marine tourism activities also need to reduce their footprint and pressure on scarce natural resources, fragile ecosystems and costly environmental infrastructure. Alternative and less seasonal models to mass tourism should be supported, seeking more environmental sustainability and social benefit.

4.4. Enabling tools for marine biodiversity conservation

76. National and subregional assessments underline the necessity to improve coherence and complementarity of all strategies, policies, plans, initiatives, planning processes and funding affecting marine areas. This includes the appropriate coordination between the various authorities competent for both the marine and the land parts of coastal zones in the different administrative services, at all relevant levels, covering the proper participation of all stakeholders, including resource users and civil society, in a transparent decision-making process that would lead to shared and better management decisions.

77. A common need to all the Mediterranean subregions is that of improving the collection of data / information for the regional evaluation of GES and updating the monitoring programmes, so that they are aligned and coherent with the IMAP process, duly harmonized with other UNEP/MAP monitoring frameworks, and avoiding to add another layer of complexity or duplication of efforts in the monitoring requirements. In most of the Mediterranean countries, explicit deadlines and reporting mechanisms on GES are not holding to their commitments and need to be implemented more widely. More particularly, the progress on the implementation of the Post-2020 SAPBIO will also need to be regularly monitored and assessed.

78. Monitoring of coastal and marine biodiversity should cover issues of emerging concern, include drivers, pressures, impacts and responses, and establishing data exchange protocols. At the MPA level, more efficiency can be attained by developing harmonized basic ecological, socio-economic and management descriptors/indicators to obtain comparable MPA monitoring data at the regional scale. National and subregional reports underline the data gaps and their disparity among countries, while critical knowledge is being generated in networks and knowledge hubs, universities, institutions, local assessment or research programmes, or is held by local communities and practitioners, but is insufficiently transmitted to decision makers. Monitoring information should also be accessible to all relevant stakeholders.

79. The effective implementation of the Post-2020 SAPBIO and achieving a good environmental status in the Mediterranean region requires to establish capacity building and awareness frameworks at the national level and also at a regional scale. These should be aimed at policymakers, economic stakeholders involved in marine activities, managers, NGOs or CSOs, universities and researchers, and the media. Particularly underlined was the need to provide capacity building for judiciary and administrative resources along the enforcement chain.

80. Further efforts are required for developing permanent collaboration across specialized stakeholder networks. Multiple innovations have been developed in the last decade and many more are ongoing, with many stakeholders involved often on short-term funding windows. Well-structured capitalization efforts are required to ensure the Post-2020 SAPBIO effectiveness to benefit from the best practices and lessons learned.

81. Most reports suggest the need to improve public access to information, as well as education for sustainable development, particularly in marine conservation matters, including school and universities. At every level the decision-makers, general public, relevant economic sectors and donors must recognize the value of biodiversity. General communications should include simpler messages, new packages, channels and tools, appropriate to reach wider non-biodiversity audiences, decision-makers and donors at all levels.

82. Funding shortages and discontinuity are remarked in every national and subregional biodiversity assessment. Moving beyond the recurring obstacle of funding gaps is essential for the proper implementation of the Post-2020 SAPBIO. A dedicated resource mobilisation strategy is a top priority, calling upon national financial resources and international financial institutions, development partners, public and private actors, to prioritize investment in a more sustainable blue economy. Recurrently mentioned is the importance of reducing or avoiding fiscal instruments and subsidies with a negative impact on the environment, e.g. supporting natural areas destruction (wetlands drainage, dune dumping) or harmful fishing practices.

83. Biodiversity loss threatens our food systems[3], putting our food security and nutrition at risk. Globally, the overall cost/benefit ratio of an effective programme for the conservation of remaining

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3 World Economic Forum (2020), The Global Risks Report 2020.

wild nature is estimated to be at least 100 to 1 4. If well protected, the marine resources of the Mediterranean Sea could deliver assets valued at US$450 billion per year (WWF 2021). An overall Mediterranean cost/benefit analysis is needed; today we know that less than a 15% of the financing needs for effective MPA management in the Mediterranean is being covered (Binet et al 2016), however, the national overall contributions to biodiversity conservation are yet to be assessed.

84. Ministers in the Union for the Mediterranean (UfM 2021) have called upon International Financial Institutions, development partners, public and private actors to prioritize investment in the sustainable blue economy, notably in the domain of preservation of the marine environment. The UNFCCC commitment in response to SDG-13a aims at mobilizing through the Green Climate Fund, US$100 billion annually from all sources to address the needs of developing countries in the context of climate change mitigation actions. The EU Biodiversity Strategy for 2030 calls on unlocking 20 billion EUR/year for biodiversity conservation through various sources, including EU, national and private funding, and integrating biodiversity considerations into business practices. In the last decade, the EU and its Member States also collectively upheld their commitment to double financial flows to developing countries for biodiversity5.

85. Resources from all origins for the implementation of the Post-2020 SAPBIO need to increase substantially and consistently, with greater cooperation among partners, and growing flows towards developing countries. The subregional assessments underline how North-South cross-border collaboration is underdeveloped, and remains dependent on one-off actions within the framework of projects (particularly thanks to European programmes: LIFE, Interreg, H2020, etc.).

86. Other than funding, the main needs identified relate to cross-border projects around priority themes, such as the invasive alien species, the coordination of monitoring systems to facilitate the comparability of data, the identification and recognition of MPAs and OECMs outside national jurisdictions, particularly on high seas in synergy with the ongoing BBNJ processes, and their coordinated management.

5. VISION, GOALS, and TARGETS

5.1. Vision and Mission

87. The Post-2020 SAPBIO Vision 2050 is adapted to Mediterranean context from that of the new CBD Framework:

88. “By 2050, marine and coastal biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy Mediterranean Sea and coast, and delivering benefits essential for nature and people”.

89. The Mission defines what is the strategy’s usefulness, its purpose and approach to reach the Vision: “By 2030 start to reverse the loss of biodiversity and put the Mediterranean marine and coastal biodiversity on the path to recovery for the benefit of nature and people”.

90. The Post-2020 SAPBIO follows a hierarchical pattern and terminology analogous to that proposed by the CBD Framework:

Vision (to 2050) → Mission (to 2030) → Goals (to 2030) → Targets → Actions

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4 Balmford et al. (2002), Economic reasons for conserving wild nature.

5 Including international financing where biodiversity is the principal objective and where it is a significant secondary objective, in line with CBD COP11 Decision XI/4 and EU and Member States financial reports submitted to the Convention on Biological Diversity in 2015 and 2018.

5.2. Goals 2030 for the Post-2020 SAPBIO

91. The Post-2020 SAPBIO subregional assessments, based on the priority needs expressed by the countries, put forward actions under 10 headings (Annex I) that accurately capture the Mediterranean most critical needs. These inspire the Post-2020 SAPBIO headings and targets, which significantly match those of the [draft] [CBD/GBF], and with all the main and most recent Mediterranean biodiversity agreements (correspondences in Table 4 in Annex II). The 10 headings are clustered under 3 overarching Goals, adapted from those of the [CBD/GBF] because of their thematic balance and global relevance:

92. Goal 1. Reduce the threats to biodiversity

93. Goal 2. Ensure that biodiversity is preserved and maintained or enhanced in order to meet people's needs

94. Goal 3. Enable the necessary transformative change, putting in place tools and -solutions for implementation and mainstreaming

5.3. Targets

95. The Post-2020 SAPBIO aims at accomplishing a short number of action Targets (outputs) which add up to achieve the Goals and the Mission (outcome).

96. Targets are, as possible, specific, measurable, achievable, relevant and time-bound (SMART). In total there are 27 Targets, addressing the accessible, direct drivers of biodiversity loss. The Post-2020 SAPBIO is not aimed at coping with general drivers of unsustainability (6), although its Targets and Actions consider those that can be readily influenced by the Strategy.

97. Targets are flexible enough to allow that implementation takes into account the precise conditions and opportunities of each country; their indicators may adapt as needed to each national context, as the *[CBD/GBF] [draft]* suggests, it will be the *"Countries to establish their national targets/indicators aligned with this framework".*

98. Some target components and monitoring elements are difficult to measure due to the current availability of indicators and data. Whilst there may initially be gaps in indicators for new and important subjects in the framework, through specific Actions (see section 6) it should be possible to develop suitable baseline indicators and data over time.

99. The targets (T) are selected based on criteria of high regional significance, responding to the main priorities and opportunities identified in the Post-2020 SAPBIO Subregional reports, adding-up to achieve the Goals, framed within the CBD Framework and its draft Targets and thus, to the SDGs, and harmonized (Annex II) with those proposed/adopted by the other main Mediterranean biodiversity frameworks[7]

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6 Such as e. g. trade and financial principles, circular economy, sustainable production and consumption, business models, mitigation of greenhouse gases, chemical pollution…

7 *EU: MSFD, WFD, MSP, BD Strategy 2030, Habitats Directive; Birds Directive; GFCM Strategy draft 2030; UNEP Marine and Coastal strategy (2019) and reviewed in Nov.2020; MAP/UNEP MTS 2022-2027; IMAP; Barcelona Convention ICZM-CRF (2016), MCPAs & OECMs Strategy (under-preparation); ACCOBAMS Strategy 2014-2025; and c*onsidering targets proposed/adopted by other relevant regional organizations such as IUCN, MedPAN, and WWF.

100. For each of the three Goals, Targets are grouped under headings[8] that stem from the priority axes identified by the Subregional Post-2020 SAPBIO analyses and consultation process undertaken within the framework of the elaboration of the [Draft] Post-2020 SAPBIO conducted following a bottom-up approach.

Goal 1 **Reduce the threats to biodiversity**

ADDRESS PRESSURES

- T 1.1. on specific pressures:

  By 2030 the specific anthropogenic pressures on all habitats and species protected under the SPA/BD Protocol have been minimized, in particular for those whose resilience or survival depends on such actions, including oil and gas activities and seabed mining, ensuring no deterioration in their conservation trends and status.

- T 1.2 on NIS/IAS:

  By 2030, prevent, manage and control NIS and in particular invasive non-indigenous species and their introduction pathways to minimize/reduce their impact on ecosystem integrity, including inter-alia, *by (i) protecting most vulnerable ecosystems (ii) implementing the Regional strategy addressing ship's ballast water management and invasive species in all countries around the Mediterranean Sea and (iii) manage other pathways of introduction.*

- T 1.3 on pollution control

  By 2030 all types of pollution are prevented, controlled and significantly reduced to levels that are not detrimental to ecosystem function and biodiversity, including through the significant reduction of plastic and nutrient leakage into the environment, and the significant reduction of light and noise pollution and the amounts of biocides used.

101. MARINE AND COASTAL PROTECTED AREAS[9]

- T 1.4. on effective systems of MCPAs and OECMs

  By 2030, at least [30] per cent of the Mediterranean Sea is protected and conserved through well connected, ecologically representative and effective ([10]) systems of marine and coastal protected

8 Headings have no relevance for the contents or structure of the Post-2020 SAPBIO, they just allow to ease the flow of the reading

9 These targets are itemized under the Post-2020 regional strategy on MCPA and OECM. A detailed monitoring framework with specific indicators and milestone on MPAs and OECMs will be developed under the Post 2020 regional MPA strategy, and will be proposed for adoption by the COP 23

10 Effective systems are understood to comprise the four components identified by the IUCN Green List standards: Good governance; sound design and planning, management effectiveness and achieving conservation outcomes. https://iucngreenlist.org

areas and other effective area-based conservation measures, ensuring adequate geographical balance, with the focus on areas particularly important for biodiversity.

- T 1.5. on areas with enhanced protection levels

  By 2030, the number and coverage of marine and coastal protected areas with enhanced protection levels is increased, contributing to the recovery of marine ecosystems

102. ECOSYSTEM HEALTH

- T 1.6. on ecosystem restoration

  By 2027 develop the full inventory of ecosystems with the highest ecological relevance and/or regeneration potential (as nursery areas and/or carbon stocks), and by 2030 complete the restoration of most of those selected.

- T 1.7. on the achievement of GES[11]

  Related to the biodiversity Ecological Objectives within the framework of the Ecosystem Approach EcAp/IMAP, by 2027 the Mediterranean Sea is on track to achieving the Good Environmental Status, and 100% countries have identified, and in case needed received support, to fill the gaps that hinder good GES evaluation, so that by 2030 most of the countries have reached appropriate GES in an effective implementation of the Ecosystem Approach and its roadmap.

- T 1.8. on climate change

  By 2030, all countries have adopted and implemented measures for climate change mitigation and adaptation, particularly to warming, acidification. and to disaster risk reduction, from reducing emissions, nature-based solutions, ecosystem-based approaches, and restoration as appropriate, ensuring resilience and minimizing any negative impacts on biodiversity.

Goal 2 **Ensure that biodiversity is preserved and maintained or enhanced in order to meet people's needs**

103. IMPROVE KNOWLEDGE

- T 2.1. Improve knowledge on threatened species

  The georeferenced distribution, values and status of marine species protected under the SPA/BD Protocol is established, and information gaps have been filled to improve the conservation status of all marine and coastal species covered by Mediterranean Regional Action Plans.

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11 Good Environmental Status for the Mediterranean is understood as described in annex I of "Decision IG.21/3 on the Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and targets", adopted at the 18th Ordinary Meeting of the Contracting Parties to the Barcelona Convention, available online: https://www.rac-spa.org/sites/default/files/ecap/ig21_3_eng.pdf

- T 2.2. Improve knowledge on threatened habitats

  By 2030 the sea-floor integrity is maintained, especially in priority benthic and dark habitats, together with critical habitats for species listed in Annex II of the SPA/BD Protocol, and the status, distribution, trends, and functional aspects of habitats protected under the SPA/BD Protocol is established and mapped at highest feasible resolution for all MPAs and OECMs, continuously monitored and shared through a biodiversity platform.

- T 2.3. on knowledge sharing

  By 2027 georeferenced Information on Mediterranean Biodiversity key components is centralized in an open access platform.

104. SUSTAINABLE FISHERIES

- T 2.4. on fishing gears, by-catch, IUU

  By 2027 start in all countries the implementation of science-based management plans to effectively regulate sustainable harvesting and to end overfishing, illegal, unreported and unregulated fishing, including measures to minimize discards and to eliminate all intentional or accidental killing, capture and trade of protected species, so by 2030 all ecologically destructive and unsustainable fishing practices have been halted by limiting the use of fishing gears most harmful to biodiversity, including on the seabed, as appropriate according to the impact of each specific fishery on marine ecosystems and/or vulnerable species.

- T 2.5. on small-scale fisheries (artisanal, recreational)

  Promote shared responsibility and strong participatory management practices in professional small-scale fisheries, advised by traditional ecological knowledge and the best available science, by 2027 in all MPAs, with controlled IUU and recreational fishing, and by 2030 in all fishing grounds within OECMs.

- T.2.6. on sustainable and biodiversity-friendly aquaculture

  By developing the Post-2020 GFCM Aquaculture and Fisheries strategy, and in synergy with the relevant work on pollution from aquaculture led by MEDPOL, in 2027 the best practices in aquaculture, such as innovation, improving aquatic health and biosecurity, encouraging the responsible use of antimicrobials, supported by certification, traceability and nature-based solutions, have been promoted across the Mediterranean countries, so that by 2030 the Mediterranean aquaculture industry is transformed in line with the ecosystem approach, through science-based solutions and marine spatial planning tools.

105. MAINSTREAMING BIODIVERSITY

- T.2.7. on the ecosystem approach and marine and coastal spatial planning

  By 2030, 100% of MPAs and as appropriate OECMs, and 50% of the remaining marine areas are sustainably managed by applying ecosystem-based approaches including biodiversity and climate change-informed marine spatial planning, and by conducting environmental impact assessments and strategic environmental assessments.

- T 2.8. on cross-sectoral integration and biodiversity accounts

  By 2030, biodiversity values and related targets have been integrated into national and local development strategies and planning processes and are being incorporated into national policies, national accounting as appropriate, and reporting systems, ensuring that biodiversity values are mainstreamed across all sectors and integrated into the assessment of environmental impacts.

- T 2.9. on governance and stakeholder participation

  By 2030 the ratification of all protocols of the Barcelona Convention and their enactment in national legislation has significantly advanced, enhancing the necessary political will to apply all processes of the Barcelona Convention, a governance framework ensuring co-responsibility and co-ownership by all relevant actors in meeting the Post-2020 SAPBIO commitments has been developed, including raising the profile of environmental administrations, supporting cross-sectorial and multi-level institutional coordination, administrative transparency, stakeholder dialogue, and participatory governance at different levels.

  Goal 3 **Enable the necessary transformative change, putting in place too ls and nature-based solutions for implementation and mainstreaming**

106. IMPLEMENTATION, MONITORING AND REPORTING

- T 3.1. on the IMAP compliance

  By 2027 most countries conduct baseline conservation, monitoring and assessment studies, update national monitoring programmes in light of the new elements of IMAP, and report regularly quality assured data, with a 100% of countries by 2030.

- T 3.2. on the SAPBIO assessment and reporting

  By 2025, countries have identified their national contributions and targets for the implementation of the Post-2020 SAPBIO, enacting national legislation and updating their NBSAPs as appropriate, reporting and reviewing periodically the status of implementation of the Post-2020 SAPBIO at the COP of the Barcelona Convention.

- T 3.3. Means for the assessment mechanisms

  By 2025, the necessary means for running the regional Post-2020 SAPBIO follow-up and assessment mechanisms, are in place within the MAP system, allowing the timely analysis of progress based on objective/numerical elements of targets towards the Post-2020 SAPBIO goals and targets.

107. CAPACITY BUILDING AND NETWORKING

- T 3.4. on capacity development

  By 2030, key officers, managers, field technicians, and local authorities responsible for the environment, fisheries, and enforcement, are sufficiently trained for the implementation of the Post-2020 SAPBIO in their respective professional environments.

- T 3.5. on networking and knowledge sharing

  By 2025 assess the knowledge sharing and networking needs and opportunities, inter alia on topics as NIS/IAS, migratory species, MPA management, GES, monitoring, law enforcement, and other relevant activities related to the Post-2020 SAPBIO, so that by 2030 any needed human networks at national, sub-regional and regional level have been developed and strengthened to ensure the enhancement of capacities, knowledge, good practices, experience sharing, and the development of joint actions.

108. OUTREACH AND AWARENESS

- T 3.6. on public awareness

  By 2025 outline a communications and awareness strategy, including the development of any necessary indicators to follow-up the extent and reach of awareness, so that by 2030 quality information is available for the effective management of biodiversity, and significant progress has been made to increase awareness, understanding and appreciating of the values and threats to the marine environment, of the responses and good practices, by targeting decision-makers and the general public, through reinforced and renewed mechanisms, including mass communications.

- T 3.7. on outreach and education

  Contracting parties, with the assistance of SPA/RAC, should help integrate marine biodiversity and ecosystems into school, higher education and professional training, incorporating the biodiversity conservation and related strategies and tools into the curricula in as many countries as possible, and by 2030, supporting multidisciplinary scientific research, strengthening citizen science, ensuring that best practices and innovative technologies are more accessible, and replicable, within policy makers, industry and civil society.

109. MOBILIZING SUFFICIENT RESOURCES

- T 3.8. on employment

  By 2030, employment in direct relation to biodiversity conservation, particularly in the public sector (or redirecting the existing one) has increased by 300%.

- T 3.9. on sustainable funding sources

  By 2027 at the Mediterranean level, and at the national level in most countries, sustainable funding strategies have been developed, with innovative approaches to mobilize alternative financial sources, covering fiscal incomes that could be redistributed, and relevant actions to fund, including regional funds and other type of national or local financing mechanisms, so that by 2030 there is a significant increase of financial and non-financial resources from all international and domestic sources, including governmental, non-governmental, and private actors from different sectors.

- T 3.10. on cooperation

  Increase cooperation both north/south and between governmental and non-governmental actors at different levels, to support national plans particularly in southern Mediterranean countries and non-EU countries, identifying potential donors and by 2023 organise a conference of donors for the implementation of the Post-2020 SAPBIO, achieving by 2030 a significant increase in the international financial flows on biodiversity conservation towards developing countries.

6. PROPOSAL FOR ACTIONS

110. The Post-2020 SAPBIO addresses clear actions that countries can reasonably achieve with the coordination of relevant international organizations and the support of donors and funding agencies.

111. The number of Actions is kept short as possible. The main criteria for their selection are:

- Concrete Actions building on the main needs expressed by the Mediterranean countries at national and sub-regional levels (Annex I).
- Supporting the needs of the less advanced countries, optimizing the north/south collaboration opportunities, trying to narrow the gap between subregions.
- Cross-cutting Actions which serve different Targets[12]

112. The Actions try to be ambitious and transformational, but realistic, relevant, focused and timely to achieve the Targets.

113. The proposed Actions provide a thematic and geographical balance, and try to avoid additional layers of institutional requirements, engaging other actors, seeking for complementary, building as possible on existing plans and strategies[13] and on what already works, as identified in the subregional and national reports.

114. Timelines and indicators are set to 2027 and to 2030 (Annex III); trying to consider not only what needs to be done, but how to achieve it, each Action includes a start-up, preparatory activity, e. g. setting the baseline to assess progress.

115. The Post-2020 SAPBIO is a Mediterranean framework (saving any clear subregional specificities), providing the setting to which only minor adjustments will be done at the national level.

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12 For example, some Targets need several Actions, e. g. *"MPA management"* has Actions in governance, monitoring, capacity building, funding…

13 NAPs, IMAP and data sharing, NIS/IAS and migratory species, expanding EIA/SEA, GES, MSP, Natura 2000, FRAs and other tools; GFCM Strategy, EU Third country incentives, regional and subregional initiatives from specialized NGOs, networks, academia...

A large part of the Actions is recommended for the National level, where most of the implementation takes place on issues as e. g. pressures on biodiversity, monitoring, MPA coverage/management, enforcement, integration of non-conservation sectors. Actions expressed by all 4 sub-regions are considered as a priority at the Mediterranean level, without reducing the importance of others which may be relevant for a given subregion or for a part of the Mediterranean Sea. Some Actions may have both a Regional and National scope; and taking account of specificities, other Actions have a sub-regional or transboundary character.

116. Each Action presents timelines to 2027 and to 2030, in which progress of measures taken will be assessed. Given the strict selection criteria and the relatively short number of Actions, their relevance is defined in just 2 levels of priority: High, or Very High.

117. The table in Annex III presents 42 Actions and their expected results for 2027 and 2030, also recommending their start-up activities, on the following subjects:

118. GOAL 1

1. SPECIES PLANS
2. URGENT SPECIES RECOVERY
3. MARITIME TRAFFIC
4. NIS/IAS COMMITMENT
5. NIS/IAS CAPACITY
6. NIS/IAS CONTROL AND MONITORING
7. LITTER
8. EIA/SEA
9. WIND ENERGY
10. .MINERALS
11. SPATIAL PLANNING
12. RESTORATION
13. CLIMATE CHANGE
14. GOOD ENVIRONMENTAL STATUS
15. EFFECTIVE SYSTEMS OF MCPAs AND OECMs

119. GOAL 2

16. BIODIVERSITY PLATFORM
17. INVERTEBRATES (status)
18. VERTEBRATES (status)
19. HABITATS
20. NIS/IAS (data bases)
21. OVERFISHING and IUU
22. BY-CATCH AND FISHERIES PLANNING
23. SMALL SCALE FISHERIES (incl. recreational)
24. AQUACULTURE
25. TOURISM
26. INTEGRATING BIODIVERSITY
27. STREAMLINE Post-2020 SAPBIO
28. POLITICAL WILL AND COORDINATION
29. STAKEHOLDER PARTICIPATION
30. UP-DOWN BOTTOM-UP INTERNATIONAL COMMITMENTS
31. COMPLIANCE AND ENFORCEMENT

120. **GOAL3**

32. IMAP REFINEMENT
33. IMAP IMPLEMENTATION
34. Post-2020 SAPBIO MONITORING
35. SUPPORT TO RUN the Post-2020 SAPBIO
36. CAPACITY BUILDING FOR THE Post-2020 SAPBIO AT NATIONAL LEVEL
37. NETWORKING AND COMMON KNOWLEDGE
38. AWARENESS
39. OUTREACH AND EDUCATION
40. EMPLOYMENT
41. SUSTAINABLE FUNDING
42. COOPERATION

7. SAPBIO IMPLEMENTATION AND MONITORING PROGRESS

121. The success of the Post-2020 SAPBIO largely relies on the cooperation among Contracting Parties supported by international organisations, institutions and fora. A strong and effective implementation mechanism promoting responsibility, accountability and transparency from all actors involved in its implementation is proposed to ensure that Mediterranean countries define national contributions that add up to the regional Goals and Targets.

122. Targets and Actions which are quantified will serve as indicators of implementation progress. By 2022 a Table on monitoring tools will be distributed so that by 2025 countries will have identified their national contributions and targets for the implementation of the Strategy, updated their NBSAPs as appropriate, reviewed their national monitoring programmes in light of the new elements, duly harmonized with IMAP and other UNEP/MAP monitoring frameworks, avoiding duplication of efforts for reporting and reviewing periodically the status of implementation of the Post-2020 SAPBIO at the COP of the Barcelona Convention. Also, by 2025, the necessary means for running the regional Post-2020 SAPBIO assessment mechanisms should be in place within the MAP system, allowing the timely analysis of progress based on objective/numerical elements of targets towards the Strategy Goals.

123. The Strategy will be monitored as an alive/dynamic document, so the monitoring framework will need flexibility to allow adaptation. The Post-2020 SAPBIO implementation status will be periodically reviewed at the Conference of the Parties of the Barcelona Convention, through systematic national reporting of progress, facilitated by the relevant Regional Activity Centres. The reports will include progress with regards to the implementation of the national contributions to the Post-2020 SAPBIO, and data on the Common Indicators of the Integrated Monitoring and Assessment Programme (IMAP) to monitor the effectiveness of the actions put in place[14], altogether building the basis of a Mediterranean assessment on the collective implementation of the SAP BIO, to ensure that by 2030 the regional targets are achieved through the compilation of national and regional actions.

14 The validity of the IMAP will be reviewed once at the end of every ecosystem approach six-year cycle, and in addition it should be updated and revised as necessary on a biennial basis, based on lessons learnt of the implementation of the IMAP and on new scientific and policy developments.

124. The Barcelona Convention provides a two-fold mechanism to ensure enforcement of its provisions, which have yet to be fully enacted: (i) the Compliance Committee and (ii) reports by the Contracting Parties on the measures implemented and their effectiveness (Article 26 of the SPA/BD Protocol), reviewed by the Conference of the Parties to recommend potential corrective measures (Article 27 of the SPA/BD Protocol).

Post-2020 SAPBIO National Correspondents:

125. SPA/RAC has, as institutional governance body, a network of Post-2020 SAPBIO National Correspondents, with a member from each state that is Party to the Convention, appointed by the country's authorities. The ToRs of their mandate are presented in Annex IV. The National Correspondent is for several Mediterranean countries the same person as the SPA / BD Focal Point. She/he ensures liaison with SPA/RAC on the technical and scientific aspects of implementing the Post-2020 SAPBIO in her/his country, in particular, but also at the Mediterranean level.

126. Post-2020 SAPBIO National Correspondents will assess the progress made in implementing the Strategic Action Programme and update the work and projects scheduled. In close consultation with the SPA/BD Focal Points they will act on:

- Identifying and establishing appropriate contacts with the national institutions/bodies concerned with the implementation of Post-2020 SAP BIO Programme;
- Organizing, with the support and assistance of SPA/RAC, the national consultation process/workshop, eventual updating, needed for the implementation of the Post-2020 SAPBIO and in particular the preparation of projects and the implementation of NAPs;
- Passing on information and communication regarding SAPBIO from the national side to SPA/RAC and to the Network, and vice-versa;

127. In the light of this assessment, the Meeting of Post-2020 SAPBIO National Correspondents suggests recommendations to be submitted to SPA/BD Focal Points Meeting and, where necessary, proposes amendments to the work schedule. Meetings of the Post-2020 SAPBIO National Correspondents, if not decided otherwise, would be convened once a year.

128. The National Correspondent, to carry out her/his tasks, must necessarily be supported by resource persons, to be identified at national level, including by NGOs and the National Focal Points of the organizations that are members of the Advisory Committee.

Post-2020 Advisory Committee:

129. The SAPBIO Advisory Committee is a regional institutional governance body envisaged since the first SAPBIO adopted in December 2003, to act as advisory, not steering, character.

130. The Advisory Committee includes nominated representatives by international and Mediterranean regional bodies with technical and scientific expertise in marine and coastal Mediterranean biodiversity issues and policies.

131. To promote coordination and avoid duplication, the Post-2020 SAP BIO takes due account of what already has been developed at the national and regional levels, so it is established to (I) ensure co-ordination with the relevant organisations and (II) provide SPA/RAC with technical and scientific advice in the process of the Post-2020 SAPBIO elaboration and implementation.

132. In particular, the Committee will provide for:

- Technical and scientific advice concerning the process of elaboration and implementation of Post -2020 SAPBIO;
- Periodic inventory of relevant activities already realised in the region. For that aim, each member organisation will provide the committee with lists of its activities and outputs done in connection with the Post -2020 SAPBIO;
- Flow and exchange of relevant information on activities implemented, on-going or planned by the member organizations, within the Committee membership and with SPA/RAC;
- Harmonization, as appropriate, of activities and results of member organizations concerning issues of relevance for Post -2020 SAPBIO.

133. It is understood that member organizations, besides their participation in the activities directly related to the Advisory Committee itself, may be involved in some national and/or regional activities of Post-2020 SAPBIO.

134. Membership of the Post-2020 SAP BIO Advisory Committee can be updated every two years. Each member organisation is invited to keep the same representative in the Advisory Committee and to ensure continuity, through appropriate transfer of files, in case of a necessary change.

135. Meetings, if not decided otherwise, would be convened once a year. The ToRs of their mandate are presented in Annex V.

List of ANNEXES

List of ACHRONYMS

ABNJ	Areas Beyond National Jurisdiction
ACCOBAMS	Agreement for the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
BC	Barcelona Convention
BD	Biodiversity
BWM	The International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004
CBD	Convention on Biological Diversity
CBD/GBF	Convention on Biological Diversity/Global Biodiversity Framework *(draft)*
CC	Climate Change
COP	Conference of the Parties
EBSAs	Ecologically or Biologically Significant Marine Areas (from CBD)
EIA	Environmental Impact Assessment
EO	Ecological Objective
EU	European Union
EWS	Early Warning System (for climate change)
FAO	UN Food and Agriculture Organization
FVGSS	Voluntary Guidelines for Securing Small Scale Fisheries
FRA	Fisheries Restricted Area (designated by the GFCM)
GEF	Global Environment Facility
GES	Good Environmental Status
GNI	Gross National Income
GFCM	General Fisheries Commission for the Mediterranean (FAO)
ICZM	Integrated Coastal Zone Management
ICZM/CRF	ICZM Common Regional Framework (2016)
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast
IMO	International Maritime Organization
IUCN	International Union for Conservation of Nature

IUU	Illegal, Unreported and Unregulated Fisheries
MAMIAS	Marine Mediterranean Invasive Alien Species Database
MAP	Mediterranean Action Plan
MAP/MTS	MAP Mid-term Strategy 2022-2027
OECM	Other Effective areas-based Conservation Measures
MAPAMED	Marine Protected Areas in the Mediterranean
MedECC	Mediterranean Experts on Climate and Environmental Change
MedFund	Environmental Fund for Mediterranean Marine Protected Areas
MedPAN	Mediterranean MPA managers' network
MED POL	Programme for the Assessment and Control of Marine Pollution in the Mediterranean
MoU	Memorandum of Understanding
MPAs	Marine Protected Areas
MSFD	EU Marine Strategy Framework Directive
MSP	Marine Spatial Planning
MSSD	Mediterranean Strategy for Sustainable Development 2016-2025
NB SAPs	National Biodiversity Strategies and Action Plans
NETCCOBAMS	Network on the Conservation of Cetaceans of the Black Sea, the Mediterranean and the Adjacent Atlantic Area
NGOs	Non-governmental Organizations
NIS/IAS	Non Indigenous Species / Invasive Alien Species
NTZs	No-take zones
ODA	Official Development Assistance
OECMs	Other Effective Conservation Measures
PSSAs	Particularly Sensitive Sea Areas (of IMO)
QSR	Quality Status Report in the Mediterranean (UNEP/MAP 2017)
RSP	Regional Seas Programme (UNEP)
SAPBIO	Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region (2004-2018)
SCP	Sustainable Consumption and Production
SDGs	United Nations Agenda 2030 Sustainable Development Goals
SEA	Strategic Environmental Assessment

SMART	Specific, Measurable, Achievable, Relevant and Time-bound
SoED	State of the Environment and Development in the Mediterranean (2020)
SPA/BD	Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Protocol to the Barcelona Convention)
SPA/RAC	Specially Protected Areas Regional Activity Centre
SPAMI	Specially Protected Area of Mediterranean Importance
SSF	Small-scale Fisheries
ToRs	Terms of reference
UfM	Union for the Mediterranean
UN	United Nations
UNEP	United Nations Environment Programme
UNEP/MCS	UNEP Marine and Coastal Strategy (2019)
UNWTO	UN World Tourism Organization
VME	Vulnerable Marine Ecosystems (of FAO)
WWF	World Wide Fund for Nature

ANNEX I

Needs, gaps and challenges identified by the subregional assessments

ANNEX I

Needs, gaps and challenges identified by the subregional assessments

	ADRIATIC	*AEGEAN-LEVANTINE*	*IONIAN – CENTRAL*	*WESTERN*
1. Addressing current pressures and threats	-NIS/IAS -Climate changes -Maritime traffic	-NIS/IAS -Climate changes -Maritime traffic	-NIS/IAS identify GES Thresholds and control	-NIS/IAS -Pollution, noise -Cumulative effects and restauration of disturbed habitats
2. Spatial protection measures	-New MPAs -Improvement of MPA management -Coastal Wetland management	-New MPAs -Improvement of MPA management -Coastal Wetland management	-Adaptive management approach in MPAs	-New MPAs and OECM -Increase strictly protected areas -Effective management
3. Ecosystem health	-Adopt the EcAp to achieve GES. -CC stressors and impacts	-Adopt the Ecosystem Approach (EcAp) to achieve the GES. -Fully understand effects of CC	-Include habitat -restoration in national legislations. -Value ecosystem services, assess -impacts and consequences of climate change	-CC monitoring of impacts over BD. Improve data collection for the evaluation of GES -Promote restoration of disturbed habitats
4. Improve knowledge on biodiversity	-Inventorying, mapping and monitoring of priority habitats and status of species	-Habitats -Biodiversity components -Adequate knowledge on NIS and IAS	-Filling important gaps -Harmonized monitoring	-Inventories , mapping of habitats and species -Synergies in data collection and monitoring (Improve data through IMAP)
5. Sustainable fisheries	-Improved surveillance of IUU fisheries, and fisheries interactions with BD	-Improved surveillance of IUU fisheries -focus on by-catch and fisheries interactions with BD	-Overexploitation of fish stocks, assess bycatch of non-target species, and discards. Assess and control recreational fisheries	-Stocks overexploited. -Establish effective mechanisms to limit IUU fishing - Assess recreational fisheries
6. Mainstreaming biodiversity in other sectors	-Improvement of cooperation between different sectors and stakeholders involvement	-Cooperation between sectors, ministries responsible for nature conservation/fisheries	-Integration of biodiversity protection tools with relevant economic and social policies and sectoral or intersectoral plans -Identification of ecosystem services	-MSP /ICZM -Integration of biodiversity at the country's local levels -Citizen science -Promote gender and equity concepts
	ADRIATIC	*AEGEAN-LEVANTINE*	*IONIAN – CENTRAL*	*WESTERN*

7. Legislation framework /Conservation Policies	- Improvement of legislative framework - Development of national action plans for marine species and habitats	- Development of new National Biodiversity Strategies. - Address CC in legal frameworks	- Harmonise legislations and foster sub-regional collaboration to implement them	- Improve legal frameworks for OECMs
8. Capacity building	- Improvement of institutional and human capacities, and expertise for GES assessment under IMAP or MSFD	- Improvement of institutional and human capacities, and expertise for GES assessment under IMAP or MSFD	- Map and assess the human and institutional capacities to define capacity-building needs	- Capacity building for managers, field technicians, local authorities
9. Outreach and awareness raising	- General public specific marine sectors	- General public or specific marine sectors	- Training and awareness to reduce mortality deriving from bycatch -	- For the involvement and support of civil society in the objectives of MPAs
10. Financing	- Stable financial resources for monitoring, MPAs and conservation actions	- Stable financial resources for monitoring, MPAs and conservation actions	- Funding using existing sources at national, regional and international levels	- Strengthening the capacity of MPAs to develop long-term financial mechanisms to support their management

ANNEX II

Correspondences of the Post-2020 SAPBIO Targets with the international biodiversity-related frameworks

ANNEX II

a) Coincidences among the Needs identified at the subregional level, and the objectives in the main marine biodiversity frameworks

	SDGs	*[CBD/GBF]*	EU BD Strategy for 2030	UNEP/MCS	MAP/MTS 2022-2027	ACCOBAMS Str.2014-25
1. Addressing current pressures & threats	G.14	T.3 /T.5 /T.6 /T.14	Key Commitment	Obj.2	Progr.2, EO 1,2,5	Chapter B2
2. Spatial protection measures	G.14.5	T.1 / T.2	MSP, MPAs, OECM	Strat.Obj.3	Pr.2, Output	B5.1
3. Ecosystem health	G.13 / G.14.1	T.6 /T.7/T.10	Key Commitment.	Objs.2 and 4	Pr.2, EO 6	B2.2 & B.2.3
4. Improve knowledge on BD	G.14.2	T.19	Enabling condition	Expected Outcome	Progr.2	Ch.B1
5. Sustainable fisheries	G.14.4, 14.6	T.4 /T.17	Key Commitment.	Obj.3	Pr.2, EO 3 & 4	Ch.B2
6. Mainstreaming BD in other sectors	G.17	T.13 /T.14 /T.17	Key Commitment.	Obj.1	Progr.2	Ch.A2
7. Legislat. Framewk / Conservat.Policies	G.14.c	T.20	Enabling condition	Obj.3	Progr.2	Ch.A4
8. Capacity building	G.13.3	T.19	Key Commitment.	Obj.3	Progr.2	Ch.B4
9. Outreach and awareness raising	G.13.3	T.19	Key Commitment.	Expected Outcome	Progr.2	Ch.B3
10. Financing	G.17/1.4.6.9.	T.18	Key Commitment.	Strat.Obj. 4.a	Core Prod.7	Ch. A3

b) Contribution of the Post-2020 SAPBIO Targets to the main frameworks of relevance for biodiversity

Post-2020 SAPBIO TARGET	**UN SDG**	***[CBD/GBF] (draft)* Target**	**EU Biodiversity Strat. 2030 Commitments**	**UNEP/MCS Strategic Objectives & Outcomes**	**MAP/MTS 2022-2027 Prog., EOs, & Core Prod.**	**GFCM Str. 2030 *(draft)***
GOAL 1						
1.1. Specific pressures	G.14.2	T.3	Key Commitment.	Str.Obj.2	Progr.2, EO 1,2,5	Target 1
1.2. NIS/IAS	G.14.2	T.5	Action 2.2.10		Progr.2 EO.2	
1.3. Pollution	G.14.1	T.6	Action 2.2.9	Str.Obj. 2.1	Pr.2, EO 6	Target 1.4
1.4. MPCA/OECM effective systems	G.14.5	T.1 / T.2	Specific Commitment & Key Action	Str.Obj.3.d	Pr.2 Output	Target 1FRAs
1.5. MPCA/OECM enhanced protection	G.14.2	T.2	Key Commitment & Key Action	Str.Obj.3.d	Pr.2 Output	
1.6. Restoration	G.13.1.	T.6/T.7/T.10	Specific Commitment	Str.Obj.3c & 4	Key deliverable	
1.7. GES	G.13 / G.14	T.6 / T.10	MSFD Directive		Several EOs	
1.8. Climate change	G.13 / G.14.1	T.7/T.10	Specific and Key Commitment	Str.Obj.4	Progr.3 & Core Prod. 9	Target 1.4
GOAL 2						
2.1. Species	G.14.2	T.3	Key Commitment		Progr.2 EO.1	
2.2. Habitats	G.14.2	T.3	Key Commitment		Prog.2 EO.1, 5	
2.3. Knowledge	G.14.2, 14.a	T.19	Enabling condition	Expected Outcome	Progr.2 Core Prod.10	
2.4. By-catch, IUU	G.14.4, 14.6	T.4 /T.17	Key Commitment.	Str.Obj.3.e	Pr.2, EO 3 & 4	Target 2
2.5. SSF	G.14.b	T.3 /T.8 /T.9		Str.Obj.2.c		Target 4.4
2.6. Aquaculture	G.14.c	T.9, T.14	Aquacult. Strategic Guidelines (2021)	Str.Obj. 2.b	Core Prod. 8	Target 3
2.7. EcAp/MSP	G.14.5	T.1 / T.2	MSP Directive	Str.Obj.3	Pr.2, Output	
2.8. Biodiversity Integration	G.13.2., G.17	T.13 / T.17	Key Commitment.	Str.Obj.1 & 2	Progr.2	
2.9. Governance	G.14.c	T.20	Specific Commitment	Str.Obj.3.a	Progr.2	Target 2
GOAL 3						
3.1. IMAP, monit	G.14a	T.19, T(iii)	MSFD Directive	Exp. Outcome	Core Prod. 7	
3.2. SAPBIO assessment	G.17.1	T(i) (iii)		Exp. Outcome	Core Prod. 1	
3.3. SAPBIO running	G.17.6 17.9	T.18		Exp. Outcome	Core. Prod. 1	
3.4. Capacity building	G.13.3 G.17.9	T.19	Key Commitment	Str.Obj.3	Progr.2	Target 5.1
3.5. Networking	G.14.3 /G.17.6	T(ii)	Enabling Condit. 3.3.4	Exp. Outcome	Core Prod. 12	
3.6. Awareness	G.13.3	T.15, T.19		Exp. Outcome	Progr.6 & 7	
3.7. Outreach	G.13.3	T.19	Key Commitment.	Exp. Outcome	Progr.7, Core Prod. 11	
3.8. Employment on biodiversity		T.18		Exp. Outcome		
3.9. Funding	G.17.1.4.6.9.	T.18	Specific Commitment	Str.Obj. 4.a	Core Prod.7	
3.10. Cooperation	G.17.2, 17.4	T.18	Enabling condition	Str.Obj. 3.1.		Target 5.2

ANNEX III

Post-2020 SAPBIO Actions Table

ANNEX III

Post-2020 SAPBIO Actions Table

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
GOAL 1							
1. SPECIES AND HABITATS PLANS **Update Mediterranean action plans for selected species and habitats listed under the SPA/BD Protocol**	T1.1. T2.1. T2.2.	Establish the list of priority habitats and species which are not in GES category, including recent updates to Annexes II and III of the SPA / BD Protocol, and the new 2019 habitat classification	The updated regional action plans for the selected priority habitats and species are adopted and passed on to national planning and implementation processes in most Mediterranean countries	At least 30% of species and habitats which were not in favourable status in 2020, are in GES category or show a strong positive trend, especially in priority benthic habitats, where the decline of coralligenous habitats and marine vegetation has been halted and sea-floor integrity is maintained	High	REGIONAL	*[CBD/GBF]* T.3 SGD 14A. & 17.6. Aichi T5. & T12 UNEP/MTS EO5 EU/2030 ACCOB/2025 IUCN(2020) WWF(2021)
2.SPECIES RECOVERY **Develop recovery plans and implement emergency actions for endangered and threatened species whose continued survival depends on such actions, including their habitats**	T1.1. T2.1. T2.2.	Recovery plans are developed in *[xx countries]*, including measures to eliminate all intentional or accidental killing or capture	Recovery plans are developed and emergency actions implemented, both *in situ* and *ex situ* as required, for species whose continued survival depends on such actions, including when relevant an agreement to establish a functional stranding network for at least two Mediterranean ecological subregions	All Mediterranean countries are implementing recovery plans and emergency actions, as appropriate, for threatened and endangered species, including, when relevant, a Mediterranean network of stranding centres	Very High	NATIONAL and REGIONAL	*[CBD/GBF]* T.3 SGD 14A. & 17.6. Aichi T5. & T12 UNEP/MTS EO5 EU/2030 ACCOB/2025 IUCN(2020) WWF(2021)
3.MARITIME TRAFFIC **Reduce the impact of maritime traffic (noise & collision) on sensitive marine**	T1.1. T1.5. T1.7. T2.7.	Identify noise pollution and collision hotspots where there is a strong interaction with cetaceans, sea turtles and other	Protection measures against noise and collision have been developed [*and* adopted by IMO guidelines *(2014)]* [in	The impact of noise and collision from maritime traffic, is considerably reduced in	High	REGIONAL and NATIONAL	*[CBD/GBF]* T.6. EU/2030

ACTION	Contributes to SAPBIO Targets	**Start-up activities**	**Expected Results for 2027**	**Expected Results for 2030**	Priority Level	Scope	Links to relevant Strategies
species (Cetaceans, Turtles, others)	T2.9. T3.4.	affected species, and approach the main sources and administrations in order to develop adequate protection measures in these areas	most] Mediterranean countries, and basic monitoring systems are in place in the most vulnerable areas	most of the identified vulnerable areas, through appropriate regulation reducing noise levels and collision events.			UNEP/MAP 2017 IMAP/EO 11 ACCOB/2025 IUCN(2020) WWF(2021)
4.NIS/IAS COMMITMENT **Ratification of the International Convention for the Control and Management of Ballast Water and Sediments from Ships (BWM Convention), and adoption of the Regional strategy addressing ship's ballast water management and invasive species (2022-2027)**	T1.2. T3.2. T6.3. T7.1.	Countries have started the necessary steps to express in national laws the provisions of the IMO Convention on the management of ballast waters and the BWM Biofouling Guidelines	Most Mediterranean countries have taken the necessary steps to express in their national laws the provisions of the IMO Convention on the management of ballast waters and the BWM Biofouling Guidelines	All Mediterranean countries collaborate in the enforcement of the Mediterranean Ballast Water Management Strategy (2022-2027) implementing the guidelines to minimize the transfer of invasive aquatic species	High	NATIONAL	*[CBD/GBF]* T.5 Aichi T.9 MAP/UNEP(2017) EU/2030 IUCN(2020) SoED 2020 REMPEC/2031 CSO.5 WWF(2021)
5. NIS/IAS CAPACITY **Strengthen the capacity of the Mediterranean countries to deal with alien marine species**	T1.2. T1.7. T3.4.	Countries have started baseline studies, (year of first record, pathway of introduction and its level of certainty (direct evidence, most likely, possible), and the status of the population	Most countries have conducted baseline studies, plus dated and georeferenced records of NIS presence; and have designed, and are implementing monitoring and assessment programmes for data collection, within the framework of IMAP	All countries have conducted a baseline study, and are collecting data and monitoring within the framework of IMAP, on the presence of alien marine species, the pathways of their introduction, and the state of their population trends, including those used in aquaculture	Very High	REGIONAL and NATIONAL	*[CBD/GBF]* T.5 UNEP/MAP (2017) UNEP/MAP (2021) EU/2030 IUCN(2020) SoED 2020 REMPEC/2031 CSO.5 WWF(2021)
6. NIS/IAS CONTROL **Take the necessary field actions to mitigate the impact from NIS/IAS**	T1.1. T1.2. T1.7. T3.1. T3.4.	Most countries have identified the vulnerable areas and priority sites for urgent mitigation action, and initiated monitoring of non-indigenous species, with particular	At the Mediterranean level, a *significant* reduction in the rate of new introductions has been achieved, and control or eradication actions are implemented for the selected,	The introduction and spread of the most harmful invasive alien species is regulated, preventing their impacts in 100% of the most vulnerable areas and/or priority sites, decreasing the	High	NATIONAL	*[CBD/GBF]* T.5 UNEP/MAP (2017) UNEP/MAP (2021) EU/2030

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
		attention to the main port enclosures and entry pathways	most problematic IAS, including in at least 50% of priority sites	number of protected species they threaten by 50%, and effectively managing 50% of the most significant pathways of introduction			IUCN(2020) SoED 2020 REMPEC/2031 CSO.5 WWF(2021)
7. LITTER **Prevent leakage and remove marine litter to mitigate its impact on the ecosystem**	T1.1. T1.2. T1.3. T1.7. T2.4. T2.8. T2.9. T3.4. T3.7.	Undertake an updated assessment of marine litter, as provided by the Regional Plan on Marine Litter (2014), Art.11, including baseline indicators to monitor progress, covering the lost fishing gears and other sources	In most Mediterranean countries new technologies to prevent and remove marine litter have been tested, *inter alia* through a full ban on plastic bags and/or changing how waste is collected and managed in cities and touristic destinations, captured in rivers and dams, and by the fishing and aquaculture sectors where appropriate, so abandonment of fishing gear and the leakage of plastic to the sea is already decreasing	All countries report the effective prevention and removal of marine litter, so the leakage of plastic to the sea has significantly and the removal from the sea and beaches has increased compared to 2027.	High	*[REGIONAL and]* NATIONAL	SDG 14.1. Aichi T.8. *[CBD/GBF]* T.6. BC/COP21 BC/ LBS Protocol (1996) EU/2030 GFCM/2020 T.1. UNEP/MAP 2017 IMAP/EO 11 UfM (2021) ICZM/CRF *(2016)* ACCOB/2025 WWF(2021)
8. EIA/SEA **Implement environmental assessments, considering cumulative impacts on the coastal zones and their carrying capacity.**	T1.1. T1.3. T.1.5. T2.6. T3.4.	Guidelines for EIA/SEA on the integration of biodiversity values in coastal and marine economic activities, based on the use of EcAp EOs and related indicators, are ready for submission to the next COP	Several countries adopted within the national EIA/SEA procedures, a framework of specific measures and indicators for addressing the values of biodiversity and the impact from tourism, aquaculture, and maritime traffic	Most Mediterranean countries adopted within the national EIA/SEA procedures, a framework of specific measures and indicators for addressing the impact on biodiversity and of specific measures favouring nature-based solutions	*Very High*	NATIONAL	*SDG 14.2. UNEP/MCS – 3.5 & 6.1. MAP/MTS (2020)* ICZM/CRF *(2016)*
9. WIND ENERGY **Advocate that wind farms, are regulated in MCPAs, and**	T1.1. T1.3. T1.7. T1.8.		A proposal for the regulation and impact assessment of the installation of wind farms within areas identified as important for	The Barcelona Convention, has adopted the proposal	High	REGIONAL and NATIONAL	*SDG 13 RFCCA Str.Dir. 1.2.*

ACTION	Contributes to SAPBIO Targets	**Start-up activities**	**Expected Results for 2027**	**Expected Results for 2030**	Priority Level	Scope	Links to relevant Strategies
cannot be developed elsewhere before their effects on the marine environment, biodiversity and human activities have been sufficiently researched, the risks are understood and alternatives assessed	T2.7. T2.8. T2.9.		marine and coastal biodiversity, is presented to consideration of the Barcelona Convention Contracting Parties				*ICZM/CRF (2016)* *EU/2030 - EIAs* *IUCN (2020)* *WWF (20021)*
10. MINERALS **[In line with the precautionary principle, the exploitation of minerals should not be authorised until the effect on the marine environment, biodiversity and related human activities have been sufficiently researched and the risks are understood and alternatives assessed.]**	T1.1. T1.3. T1.7. T1.8. T2.7. T2.8. T2.9.		A proposal to [ban] [regulate] prospection or exploitation of inorganic minerals over or under the seabed, is presented to consideration of the Barcelona Convention Contracting Parties	The Barcelona Convention, *, [has adopted] [is in process of adoption]* the [*regulation] [ban] of* the prospection or exploitation of inorganic minerals in or under the seabed*]*	High	REGIONAL and NATIONAL	*SDG 13* *RFCCA* *Str.Dir. 1.2.* *ICZM/CRF (2016)* *EU/2030 - EIAs* *IUCN (2020)* *WWF (20021)*
11. SPATIAL PLANNING **Support countries for the development of systematic conservation planning taking into account ICZM, land use/marine use planning and management aspects in the context of MSP**	T1.4. T1.6. T1.7. T2.6. T2.7. T2.8.	Developed a baseline of indicators to assess the implementation of maritime and of coastal spatial plans, covering all coastal and maritime sectors and activities with area-based conservation-management measures	50% of coastal length and marine surface, and 100% of SPAMIs, is included within formulated maritime and coastal spatial plans, covering biodiversity values in all coastal and maritime sectors and activities	100% of MPAs, and as appropriate OECMs, and 50% of the remaining marine areas are sustainably managed by applying ecosystem-based approaches including biodiversity and climate change-informed marine spatial planning	Very High	NATIONAL	SDG 14.2 *[CBD/GBF]* T.1 UNEP(MCS SO.3 EU/2030 SPA/RAC (2021) BC/ICZM Protocol *(2016)* *[MPA Forum Roadmap post-2020]* WWF (2021)

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
12. RESTORATION **Support restoration of ecosystems providing key services, those degraded and expected to become increasingly critical in a changing climate, such as wetlands and shallow seashore habitats among others**	T1.6. T1.8. T3.5. T3.7.	Countries have developed the inventory of ecosystems with the highest ecological relevance and/or regeneration potential (as nursery areas, carbon stocks, avoiding coastal erosion, preventing or reducing the impact of natural disasters) such as Posidonia beds, coralligenous assemblages, wetlands, and dune systems, among others	Most Mediterranean countries have completed the inventory of ecosystems with the highest ecological relevance and/or highest regeneration potential, and have started restoration activities on *[30%]* of those selected, favouring nature-based solutions	All Mediterranean countries have developed inventory of ecosystems with the highest ecological relevance and/or regeneration potential, and most Mediterranean countries have completed restoration activities on most of those selected between the identified priority areas	*High*	REGIONAL and NATIONAL	*SDG 14.2.* *Aichi T.15* *[CBD/GBF] T.1* *EU/2030* *MAP/MTS 9 & 15* *P* BC/ICZM Protocol *(2016)*
13. CLIMATE CHANGE **Increase climate change impacts monitoring and contributions to mitigation and adaptation, particularly to warming, acidification, and to disaster risk reduction, through nature-based solutions and ecosystem-based approaches**	T1.3. T1.7. T1.8. T2.8. T3.10.	A working group has agreed on factsheets for baseline indicators follow up on the effects of CC on marine environment, , based in SPA/RAC developed ones; particularly in a pilot network of SPAMIs	SPAMIs are coordinated into a climate change monitoring network and most countries have developed Early Warning Systems (EWS), mapping, risk assessment and reduction strategies, by which adaptation plans, based on nature-based solutions, are integrated into planning and budgeting processes	All Countries have developed EWS, mapping, risk assessment and reduction strategies over nature-based solutions, and a climate change monitoring network in MPAs representative of the Mediterranean conditions is fully operational	High	REGIONAL and NATIONAL	SDG 14.2 Aichi T.14 [CBD/GBF] T.7 EU/2030 UNEP/MCS 2019 SO.3 MAP/MTS CP-9 BC/ICZM Protocol *(2016)* *[[MPA Forum Roadmap post-2020]]*
14. GOOD ENVIRONMENTAL STATUS **Promote actions, including scientific research, with the view of achieving GES for all biodiversity-related ecological objectives within**	T1.7. T2.1. T2.2. T3.1. T3.4. T3.5.	Promote scientific research, particularly on trophic networks and the functioning of ecosystems in general, to consolidate science base for the evaluation of GES within the Ecosystem Approach EcAP/IMAP	Related to the biodiversity-relevant ecological objectives within the IMAP framework,Mediterranean countries have reached the Good Environmental Status and all countries have identified, and in case needed received support, to	All the biodiversity-related ecological objectives of GES show positive trends, being verifiable by scientific knowledge, and most Mediterranean countries have reached GES in an effective implementation of the	Very High	NATIONAL	IMAP EU MSFD AP/MTS EO4 ACCOB/2025

ACTION	Contributes to SAPBIO Targets	**Start-up activities**	**Expected Results for 2027**	**Expected Results for 2030**	Priority Level	Scope	Links to relevant Strategies
the Ecosystem Approach EcAp/IMAP			fill the gaps that hinder good GES evaluation	Ecosystem Approach and its roadmap			
15. MCPAs and OECMs **Assist countries in the implementation of the Post-2020 Regional Strategy for MCPAs and OECMs**	T1.4. T1.5. T2.7. T2.9. T3.5.	SPA/RAC, assisted by the Mediterranean ad-hoc group of experts for Marine Protected Areas in the Mediterranean (AGEM) has prepared relevant guidelines to support the implementation of the Strategy, including on ecological representativity and , connectivity and effectiveness of MPA systems; identifying, recognizing and reporting OECMs	The Post-2020 Regional Strategy on MCPAs and OECMs is being effectively implemented; including specific actions on: enhancing improving governance arrangements of MCPAs and OECMs, expanding soundly-designed, ecologically representative and well-connecting systems of MCPAs, identifying, recognizing and reporting marine and coastal OECMs, management effectiveness of MCPAs, mobilizing actions and support for MCPAs and OECMs	The Post-2020 Regional Strategy on MCPAs and OECMs has been implemented by the Contracting Parties, resulting in expanded and effective systems of MCPAs and OECMs that successfully deliver biodiversity conservation outcomes	Very High	REGIONAL and NATIONAL	UNEP/MCS (2019) - 61 GFCM (2020) MAP/MTS-3, 11, 61 SPA/RAC(2021) ACCOB/2025 *[MPA Forum Roadmap post-2020][[MPA Forum Roadmap post-2020]]*
16. BIODIVERSITY PLATFORM **Establish an open access Mediterranean Biodiversity Platform**	T2.1. T2.2. T2.3. T3.2. T3.5. T3.7.	Update manuals of priority habitats and species identified under the BC, including recent updates to the list of species in Annexes II and III of the SPA / BD protocol, and the new 2019 habitat classification	By 2027 georeferenced Information on Mediterranean Biodiversity key components is centralized in an open access Mediterranean Biodiversity Platform		High	REGIONAL	*[CBD/GBF]*-IPBES UNEP(MCS-IPBES MAP/MTS (2020) EU/2030 - IPBES
17. INVERTEBRATES **Survey distribution and abundance, and assess status and main anthropogenic pressures, over priority invertebrate species with**	T1.1. T1.2. T1.6. T2.1. T2.2. T2.3.	Research projects are launched in countries which had not yet started their relevant marine invertebrate studies	The distribution, abundance, and status assessment studies are progressing in most Mediterranean countries and research projects are prepared for the rest of the countries	The distribution, abundance, and status assessment are finished in all countries, at least for *C. rubrum*, *P. nobilis*, and vermetid platforms	High	NATIONAL	*[CBD/GBF]* T.3 SGD 14A. & 17.6. Aichi T5. & T12 UNEP/MTS EO5

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
focus on *C.rubrum*, *P.nobilis*, and vermetid platforms							EU/2030 IUCN(2020) WWF(2021)
18.VERTEBRATES **Establish the distribution, status, and the main anthropogenic pressures of species listed under Annex II to the SPA/BD Protocol**	T1.6. T1.7. T2.1. T2.3. T3.2.		Ready in most Mediterranean countries	Ready in all Mediterranean countries	High	REGIONAL and NATIONAL	*[CBD/GBF]* T.3 SGD 14A. & 17.6. Aichi T5. & T12 UNEP/MTS EO5 EU/2030 ACCOB/2025 IUCN(2020) WWF(2021)
19. HABITATS **In coastal and offshore waters, inventory and cartography key Mediterranean habitats, and assess their status and main anthropogenic pressures**	T1.2. T1.4. T1.6. T2.2. T2.3. T2.7. T3.2. T3.10	Using the updated SPA/RAC repository, prioritize areas to map	Start mapping key habitats, at the highest possible resolution, including those for vulnerable vertebrates, seabed and dark habitats, in all the SPAMIs, MPAs and OECMs	Achieved cartography of key habitats in the identified priority areas, covering 100% protected areas, and also including FRAs and OECM, and their status and responses to threats and impacts have been assessed	Very High	REGIONAL and NATIONAL	*[CBD/GBF]* T.3 SGD 14A. & 17.6. Aichi T5. & T12 UNEP/MTS EO5 EU/2030 ACCOB/2025 BC/ICZM Protocol *(2016)* IUCN(2020) WWF(2021)
20. NIS/IAS Database **Develop the shared georeferenced database (MAMIAS), user-friendly**	T.1.2. T2.1. T2.2. T2.3. T3.1.	National level baseline values and early warning systems established and data on NIS/IAS are started to be shared with the georeferenced	Data on NIS/IAS are shared with the georeferenced user-friendly database web site, with online tools and web services for	All Mediterranean countries continuously monitor the status and pathways of non-indigenous species and share it within the MAMIAS	Very High	REGIONAL	*[CBD/GBF]* T.5 MAP/UNEP(2017) EU/2030

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
platform, to continuously monitor the status and pathways of non-indigenous species and support early warning	T3.2. T3.5. T3.7.	online platform MAMIAS covering national lists of alien species, their habitats, introduction pathways, and impacts on biodiversity, human health, and ecosystem services	searching and extracting data (MAMIAS)	platform, aiding to mitigate detrimental effects of NIS/IAS			IUCN(2020) SoED 2020 REMPEC/2031 CSO.5 WWF(2021)
21. OVERFISHING and IUU **Implement science-based management plans to effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing, including phasing out harmful fisheries subsidies which contribute to overcapacity and overfishing**	T1.1. T2.4. T2.5. T2.8. T3.1. T3.4. T3.5.	Identify all forms of fisheries subsidies which contribute to overcapacity and overfishing. Based on the MoU GFCM/UNEP-MAP, develop an efficient and standardized data collection and discharge control system, and make available guidelines covering measures, tools and best practice to eliminate IUU	The reform of fisheries subsidies is promoted at the regional/country levels and in the World Trade Organisation (WTO). Science-based management plans to regulating harvest and to end overfishing, and a standardized data collection and discharge control system are in process of adoption in most Mediterranean countries. The stretch of IUU in the Mediterranean is assessed and monitored	In the Mediterranean, the data-collection system and discharge control are standardized and adopted, there is zero-tolerance for illegal practices, overfishing has drastically dropped compared to 2020 levels so that marine resources are harvested sustainably.	Very High	NATIONAL	SDG 14.4 & 14.6 *[CBD/GBF]* T.17 Aichi T.3 and T.6 EU/2030 GFCM (2020) T.1 UNEP/MCS (2019) MAP/MTS EO3 - CP-8 IUCN(2020)
22. BY-CATCH **Develop a national mechanism and implement agreed and scientifically tested by-catch mitigation measures, to eliminate all intentional or accidental killing of threatened or endangered species and/or in bad conservation status**	T1.1. T2.1. T2.4. T2.5. T2.8. T3.1. T3.4. T3.5.	Data collection and assessment of the bycatch effect on non-targeted species; and develop guidelines to adapt or ban the use of fishing gear most harmful to the seabed, to sharks and rays, marine turtles, seabirds, and cetaceans, in support to countries to develop a mechanism for by-catch mitigation strategies	Most Mediterranean countries are implementing guidelines and are developing a By-catch mitigation mechanism to adapt or ban the fishing gear most harmful to biodiversity, including on the seabed, and their implementation started in *[xx countries]* so that the by-catch of species in bad conservation status is reduced to a level that allows full recovery	All countries have developed a mechanism to deal with By-catch mitigation including the adaptation and/or ban of fishing gears most harmful to biodiversity, including on the seabed; their implementation is undertaken in all Mediterranean countries so that fishing gears have no significant adverse impacts on endangered and threatened species and vulnerable ecosystems	Very High	[REGIONAL and] NATIONAL	SDG 14.4 *[CBD/GBF]* T.19 EU/2030 FAO (2021) GFCM (2020) T.2 UNEP/MCS (2019) MAP/MTS CP-8 ACCOB/2025 IUCN (2020)

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
23. SMALL SCALE FISHERIES **Promote the FAO Voluntary Guidelines for Securing Small Scale Fisheries (VGSSF) and co-management practices in professional small-scale fisheries, advised by traditional ecological knowledge and the best available science**	T1.1. T2.4. T2.5. T2.8. T2.9. T3.1. T3.4. T3.5.	Based on the MoU GFCM/UNEP-MAP, promote the FAO-VGSSF in every country, and assess, in a selected sample of MPAs, the opportunities for SSF co-management, and to control illegal practices in marine recreational fishing (MRF)	In MPAs and OECMs the capacity of small-scale fisher organizations has been enhanced to engage and partner to institute co-management models, and the practice of IUU fishing, including recreational fishing, is controlled with full participation from the respective sectors involved	In MPAs and OECMs, and in fishing grounds, the capacity of small-scale fisher organizations has been enhanced to engage and partner co-management models, and the practice of IUU fishing, including recreational fishing, is controlled with full participation from the respective sectors involved	High	NATIONAL	SDG 14.7 *[CBD/GBF]* T.4 & T.18 Aichi T.14 UNEP/MCS (2019) SO.2 FAO (2021) GFCM (2020) T.4 IUCN (2020) WWF (2021) *[MPA Forum Roadmap post-2020]*
24. AQUACULTURE **Support developing the Post-2020 GFCM Aquaculture and Fisheries strategy - transforming the aquaculture industry through science-based solutions and marine spatial planning (MSP) tools**	T1.1. T1.2. T1.3. T1.61. T1.7. T2.6. T2.7. T2.8. T2.9. T3.4. T3.5. T3.7.	Collaborate in the development of the Post 2020 GFCM Aquaculture and fisheries strategy, including guidelines on best practices to improve aquatic health and biosecurity	Best practices in aquaculture, such as innovation, improving aquatic health and biosecurity, encouraging the responsible use of antimicrobials, supported by certification, traceability and nature-based solutions, have been promoted across the Mediterranean countries, and adopted in most Mediterranean countries	The Mediterranean aquaculture industry is fully transformed in line with the ecosystem approach, through science-based solutions and marine spatial planning tools	High	[REGIONAL and] NATIONAL	*FAO (2021)* *GFCM (2020)* UNEP/MCS (2019) SO.3 BC/ICZM Protocol *(2016)* IUCN (2020) WWF (2021)
25. TOURISM **Develop a framework of specific indicators for assessing the impact of marine and coastal tourism on destinations and for promoting ecotourism**	T1.3. T1.5. T1.8. T2.8. T2.9. T3.4. T3.7. T3.92.	Identify preliminary indicators and hotspots of pressure from the tourism industry in marine and coastal biodiversity (including habitat disruption, noise, light, water quality, garbage) , in coordination with the PAP/RAC and Plan Bleu/RAC, as appropriate	A framework of specific indicators for assessing the impact of marine and coastal tourism on destinations and for promoting ecotourism is adopted within environmental assessments in tourism hotspots in several Mediterranean countries	Environmental assessments including the framework of specific tourism indicators, taking into consideration the cumulative impacts on the coastal zones and their carrying capacity, is in process of adoption in all countries and implemented in most Mediterranean countries	High	REGIONAL	*MAP/MTS-D82* *SPA/RAC (2021)* *PAP/RAC ICZM (2016)* *ACCOB/2025* *UfM (2021)* *IUCN (2020)* WWF (2021)

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
26. INTEGRATING BIODIVERSITY **Integrate biodiversity values into national and local development planning processes, into the strategies and planning processes of marine-related economic sectors, into national accounting as appropriate, reporting systems, and into the assessment of environmental impacts**	T1.3. T1.7. T2.8. T2.9. T3.4. T3.6. T3.7. T3.9.	Establish a common classification of economic activities that substantially contribute to protecting and restoring biodiversity and ecosystems and assess opportunities to redirect, repurpose, reform or eliminate harmful incentives	The level of consideration of biodiversity conservation concerns in the strategies and planning processes of MSP, including fisheries, aquaculture, agriculture, coastal tourism, ports, maritime transportation, wind farms,, and also in EIA/SEA frameworks, has been assessed in every country, and proposals are being drafted to include them, to enhance economic activities that substantially contribute to protecting and restoring biodiversity	In most Mediterranean countries biodiversity conservation is mainstreamed in the strategies and planning processes of MSP, including fisheries, aquaculture, agriculture, coastal tourism, ports, maritime transportation, education, and also in EIA/SEA frameworks	High	NATIONAL	SDG 14.2., 14.4 & 14.6 *[CBD/GBF]* T.13. & T.17 Aichi T.2, T.3. and T.6 EU/2030 UNEP/MCS (2019) MAP/MTS - 2 BC/ICZM Protocol *(2016)* *UfM (2021)* *[MPA Forum Roadmap post-2020]*
27. STREAMLINE Post-2020 SAPBIO **Streamline the Post-2020 SAPBIO and Regional strategies and action plans, developed in the framework of the SPA/BD Protocol, into national strategies, action plans and legal frameworks**	All targets	Adoption of the Post-2020 SAPBIO by the Contracting parties to the Barcelona Convention and assistance provided, as necessary, to countries for its integration within national biodiversity conservation and development frameworks Mediterranean countries are integrating and streamling the Post-2020 SAPBIO in national biodiversity conservation and development frameworks		All Mediterranean countries have integrated and streamlined the Post-2020 SAPBIO in national biodiversity conservation and development frameworks	Very High	NATIONAL	MAP/MTS (2020)
28. POLITICAL WILL AND COORDINATION	T1.5. T1.6. T1.7. T1.8.	Prepare an executive document in the appropriate fora, presenting the socio-economic and cost/benefit profit and the	Most Mediterranean countries are promoting appropriate coordination between the various competent authorities for both	Each Party has incorporated Post-2020 SAPBIO in its national biodiversity strategy and action plan	Very High	NATIONAL	SDG 14 Aichi T.17 *[CBD/GBF]* g) k)

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
Ensure political will and recognition at the highest levels of Government or State, to develop appropriate governance schemes, in particular cross-sectorial and multi-level institutional coordination	T2.4. T2.6. T2.7. T2.8. T2.9. T3.6. T3.8. T3.9.	urgency of the Post-2020 SAPBIO, its significant input to SDGs, CBD and UNEP-related commitments, and the cross-sectorial and multi-level institutional coordination needs	the marine areas and the land parts of coastal zones, in the different administrative services, at all relevant levels				UNEP/MCS MAP/MTS (2020) EU/2030 BC/ICZM Protocol *(2016)* *ACCOB/2025* *WWF (2021)*
29. STAKEHOLDER PARTICIPATION **Facilitate stakeholder engagement to address conflict between users, build capacity to contribute to the SAPBIO enforcement, particularly in MPA planning and management, through proper participation of all stakeholders in a transparent decision-making process**	T1.1. T1.2. T1.3. T1.5. T1.6. T2.3. T2.4. T2.5. T2.6. T2.8. T2.9. T3.4. T3.5.	All countries have identified the relevant sectors and stakeholders to participate in the effective implementation of the Post-2020 SAPBIO Actions, and started the relevant contacts particularly in priority fields, e. g. MPAs, fisheries, and enforcement means	In most Mediterranean countries, formal and informal platforms to ensure the participation of the relevant sectors and stakeholders in priority sectors (e. g. MPAs, fisheries, and enforcement means) are established and operative, including local and subnational authorities, the private sector, civil society, women, youth, academia and scientific institutions	In all countries, formal and informal platforms to ensure the participation of the relevant sectors and stakeholders in priority sectors are established and operative, including local and subnational authorities, the private sector, civil society, women, youth, academia and scientific institutions, in a whole-of-society approach	Very High	NATIONAL	*[CBD/GBF]* T.20 UNEP/MCS EU/2030 *P* BC/ICZM Protocol *(2016)* *ACCOB/2025* *[MPA Forum Roadmap post-2020]* *WWF (2021)*
30. TOP-DOWN AND BOTTOM-UP SCALING OF INTERNATIONAL COMMITMENTS **Scale down international commitments into national plans and to local level, streamlining the approach, targets and actions of the Post-2020 into**	All targets	Parties identify the sub-national and local plans related to the Post-2020 SAPBIO implementation and to set up mechanisms to mainstream its provisions into local planning and action, updating their NBSAPs and Action Plans as appropriate, through coordination between local administrations and central and	In most Mediterranean countries, active alliances of governments, businesses, scientists and opinion leaders are built to implement the Goals of the Post-2020 SAPBIO, ensuring co-responsibility and co-ownership by all relevant actors, through administrative transparency, stakeholder dialogue, and participatory	All countries can present positive results in implementing the updated 1995 Specially Protected Areas and Biological Diversity (SPA/BD) Protocol, and in effectively scaling-down and adapting the proposed SAPBIO Actions to the local context, while recuperating any relevant proposals from	High	NATIONAL	*[CBD/GBF] T.15 & T.20* *MAP/MTS (2020)* *SPA/RAC (2021)* BC/ICZM Protocol *(2016)*

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
national strategies and into local planning processes, while facilitating the bottom-up feeding of local proposals into future planning processes at the national and Mediterranean levels		decentralized sectoral technical services	governance at different levels, adapting the proposed Actions to local context while recuperating any relevant proposals from the local level to feed future Mediterranean planning processes	the local level to feed future Mediterranean planning processes			*MedPAN Strategy 2019-2023*
31. COMPLIANCE AND ENFORCEMENT **Enable the compliance of the provisions of the SPA/BD and the ICZM Protocols and related Action Plans at national level by strengthening capacities and cooperation between judiciary and administrative bodies**	T1.1. T1.2. T1.3. T1.5. T1.7. T2.4. T2.8. T2.9. T3.1. T3.4. T3.7. T3.8.	Prepare practical guidelines for the enforcement of the SAPBIO provisions through appropriate capacity building, and coordination between the various authorities competent for both the marine and the land parts of coastal zones in the different administrative services, at all relevant levels	Several countries have started capacity building for judiciary and administrative resources along the enforcement chain, on environmental legal frameworks, including environmental agencies, inspectors, auditors, police, prosecutors and judges	Most Mediterranean countries have completed capacity building for judiciary and administrative resources along the enforcement chain, on environmental legal frameworks, including environmental agencies, inspectors, auditors, police, prosecutors and judges	*Very High*	*[REGIONAL and] NATIONAL*	*SGD 14* *EU/2030* *GFCM (2020)* *MAP/MTS 41.8* SPA/RAC (2021) BC/ICZM Protocol *(2016)* *[MPA Forum Roadmap post-2020]*
GOAL 3							
32. IMAP REFINEMENT **Identification of the gaps that hinder the good environmental status evaluation, and in case needed, support countries to fill them out**	T2.1. T2.2. T2.3. T3.1. T3.2. T3.5.	Support the identification and assessment of the data gaps - identified in the MED QSR- that hinder evaluation of the good environmental status in each country, especially in relation to scales of assessment, specification, and further quantification of GES	Most Mediterranean countries have refined their ecological objectives in relation to scales of assessment, specification and further quantification of GES, and have further developed the candidate indicators, expanding monitoring to also cover drivers, pressures on biodiversity, and adequate responses	All countries have refined their ecological objectives in relation to scales of assessment, specification and further quantification of GES,	Very High	REGIONAL and NATIONAL	IMAP EU-MSFD MAP/MTS CP.7 MAP/NIS-IAS (2017) BC/ICZM Protocol *(2016)*

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
33. IMAP IMPLEMENTATION **Update national monitoring programmes in light of the new elements of IMAP, and achieve regular reporting**	T2.1. T2.2. T2.3. T3.1. T3.2. T3.5.	Start developing region-wide, electronic, common indicator-based reporting formats and up-to-date tools for data exchange, based on the structure of the Common Indicator Fact Sheets	Based on harmonized reporting formats in synergy with other reports such as CBD reports, most Mediterranean countries are reporting on common indicators for the biodiversity-related ecological objectives of GES	All countries are reporting on common indicators for the biodiversity-related ecological objectives of GES	High	NATIONAL	*[CBD/GBF]* 15 (ii) (iii) EU-MSFD MAP/MTS CP.7 MAP/NIS-IAS (2017) BC/ICZM Protocol *(2016)*
34. Post-2020 SAPBIO MONITORING **Allow the Contracting Parties to periodically review and report, harmonized with IMAP and UNEP/MAP monitoring frameworks, on the status of implementation of the Post-2020 SAPBIO**	T3.1. T3.2. And all Targets	Based on a simplified monitoring table developed by SPA/RAC, considering harmonization with other monitoring frameworks and with input, as appropriate, from the SAPBIO governance bodies, in synergy with other bodies and [GBF], the Countries identify their monitoring needs for the Post-2020 SAP BIO targets, requesting regional support as appropriate, to update their national monitoring programmes in light of the new elements, harmonized with other MAP frameworks, and ensuring quality data and reporting	The implementation and monitoring process of the Post-2020 SAPBIO is set in every country, duly harmonized with IMAP and other UNEP/MAP monitoring frameworks, and most Mediterranean countries have started recording biennial progress towards these targets and report to the Barcelona Convention system. The possibility of performing collective assessments may be considered	In all countries a reporting schedule is consistently used by all institutions involved, recording biennial progress in the implementation of the Post-2020 SAPBIO, and report to the Barcelona Convention system, supported when appropriate by the Secretariat and/or by voluntary in-depth peer review by experts including from other parties	Very High	REGIONAL and NATIONAL	*[CBD/GBF]* H (i) (iii) EU/2030 UNEP/MCS (2019) MAP/MTS KD.90 ACCOB/2025
35. SUPPORT TO RUN THE SAPBIO **Provide sufficient human and financial resources to the MAP system in order to efficiently run the**	T3.2. T3.3And all Targets	Approach international and EU funding sources and appoint one project to resource countries and the Secretariat for the Post-2020 SAPBIO implementation, run the	The regional Post-2020 SAPBIO follow-up and assessment mechanisms, are in place and resourced within the MAP system, allowing the timely analysis of progress based on objective/numerical elements of	The MAP system is sufficiently resourced to efficiently run the Post-2020 SAPBIO at national and regional levels and to formulate a Post-2020	Very High	REGIONAL	UNEP MAP system and All Contracting Parties

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
implementation, follow-up and assessment mechanisms for the Post-2020 SAPBIO		assessment and reporting mechanisms	targets towards the Post-2020 SAPBIO goals and targets	SAPBIO update for beyond 2030			
36. CAPACITY BUILDING FOR THE Post-2020 SAPBIO AT NATIONAL LEVEL **Enhance the national capacities to implement the Post-2020 SAPBIO, to manage MPAs and vulnerable marine and coastal habitats and species within and across national jurisdictions, with particular attention to less developed countries, and towards reducing the gender and the digital divide**	T3.4. T3.5. And all Targets	Map and assess the human and institutional capacities to define the capacity-building needs, gaps and priorities in the next future, targeting managers and field technicians, and national and local authorities responsible for the environment, fisheries and enforcement, and design a regular and interactive training programme	In all national and subnational administrations, particularly in developing countries, the capacity to address the needs and priorities of marine conservation objectives has been assessed. Impacting training modules have been designed, and tested by groups of countries *and* user networks, reinforcing the capacity of national administrations to monitor and improve management effectiveness	In every country key officers, MPA managers, field technicians, and local authorities responsible for the environment, fisheries, and enforcement, are sufficiently trained and remain in close coordination with Mediterranean partners, for the implementation of the Post-2020 SAPBIO in their respective professional environments	High	[REGIONAL and] NATIONAL	*SDG 13b* *[CBD/GBF] (ii)* *FAO (2021)* *MAP/MTS (2020)* *SPA/RAC (2021)* BC/ICZM Protocol *(2016)* *MedPAN Strategy 2019-2023*
37. NETWORKING **Support existing regional, subregional and/or transboundary networks, or develop new ones as needed, to enhance capacities, knowledge, experience and opportunity sharing, *inter alia*, on topics as NIS/IAS, migratory species, MPA management, habitat restoration, reduced by-catch, harmonized monitoring, compliance with**	T1.1. T1.2. T2.2. T1.6. T2.3. T2.4. T2.5. T2.6. T2.9. T3.2. T3.4. T3.5. T3.9. T3.10.	Taskforces including scientists , experts, and managers on priority issues may be called to design new, or reinforce existing, human networks to improve dialogue, networking, capitalizing and making accessible the existing scientific, practical, and traditional knowledge, best practices and local innovations	Human networks participated by most countries in several priority themes have been established either at regional, or sub-regional or national levels as appropriate, and sufficiently resourced to keep a hub, a user-friendly website, and to regularly meet and exchange knowledge and practice, particularly to cover the capacity building needs in the less developed countries, in recently established MPAs, and in all SPAMIs	Human networks at national, sub-regional and regional level - *inter alia on* NIS/IAS, migratory species, MPA management, habitat restoration, reduced by-catch, harmonized monitoring, compliance with law and regulations- have been developed and strengthened to ensure the enhancement of capacities, knowledge, good practices, experience sharing, and the development of joint actions	Very High	REGIONAL	*[CBD/GBF] (ii)* *UNEP/MCS (2019)* *MAP/MTS (2022-2027)* IMAP ACCOB/2025 PAP/RAC ICZM/CRF (2016) IUCN (2020) WWF (2021)

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
law and regulations, and other subjects relevant to the Post-2020 SAPBIO							*MedPAN Strategy 2019-2023 [MPA Forum Roadmap post-2020]*
38. AWARENESS **Increase awareness, understanding and appreciating of the values and threats to the marine environment, stimulating improved behaviour, and of the responses and good practices, by targeting decision-makers and the general public, through reinforced and renewed mechanisms, including mass communications**	T1.1. T1.2. T1.3. T1.5. T1.7. T2.4. T2.8. T2.9. T3.6. T3.9.	Call on a task-force to outline a communication and awareness strategy, assessing the needs, gaps and opportunities of biodiversity communication, including the development of any necessary indicators to follow-up the extent and reach of awareness, in order to target decision makers from different administrations and economic sectors, and the general public	A Mediterranean communication and awareness strategy, with recommendations for each national level context, has been presented to the NFPs and its implementation started in several countries, regularly storytelling and informing the media about cetacean, turtle and other flagship species conservation activities, raising awareness on negative impacts of plastic waste, ghost nets, the added values of MPAs, the risks of introducing alien marine species, and other aspects of SPA/RAC work	The Mediterranean communication and awareness strategy is being adopted by all Parties, targeting mass media, policymakers, economic stakeholders involved in land and marine activities, associations, universities and researchers, and civil society. A marine biodiversity day on mass media and schools has been introduced and its annual celebration promoted	High	REGIONAL and NATIONAL	*SDG 23 Aichi T.1 [CBD/GBF] T.19, c) EU/2030 UNEP(MCS (2019) ACCOB/2025 SPA/RAC (2021) PAP/RAC ICZM/CRF (2016)* IUCN (2020) WWF (2021) *[MPA Forum Roadmap post-2020]*
39. OUTREACH AND EDUCATION **Promote the integration of marine biodiversity and ecosystems conservation concerns into school, higher education, professional training, and citizen science, so that best practices and innovative technologies to protect marine and coastal**	T1.3. T2.8. T3.4. T3.7.	Elaboration by the Contracting Parties, with the support of relevant regional organisations of the definition of the contents of bachelor and master (pre- and post-graduate) curricula, including practicum and field training about marine ecosystem and biodiversity conservation and its relevant strategies Identify a network of pilot universities in Southern and	The marine biodiversity conservation and its relevant strategies/tools are included in the curricula of schools and universities in several countries, and at least several multi-national or bilateral network (North-South and South-South exchanges) among Mediterranean universities is established, a training of trainers has been developed, and at least several MPAs are used as	The marine biodiversity conservation and its relevant strategies/tools are included in the curricula of schools and universities in as many countries as possible, where universities are networking in North-South and South-South exchanges, and many MPAs are used as a framework for education and awareness activities, involving NGOs and citizen science	High	REGIONAL and NATIONAL	*SDG 23 [CBD/GBF] T.2. T.19 EU/2030 UNEP/MCS (2019) MAP/MTS CP.11 ACCOB/2025 UfM (2021) SPA/RAC (2021)*

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
ecosystems are more accessible and replicable		Eastern countries or other universities targeting students from all over the Mediterranean	a framework for education and awareness activities, involving NGOs and citizen science				*PAP/RAC ICZM (2016)* IUCN (2020) WWF (2021) *[MPA Forum Roadmap post-2020]*
40. EMPLOYMENT **Adequately increase the employment, notably public employment in direct relation to marine biodiversity conservation (and eventually include redirecting existing one) as basic component for future blue economy wise development**	All Targets	Contracting Parties identify their present baseline of employment, notably public employment in direct relation to marine biodiversity conservation (human resources at different technical and institutional levels), and assess (considering women, youth, and local communities) employment needs to implement the Post-2020 SAPBIO	As related to the baseline, the employment, notably public employment in direct relation to marine biodiversity conservation, has grown in most Mediterranean countries	As related to the baseline, the employment, notably public employment, in direct relation to marine biodiversity conservation has significantly grown in the region, and not less than doubled in any country	Very High	NATIONAL	*[CBD/GBF]* F. a) 1 UE/2030 3.2. UNEP/MCS (2019) All Parties
41. SUSTAINABLE FUNDING **Develop sustainable funding strategies with, as appropriate, innovative approaches to mobilize alternative financial sources, covering fiscal incomes that could be redistributed, and relevant actions to fund, including The MedFund and other types of national or local financing mechanisms**	All Targets	Develop an overall Mediterranean cost/benefit analysis, including the economic value of ecosystem services, particularly blue carbon sinks, prevention of coastal erosion, fisheries breeding ground, and assessing the national contributions to marine biodiversity conservation. Foster countries to develop a strategy and action plan for long term funding of nature conservation needs, or similar instruments, considering all the necessary components	At the Mediterranean level, and at the national level in most Mediterranean countries, sustainable funding strategies have been drafted, and have been adopted in several countries including, as appropriate, the establishment of national or local trust funds, fed *inter alia* by tolls on tourism, fishing licences, plastic bags, EIA compensations and other, and made available to local environmental budgets- so that the financial resources from all international and domestic sources, including governmental, non-governmental, and private	Sustainable funding strategies are being implemented, so there is a significant increase of financial and non-financial resources from all international and domestic sources, including governmental, non-governmental, and private actors from different sectors.	Very High	REGIONAL AND NATIONAL	*SDG 17.1 Aichi T.20 [CBD/GBF] T.18 [CBD/GBF] 5 EU/2030 UfM (2021) UNEP/MCS (2019) MAP/MTS (2020) ACCOB/2025 SPA/RAC (2021) PAP/RAC ICZM (2016)*

ACTION	Contributes to SAPBIO Targets	Start-up activities	Expected Results for 2027	Expected Results for 2030	Priority Level	Scope	Links to relevant Strategies
			actors has significantly increased as appropriate.				IUCN (2020) *MedPAN Strategy 2019-2023 [MPA Forum Roadmap post-2020]* WWF (2021)
42. COOPERATION **Increase cooperation both north/south, south-south, and between governmental and non-governmental actors at different levels, to support the Post-2020 SAPBIO, particularly in the less developed countries**	All targets	Call an international donor conference in support of the Post-2020 SAPBIO, including environmental funds such as GEF, Green Climate Fund, and bilateral agencies to fulfil their official development assistance commitments, and prepare broad Mediterranean projects backed with official country requests , inviting ODA agencies to consider MPAs as live examples of nature-based solutions for food security, long-term planning and participatory management, all in the interest of poverty alleviation and the SDGs	Parties are regularly informed about project call of proposals and other funding possibilities. Three broad Mediterranean projects with official country backing have started and other 3 are being prepared for international and bilateral environmental and development funds and agencies, covering priority subjects in the less developed countries, *inter alia* implementing the national action plans, developing environmental funds at the national levels, restoration and disaster risk reduction arising from climate change on coasts and at sea, supporting research, management, and monitoring networks.	Sgnificant increase of international financial flows towards developing countries takes place, in order to meet the needs for the effective implementation of the Post-2020 SAPBIO	Very High	REGIONAL and EU Countries	*SDG 17* *[CBD/GBF] 18, 14.e* *Aichi T.20* *EU/2030* *UfM (2021)* *UNEP/MCS (2019)* *MAP/MTS (2020)* *ACCOB/2025* *SPA/RAC (2021)* *PAP/RAC ICZM (2016)* IUCN (2020) *MedPAN Strategy 2019-2023 [MPA Forum Roadmap post-2020]* WWF (2021)

ANNEX IV

Post-2020 SAPBIO National Correspondents ToRs

Terms of Reference for the National Correspondents of the Post-2020 SAPBIO

The Post-2020 SAPBIO envisages Post-2020 SAPBIO National Correspondents as part of the institutional implementation governance arrangements. These Correspondents will have to act at dual level:

a) as individual National Correspondents, with the role, function and tasks to be implemented at national level, and

b) as an institutionalised body (the Network of Post-2020 SAPBIO National Correspondents), with the role, function and tasks to be implemented at regional level.

Accordingly, the Terms of Reference related to the National Correspondents are presented herein:

I. Role, tasks and institutional framework for National Correspondents

Individual Post-2020 SAPBIO National Correspondents will be responsible for facilitating the implementation of the Strategy at national level in their respective countries. Their main role is to stimulate and coordinate activities at national level aimed at the Post-2020 SAPBIO as well as to facilitate inputs for implementing the regional components of Post-2020 SAPBIO actions. These activities will also include defining and coordinating any needed national consultation processes. The National Correspondent will constitute UNEP/MAP-SPA/RAC 's main contact point for examining the progress of preparing and implementing the national and regional activities. Within the national institutional arrangements, individual National Correspondents will act under the guidance and according to the instructions of the SPA/BD Focal Point of the Party.

Individual National Correspondents, acting at national level, will,, in particular, provide for:

- Identifying and establishing appropriate contacts with the national institutions/bodies concerned with the implementation of Post-2020 SAPBIO Programme

- Organizing, with the support and assistance of SPA/RAC, national consultations, workshops, etc., to facilitate the preparation of projects; as well as contribution to any needed updating process, for the smooth implementation of the Post-2020 SAPBIO

- Passing on information and communication regarding Post-2020 SAPBIO from the national side to SPA/RAC and to the Network, and vice-versa

In addition, the National Correspondents will be directly involved (I) in the process of formulating and implementing the relevant national participatory activities, and (II) in the process of evaluating/updating the Post-2020 SAPBIO regional documents along its implementation, when requested by the Parties.

The National Correspondent, to carry out her/his tasks, should be supported by resource persons, to be identified at national level, including by NGOs and the National Focal Points of the organisations with such contacts that are members of the Post-2020 SAPBIO Advisory Committee.

To this end, those member organisations are invited to circulate information about the Post-2020 SAPBIO to their Focal Points in the Mediterranean countries, asking them to keep contact with the Post-2020 SAPBIO National Correspondent.

II. Nomination and profile of National Correspondents

Individual National Correspondents will be nominated by their respective MAP Focal Points. If possible and appropriate, they will preferably be members of the respective Post-2020 SAPBIO national implementation lead Agency or, where nationally decided, consultants/contractuals appointed by the National Lead Agency.

Their affiliation, academic degrees and professional background and references should guarantee their competence and capacity for implementing the role and tasks defined by these Terms of Reference.

It is recommended that the National Correspondents meet certain requirements, as follows:

- be at a convenable level in the hierarchy of the respective institution
- have a good knowledge of aspects related to coastal and marine biodiversity and be able to deal also with topics concerning fishing and socio-economic aspects
- have a good command of either English or French
- be accustomed to elaborating reports/documents of the kind
- be familiar with the principles and practices of consultation participatory processes, in particular, within national conditions
- be realistically available to carry out the envisaged tasks.

Further detailed obligations and tasks of each individual Post-2020 SAPBIO National Correspondent with respect to SPA/RAC will be defined by the concerned Party on a case-by-case basis, considering the specific national conditions.

III. Internal arrangements

Individual National Correspondents will be members of the Post-2020 SAPBIO Network of Post-2020 SAPBIO National Correspondents.

At national level they will act under the responsibility of Party SPA/BD focal point and according to:

- instructions from the Post-2020 SAPBIO National Lead Agency
- guidance from SPA/RAC, taking into account the recommendations made by the Post-2020 SAPBIO Advisory Committee and by the Network of Post-2020 SAPBIO National Correspondents.

IV. The role, tasks and institutional framework of the Network of Post-2020 SAPBIO National Correspondents

The Network of Post-2020 SAPBIO National Correspondents is envisaged to act at regional level.

The Network is composed by all individual National Correspondents and includes in practice the activities to be implemented jointly by all the National Correspondents including their regular meetings and possible further meetings, either presential or virtual ones. Most of envisaged activities are of regional character.

The Network will start acting after Post 2020 SAPBIO adoption, through the first meeting of Post 2020 SAPBIO National Correspondents, following a meeting of the Post 2020-SAPBIO Advisory Committee and considering the advice made by that Meeting.

The basic role and task of the Network is to provide detailed technical advice and recommendations in the process of implementing the Post-2020 SAPBIO.

Advice and recommendations of the Network will be addressed to:

- SPA/RAC, for advice and recommendations of a general nature, concerning the Post-2020 SAPBIO
- the responsible national authorities and teams, concerning the preparation and execution of Post-2020 SAPBIO actions
- international consultants involved in helping national teams on Post-2020 SAPBIO actions implementation issues.
- SPA/RAC related international consultants and/or regional team(s) involved in preparing and executing regional/transboundary projects addressed to implement the Post-2020 SAPBIO.

In particular, the Network will provide for:

(a) flow and exchange of information about national activities directly related to the Post-2020 SAPBIO (implemented, ongoing or planned) within the Network membership and with SPA/RAC
(b) information to Network members and SPA/RAC about other activities implemented and/or about documents prepared or in preparation at national level that are of relevance for the Post-2020 SAPBIO implementation
(c) harmonization among countries, as appropriate, of activities and results at the level of individual countries concerning the activities envisaged by the Post-2020 SAPBIO
(d) evaluation of and recommendations concerning the Post-2020 SAPBIO institutional governance arrangements at regional and national level, in particular, related to the role and functions of:

I. the Network of National Correspondents itself
II. the individual National Correspondents, at national level
III. other national arrangements envisaged or developed by countries
IV. mechanisms for coordinating transboundary projects’ activities
V. technical and scientific advice concerning the entire process of Post-2020 SAPBIO implementation

ANNEX V

Post-2020 SAPBIO
Advisory Committee ToRs

Terms of Reference for the Post-2020 SAPBIO Advisory Committee

I. The role, tasks and the institutional framework of the Committee

The SAPBIO Advisory Committee was one of the institutional governance bodies envisaged by the first SAPBIO (adopted in December 2003 by the Contracting Parties to the Barcelona Convention), to act at the Mediterranean regional level.

To promote coordination and avoid duplication, the Barcelona Convention COP21 decision IG 24/7 confirmed that in the process of the elaboration of the Post-2020 SAP BIO, due account has to be taken of what already has been developed at national and regional levels. Therefore, the SAPBIO Advisory Committee having served as advisory body to the SAPBIO adopted in December 2003 since its inception until 2019, continued supporting SPA/RAC to (I) ensure co-ordination with the relevant organisations for the Mediterranean Region and (II) provide SPA/RAC with technical and scientific advice in the process of the Post-2020 SAPBIO elaboration.

The running of the Post-2020 SAPBIO, governance implementation tool of the SPA/BD Protocol, may further benefit by keeping the advisory committee, which so much aided the previous SAPBIO implementation and the Post-2020 SAPBIO elaboration phase.

The re-established Committee is called Post-2020 SAPBIO Advisory Committee, and includes representatives nominated by international and regional bodies (hereinafter member organizations) with technical and scientific expertise and/or relevant environmental policy role on Mediterranean marine and coastal biodiversity issues, including live resources. The Components of the Mediterranean Action Plan are also represented in the Committee.

In particular, the Committee provides for:

(a) technical and scientific advice concerning the process of implementing the Post-2020 SAPBIO and its relevant related projects

(b) periodical inventory of relevant activities already realised in the region. For that aim, each member organisation will periodically provide to the Committee lists of its activities and outputs done in connection with the Post-2020 SAPBIO

(c) flow and exchange of relevant information on strategies, programmes/activities and outputs implemented, on-going or planned by the member organizations, within the Committee membership and with SPA/RAC, in connection with the Post-2020 SAP BIO

(d) information to member organizations on activities and documents prepared or in preparation relevant to Post-2020 SAPBIO implementation

(e) the harmonization, as appropriate, of activities and results upraising of member organizations concerning issues of relevance for Post-2020 SAPBIO; and

(f) recommendations concerning the running of institutional governance arrangements, envisaged within the Post-2020 SAPBIO, and in particular related to the role and functions of: (I) the individual National Post-2020 SAPBIO Correspondents, (II) the emanating National Post-2020 SAPBIO Correspondents Network for the Programme implementation (III) other relevant national arrangements envisaged, and (IV) mechanisms of coordination of programme activities.

It is understood that member organizations, besides their participation in the activities directly related to the Advisory Committee itself, may be in parallel involved in some regional and/or national activities of Post-2020 SAPBIO.

Furthermore, each member organization is invited to send a representative (preferably the respective Committee member) to attend as an observer the Meetings of the National Correspondents of the Post-2020 SAPBIO.

II. Membership

The international and regional bodies invited as member organizations of the Post-2020 SAPBIO Advisory Committee follows (alphabetical order):

1. UNEP Mediterranean Action Plan / Coordinating Unit): (Co-Chair)
2. SPA/RAC: (Co-Chair)
3. ACCOBAMS
4. ALECSO
5. Bern Convention/ Council of Europe
6. CBD
7. CIESM
8. CMS
9. Conservatoire du Littoral
10. EEA
11. GFCM
12. IUCN Med
13. MedECC
14. MedPAN
15. MedWet
16. OCEANA
17. UfM
18. UNEP Marine and Coastal Ecosystems Unit
19. UNESCO /IOC
20. UN/FAO
21. WWF MedPO
22. INFO/RAC
23. MEDPOL
24. PAP/RAC
25. Plan Bleu/RAC
26. REMPEC
27. SCP/RAC

Membership of the Post-2020 SAPBIO Advisory Committee may be reviewed and updated every two years, starting from the adoption of the Post 2020 SAPBIO

At each meeting of the Post-2020 SAP BIO Advisory Committee, a Rapporteur has to be elected among the member organisations.

Each member organisation is invited to keep the same representative in the Advisory Committee and to ensure continuity, through appropriate transfer of files, in case of a necessary change.

Organizations Invited as Observers

Other organizations may be invited, as observers to the Post-2020 SAPBIO Advisory Committee meetings, after proposal to SPA/RAC by any current member up to one month before the celebration of any such meeting.

III Meetings' periodicity

Meetings will be convoked by SPA/RAC and, if not decided otherwise, will be convened once a year.

IV. Internal arrangements

At each meeting of the Post-2020 SAPBIO Advisory Committee:

I. UNEP MAP / Coordinating Unit and SPA/RAC will Co-Chair

II. the Committee will elect a Rapporteur

III. the SPA/RAC Director, and the Rapporteur will act as the Committee Secretariat. They shall remain in office until Rapporteur successor is elected at the following meeting

IV. SPA/RAC will provide for the needed technical and logistical support during meetings.

Committee members will be regularly informed by SPA/RAC on the progress of Post-2020 SAPBIO Programme related activities.

If needed and agreed, the Committee will be supplied with specific technical and/or scientific information, to be provided by SPA/RAC directly or by contribution of reputed international consultancies.

The outputs of the Committee (meeting reports, recommendations, proposals, etc.) will be prepared by SPA/RAC in consultation with the Rapporteur and cleared by the Post-2020 SAPBIO Advisory Committee Secretariat . The reports and recommendations of Post-2020 SAPBIO Advisory Committee

Meetings shall be circulated, by e-mail, for comments by the members, before their submission for final clearance by the Rapporteur.

ANNEX VI

References in the text

ANNEX VI

References in the text

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Annex XIII

Draft Programme of work of SPA/RAC for the biennium 2022- 2023

Narrative introduction to the draft Programme of Work 2022-2023 of SPA/RAC

1. The preliminary draft Programme of Work (PoW) for the 2022-2023 biennium of SPA/RAC (hereinafter referred to as SPA/RAC's draft 2022-2023 PoW) has been prepared following the guiding elements included in the Planning and Programming Paper for the preparation of the 2022-2023 PoW prepared by the Secretariat. Since this is the first biennium of the next MTS cycle (2022-2027), which is still under development, the SPA/RAC's draft 2022-2023 PoW uses all the main elements included in the current draft of the new MTS, including key priorities, objectives and strategic outcomes.

2. In developing the SPA/RAC's draft 2022-2023 PoW due consideration has been given to the contribution of its expected deliverables to the achievement of the anticipated MTS programmes and outcomes. Special emphasis was placed on outcomes which require a long-term timespan, especially those planned to be expanded over the entire six-year MTS cycle, as well as those being directly linked with or continuing ongoing work of the current biennium.

3. The activities proposed under the SPA/RAC's draft 2022-2023 PoW aim at assisting Barcelona Convention Contracting Parties in the implementation of the Specially Protected Areas and Biological Diversity (SPA/BD) Protocol, in particular, by protecting, preserving and managing, in a sustainable and environmentally sound way, areas of particular natural or cultural value, notably by the establishment of specially protected areas and by protecting, preserving and managing threatened or endangered species of flora and fauna, and their habitats, in line with the SPA/RAC mandate.

4. The SPA/RAC's draft 2022-2023 PoW has been developed considering the priorities defined in the Post-2020 SAPBIO, the Post-2020 Regional Strategy for marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean, both under development, and the Regional Action Plans and Strategy on threatened and endangered species and key habitats. Its deliverables aim at contributing, based on the available budget (both MTF and externally mobilized funds), to the implementation of the following Instruments and Decisions taken by the Contracting Parties to the Barcelona Convention: the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol); COP 15 Decision IG.17/12: Procedure for the revision of the areas included in the Specially Protected Areas of Mediterranean Importance (SPAMI) List (Almeria, Spain, 15-18 January 2008); COP 19 Decision IG.22/7: Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (Athens, Greece, 9-12 February 2016); COP 20 Decision IG.23/6: 2017 Mediterranean Quality Status Report (MED QSR) (Tirana, Albania, 17-20 December 2017); and COP 21 Decision IG.24/4: Assessment Studies, and more particularly its Annex V on the Roadmap and Needs Assessment for the 2023 Mediterranean Quality Status Report, Decision IG.24/6: Identification and Conservation of Sites of Particular Ecological Interest in the Mediterranean, including Specially Protected Areas of Mediterranean Importance; Decision IG.24/7: Strategies and Action Plans under the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean, including the SAPBIO; the Strategy on Monk Seal, and the Action Plans concerning Marine Turtles, Cartilaginous Fishes and Marine Vegetation; Classification of Benthic Marine Habitat Types for the Mediterranean Region, and Reference List of Marine and Coastal Habitat Types in the Mediterranean and COP 21 Decision IG.24/14: Programme of Work and Budget (Naples, Italy, 2-5 December 2019).

5. The SPA/RAC’s draft 2022-2023 PoW also considers relevant current and emerging global and regional frameworks and processes, including SDG 14.2, 14.4, 14.5, 12.2, 15.5, 15.8, 15.9, 15.a; UN Convention on Biological Diversity and the Post-2020 global biodiversity framework, UNFCCC and Paris Agreement, UN Decade on Ecosystem Restoration (2021-2030), UN Decade of Ocean Science for Sustainable Development (2021-2030), the under development global Biodiversity Beyond National Jurisdiction binding framework (BBNJ), etc.

6. The SPA/RAC’s draft 2022-2023 PoW is developed mainly under five MTS Programmes, namely “Towards Healthy Mediterranean Ecosystems and Enhanced Biodiversity”, “Towards a Climate Resilient Mediterranean”, “Governance”, “Together for a shared vision of the Mediterranean Sea and coast” and “Towards a stronger advocacy, awareness, education and communication of the Mediterranean Sea and coast”. Particular attention will be paid to the collaboration with other MAP Components.

I. MTS Programme “Towards Healthy Mediterranean Ecosystems and Enhanced Biodiversity”

7. The main objective of the SPA/RAC’s draft 2022-2023 PoW under this programme is to support the Contracting Parties in their efforts towards improving ecosystem resilience through restoration of those with best regeneration potential, to assist them in establishing, expanding and efficiently managing a comprehensive, coherent and effective Mediterranean network of MPAs and OECMs, improving the status of conservation of Mediterranean endangered and threatened species and key habitats and minimizing non-indigenous species introductions and controlling their introduction pathways. More specifically, the SPA/RAC’s draft 2022-2023 PoW envisages to assist the Contracting Parties to implement national measures to restore the most resilient marine and coastal habitats, as mean to allow successful restorations during the Decade for Ecosystem Restoration and get experience for more challenging ones in the future, including through the elaboration of tools and guidelines, specific training and where and whenever possible, countries’ field actions.

- in the elaboration or updating of their national strategies and action plans for the development of MPAs and OECMs networks, based on the orientations and priorities of the post-2020 SAPBIO, post-2020 regional strategy for MPAs and OECMs, the CBD post-2020 global biodiversity framework, and other relevant global goals and targets.
- in extending their MPA/Specially Protected Areas of Mediterranean Importance (SPAMIs), Particularly Sensitive Sea Areas (PSSAs) and OECM networks, by extending existing areas, declaring new ones, including in Areas Beyond National Jurisdictions (ABNJ), designating highly protected zones, and enforcing efficient management measures for their long-term conservation. Specific support will be provided in terms of strengthening effective SPAMI management through SPAMI Twinning Programmes. Enforcement activities will be guided and supported by technical tools, standards, criteria, guidelines, tailored at regional or sub-regional level, as needed and as relevant.
- to ensure the continuous knowledge and conservation status assessments of marine and coastal species and habitats covered by Regional Action Plans or by the Annex II and III of the SPA/BD Protocol, in line with the IMAP requirements as well as data sharing, capacity building programmes (symposia, workshop and thematic regional, sub-regional and national training sessions), regional action plans/strategy update and elaboration of sub-regional and national ones, but also improvement of measures to mitigate the impact and interaction with coastal and marine human activities and enhancing their adoption by the Contracting Parties.
- to update and implement the Regional Action Plan concerning Species Introductions and Non-Indigenous Species (NIS) in the Mediterranean Sea, through the elaboration of tools and

guidelines and to adapt it to sub-regional and national contexts, to enhance knowledge and capacities, in particular, through the monitoring and assessment of GES related to NIS, in line with the IMAP requirements, as well as to facilitate data sharing and capacity buildings activities.

II. MTS Programme “Governance”

8. The main objective of the SPA/RAC’s draft 2022-2023 PoW under this programme is to contribute to the effective implementation and enforcement by the Contracting Parties of the Barcelona Convention, its Protocols, MAP Policies, the MSSD and Programmes of Measures achieved at regional and national levels, to ensure policy coherence and complementarity among relevant work at global, regional and national levels and among MAP-Barcelona Convention system’s policy and regulatory instruments, to enhance partnerships and multi-stakeholder engagement including with the private sector, civil society organisations and science-policy interface and the implementation of coordinated approaches to strengthen public institution capacities for the implementation of the Barcelona Convention and its Protocols. More specifically, the SPA/RAC’s draft 2022-2023 PoW envisages to assist the Contacting Parties through:

- The organisation of the SPA/BD Focal Points meeting and the SAPBIO National Correspondent meetings.
- National Biodiversity Strategic Action Programmes (NBSAPs) elaboration in alignment with the Post-2020 SAPBIO.
- Bilateral working exchanges with global institutions of relevance for the implementation of the Post-2020 SAPBIO actions linked to their prerogatives.
- Virtual meetings of the SAPBIO Advisory Committee.
- Promoting the title of “Partner” to the Regional Action Plans for the conservation of threatened and endangered species and marine key habitats: "Regional Action Plans Partners".
- Development of funding proposals to support Parties' institutions on initial implementation of the Post-2020 SAPBIO.

III. MTS Programme “Together for a shared vision of the Mediterranean Sea and coast”

9. The main objective of the SPA/RAC’s draft 2022-2023 PoW under this programme is to support and facilitate Environment and Development Observation and IMAP monitoring to provide updated and quality-assured data in support of decision-making by the Contracting Parties and assessment of GES and science-based IMAP, foresight and other assessments and assessment tools for strengthened science-policy interface and decision-making. More specifically, the SPA/RAC’s draft 2022-2023 PoW envisages to assist the Contacting Parties through:

- Supporting the development and implementation of National/Sub-regional Monitoring Programme(s) in line with the Biodiversity cluster of IMAP and reporting results through the IMAP Info System in line with MED QSR 2023 Roadmap Decision.
- Maintaining Biodiversity databases as appropriate, regularly update databases content and elaborating operational strategy for marine biodiversity data management in line with the UNEP/MAP Data Management Policy.
- Developing monitoring and assessment criteria as well as the reporting processes at national, sub-regional and regional levels for IMAP common indicators (CIs) on biodiversity.

IV. MTS Programme "Towards a stronger advocacy, awareness, education and communication of the Mediterranean Sea and coast"

10.The main objective of the SPA/RAC's draft 2022-2023 PoW under this programme is to contribute to properly informing stakeholders and policy makers about the state of the Mediterranean Sea and coast and to let them aware of the environmental priority issues, to raise citizen and general public awareness and outreach through citizen science and digital campaigns, and to contribute to a digital transformation using digital technologies to improve networking and MAP visibility. More specifically, the SPA/RAC's draft 2022-2023 PoW envisages to assist the Contacting Parties through:

- Developing communication material and events to enhance knowledge on SPA/RAC action in collaboration with the Contracting Parties.
- Co-creating and implementing with CSOs education and awareness programmes on biodiversity conservation within SPAMIs.
- Celebrating the SPAMI Day and delivering the SPAMI Certificates.
- Developing a strategy on incorporating the SPA/BD Protocol and its relevant strategies and tools into Mediterranean countries relevant university curricula and initiating its implementation.
- Enhancing networking among SPAMIs and increasing the visibility of the SPAMI List through the SPAMI Collaborative Platform.

11.The SPA/RAC's draft 2022-2023 PoW is built on and aims at strengthening the result-based management (RBM) approaches that have been already followed in the previous PoW cycles as well as the integration element.

12.Lessons learned from previous biennia have also been taken into consideration, particularly in terms of feasibility of planned deliverables, implementation flexibility to be considered when programming, the number and size of planned actions and how to consolidate activities of a similar nature.

13.To support the implementation of the PoW 2022-2023, SPA/RAC, together with the MAP CU or with its own means, has secured (or expect to secure) around 2,230,000 €, beside MTF funds.

14.The SPA/RAC's draft 2022-2023 PoW consists of the following elements: The MTS 2022-2027 programmes and outcomes under which the PoW is developed. Under each outcome, are presented, respectively, the main activities, means of implementation and expected deliverables that would be produced, as well as the Lead Component (i.e., SPA/RAC), the other Components expected to contribute to the activity and the partners that would be involved to achieve the expected deliverables. Are, also, indicated in the tables for each main activity, the SDG's references to which it is linked. An idea is also given on whether only MTF budget and/or external resources are planned for the suggested activities and expected deliverables.

MTS Programme 2. Towards Healthy Mediterranean Ecosystems and Enhanced Biodiversity						
Main activity (means of implementation)	**Expected deliverable**	**Lead Component**	**Other Component(s)**	**Partners**	**SDG Targets**	**MTF/External Resources/Both**
Outcome 2.1. Ecosystem resilience improved through restoration of those with best regeneration potential						
2.1.1. Promote the implementation of the UN Decade on Ecosystem Restoration in the Mediterranean: Identify innovative actions, capitalize and promote replication (In-house expertise, consultancy, pilot projects, regional workshop, side-events)	a) Priority actions to contribute to the implementation of the UN decade on Ecosystem Restoration identified including through mitigation of fisheries interaction, underwater noise, and marine litter.	SPA/RAC/CU	ALL MAP Components	FAO-GFCM, ACCOBAMS, CBD, IUCN MedPAN, RAP associated Partners	14.2; 14.a; 13.1; 13.2	MTF, QUIETSEA EU funded project / MAVA Depredation project
	b) Integration and streamlining of ecosystems restoration in MAP regional measures /action plans/strategies.					
	c) Sharing of best practices, measures and lessons learnt for biodiversity restoration, ensuring carbon sink optimisation and buffering resilience to climate extremes.	SPA/RAC	Plan Bleu	MedECC, UNFCCC, IUCN		MTF + external funds to be identified

	d) Proceedings document with compilation on best practises and measures taking place in Mediterranean ecosystems or applicable to them edited and disseminated.					
Outcome 2.2. Comprehensive, coherent Mediterranean network of well-managed MPAs and OECMs in place, expanded, effective and sustainable						
2.2.1. Enhance the designation and connectivity of different area-based conservation measures, including in ABNJ (in-house expertise, consultancy)	a) Existing MPAs/SPAMI and other OECM (PSSA, FRA, etc.) in the Mediterranean mapped (MAPAMED). b) Objectives and complementarities among different area-based conservation measures assessed. c) Recommendations developed for new designations and measures to enhance connectivity and effectiveness, including in ABNJ. d) Guidelines on OECM identification in the Mediterranean marine and coastal environment elaborated.	SPA/RAC, CU	REMPEC, PAP/RAC, Plan Bleu	FAO-GFCM, ACCOBAMS, IOC-UNESCO, IUCN, AGEM, MedPAN	14.2; 14.5	Both (including IMELS support)
2.2.2. Design and implement national measures to boost marine protected areas (MPAs) in the region	a) Post-2020 national strategies/priorities for MPAs (at least for two CPs: the (i) Egyptian Mediterranean and (ii) Libyan coasts). b) National and institutional capacities strengthened through (i) training courses on improving Mediterranean MPA	SPA/RAC, Respective Contracting Parties	CU and other Components as relevant	Relevant national authorities, relevant regional partners, AGEM, national, sub-regional and regional networks of MPA managers,	14.2; 14.5; 14.a; 14.c	2.2.1.(a) (i) EXT: EU-funded IMAP-MPA project2.2.1.(a) (ii) EXT: GEF-funded MedProgramme Child project 3.12.2.1.(b) MTF; EXT: GEF-funded MedProgramme Child project 3.1; EXT: Unsecured: EC-ENI CBC MED ENSERES project:

(in-house expertise, consultancy, national trainings/workshops, financial support to countries)	management and sustainability including strengthened financial mechanisms as well as (ii) national legislation development for MPA (Libya).			MedPAN Regular Training Programme		under review2.2.1.(f) (i) EXT: MAVA-funded NTZ/MPA project + EU-funded IMAP-MPA Project2.2.1.(f) (ii) EXT: EU-funded IMAP-MPA project
	c) Contracting Parties implement their national strategies and priorities for MPAs.					
	(d) 6 management plans elaborated for the Rachgoun Island future MPA (Algeria), Tyre Coast Nature Reserve/SPAMI (Lebanon), Gulf of Sirte future MPA (Libya), Al Hoceima NP (Morocco), Kuriat MCPA (Tunisia), Foça SPEA (Turkey), and					
	(e) 3 business plans elaborated for the Rachgoun Island future MPA (Algeria), Tyre Coast Nature Reserve/SPAMI (Lebanon), and Gulf of Sirte future MPA (Libya).					
2.2.3. Ensure effective SPAMI management and evaluation (in-house expertise, consultancy, field trips, exchange visits,	(a) SPAMI management status kept under review: SPAMI ordinary periodic reviews undertaken (2022: Karaburun Sazan National Marine Park (Albania); 2023: Banc des Kabyles Marine Reserve (Algeria), Habibas Islands (Algeria), Calanques National Park (France), and Portofino Marine Protected Area (Italy)).	SPA/RAC	CU and other Components as relevant	SPAMI managers, SPA/BD Focal Points, CSOs and private sector, CBD, GFCM, IUCN, WWF, MedPAN,	14.2; 14.5; 14.a	2.2.2.(a) MTF 2.2.2.(b) MTF / EXT (EC, ENI CBC MED, ENSERES project: under review) 2.2.2.(c) EXT (EC, ENI CBC MED, ENSERES project: under review) ; 2.2.2.(d) NTZ/MPA Project

coordination national/local trainings, MoUs with CSOs)	b) SPAMI Twinning Programmes developed and implemented for at least 6 SPAMIs (management issues diagnosed and addressed, habitats conservation, fishing impacts, joint monitoring programmes implemented, medium-term on-the-job training, peer-to-peer support and mentoring, exchange visits, small grants programme benefiting to local CSOs/local small enterprises.					
	c) Local stakeholders and civil society involved in SPAMI/MPA management.					
	d) SPAMI Collaborative Platform maintained, including support the intervention of other MAP Components in SPAMIs (Marine Litter management, SCP action, ICZM, MSP, sustainable tourism, etc.).					
Outcome 2.3. Mediterranean endangered and threatened species and key habitats in favourable status of conservation						
2.3.1. Implement regional and national actions to boost the implementation of the Action Plans on marine key habitats (in-house expertise, consultancy, national consultations, pilot	a) Symposia on marine key habitats organised and Proceedings disseminated (7th Mediterranean Symposium on marine vegetation, 4th Mediterranean Symposium on the Conservation of the Coralligenous and other calcareous bio-concretions and 3rd Mediterranean symposium on the dark habitats): Scientific updates shared, Roundtables and Panels held to take stock of newest	SPA/RAC	CU and other Components as relevant	RAP associates and Partners, GFCM	14.2; 14.5; 14.a	MTF + MAVA NTZ/MPA for 2022

actions, national/regional events, and symposia)	knowledge and address emergent issues of the marine key habitats.					
	b) First Mediterranean distribution maps of Posidonia meadows and coralligenous assemblages elaborated as provided for in the Regional Action Plans concerning threatened species and key habitats, and as input for Med QSR 2023 : inventory and collection of existing distribution data of Posidonia meadows and coralligenous assemblage elaborated; distribution maps inventoried, collected and aggregated, national consultations organised, data layers uploaded and made available in the Mediterranean Biodiversity Platform (MBP).	SPA/RAC	CU and other Components as relevant	RAP associates and Partners, CPs, EmodNet		MTF + MAVA NTZ/MPA for 2022
	c) Knowledge about semi-dark populations (e.g. location, specific richness, functioning, typology) improved through national and regional data and scientific work on marine caves habitats inventory and mapping in south Mediterranean (at least for a pilot site in one country).	SPA/RAC	CU and other Components as relevant	RAP associates and Partners, CPs, relevant national/regional research/scientific actors		MTF + external funds to be identified

	d) Restoration measures taken related to conservation of *Pinna nobilis* in the Mediterranean to respond to their mass mortality. e) Knowledge, and monitoring strengthened at national/regional levels	SPA/RAC	CU and other Components as relevant	Oceana, IUCN, GFCM		MTF + external funds to be identified
2.3.2. Effectively implement the updated regional Strategy and Action Plans for the conservation of threatened and endangered species (in-house expertise, consultancy, awareness raising)	a) Status of implementation of the Action plan on seabirds listed in Annex 2 to SPA/BD protocol assessed and Action Plan updated	SPA/RAC	CU and other Components as relevant	National experts and organizations, NGOs, SPA/BD Focal Points, Action Plans Partners; BirdLife Europe and Central Asia, GFCM, ACCOBAMS, IUCN Med, MEDASSET, WWF, MedPAN, DEKAMER, ARCHELON, Foça SPEA Managers	14.1; 14.2; 14.4; 14.5; 14.a	a) MTF
	b) Status of Mid-term evaluation of the Monk seal regional strategy implementation in the Mediterranean assessed. c) Knowledge enhanced and awareness actions on monk seal in the Mediterranean implemented.					b) (i) MTF (ii) MONK SEAL ALLIANCE project (under negotiation)
	d) Priority actions supported for the full and effective implementation of the updated regional Action Plans for the conservation of threatened and endangered species (Cartilaginous fishes AP, Turtles AP, Bird AP).					c) MTF, External funds to identify
	e) Most vulnerable species impacted by bycatch and most impacting fishing gears identified based on bycatch data collection programmes allowing identification and proposal of mitigation measures.					d) MAVA MedBycatch project - funds available up to October 2022; external funds to identify
	f) National stranding networks set up and/or reinforced.					e) MAVA MedBycatch project, MAVA Marine turtles project - funds available up to October 2022

	g) Communication and policy/advocacy material elaborated to support Contracting Parties to: - foster bycatch issue and its mitigation solutions - raise awareness on fisheries and other human activities interaction with Mediterranean endangered and threatened species and key habitats (bycatch, depredation, marine litter, underwater noise, stranding, habitat loss, etc.) - Promote conservation status and actions based on key knowledge collected on vulnerable species (marine mammals, seabirds, sea turtles and elasmobranchs).					f) MAVA MedBycatch project, Mava species project - fund available up to May 2022
	h) Surveillance strategy to mitigate illegal fishing activities over the sensitive marine habitats elaborated and support to local authorities for the establishment of a ranger system in Foça SEPA provided.					g) NTZ/MPA project
2.3.3. Implement conservation measures and share best practices related to threatened and endangered species listed in Annex II to SPA/BD Protocol (in-house expertise, consultancy, regional,	a) Best practices shared through: - Vulnerable species bycatch mitigation measures trials- Regional gathering events related to key knowledge sharing on vulnerable species (marine mammals, seabirds, sea turtles and elasmobranchs) and their interactions with fisheries including within GFCM FishForum- training and capacity building programmes.	SPA/RAC	CU and other Components as relevant	National experts and organizations, NGOs, SPA/BD Focal Points, Action Plans Partners; BirdLife Europe and Central Asia, GFCM, ACCOBAMS, IUCN Med,	14.1; 14.2; 14.4; 14.5; 14. a	a) MAVA MedBycatch Project - funds available up to october 2022; MTF; external funds to identify; Mava Species project - fund available up to May 2022

sub-regional and national trainings, workshops and regional other events)	b) Collection, analysis and uploading of Bycatch data into the GFCM online Mediterranean bycatch database portal by one Contracting Party within the MedBycatch project in line with the vulnerable species and habitat Regional Action Plans and IMAP.			MEDASSET, WWF, Medpan, DEKAMER, ARCHELON, Foça SPEA Managers		b - MAVA MedBycatch Project - funds available up to October 2022; External funds to be identified
	c) National Capacity building trainings organised at subregional and or national levels on the: - identification of vulnerable species, their interactions with fisheries and bycatch mitigation tools and technics including bycatch data collection - monitoring of vulnerable species in line with the IMAP and Regional Action Plans.	SPA/RAC	CU and other Components as relevant	National experts and organizations, NGOs, SPA/BD Focal Points, Action Plans Partners; BirdLife Europe and Central Asia, GFCM, ACCOBAMS, IUCN Med, MEDASSET, WWF, Medpan, DEKAMER, ARCHELON, Foça SPEA Managers	14.1; 14.2; 14.4; 14.5; 14. a	c) MAVA MedBycatch Project - funds available up to October 2022; MTF; funds to identify
	d) Sharing of best practices and lesson learnt at regional and/or national levels to disseminate project results on threatened species such as: - MedBycatch project - Species (highly mobile species) project results.					d) e) and f) MAVA MedBycatch Project - funds available up to October 2022; MTF; external fund needed
	e) Biennial cetacean conference for the south Mediterranean countries co-organised.					
	f) The Symposium on Med chondrichtians Fishes co-organised.					
Outcome 2.4. Non-indigenous species introductions minimized and introduction pathways under control						

2.4.1. Update and implement the regional action plan on Non-Indigenous species (NIS) and species introductions, as well as targeted measures of the Mediterranean Strategy on Ships' Ballast Water Management and Action Plan (in-house expertise, consultancy, regional meetings and events, national capacities building)	a) Regional Action Plan on non-indigenous species and species introduction implementation assessed and updated in line with IMAP, Post 2020 SAP BIO and related Global Processes.	SPA/RAC	CU, REMPEC and other Components as relevant	RAP associates and Partners, CPs	14,2	MTF
	b) Guidelines for controlling the vectors of introduction into the Mediterranean of NIS and invasive marine species and Guide for risk analysis assessing the impacts of the introduction of NIS updated taking into account the Mediterranean BWM.	SPA/RAC	CU, REMPEC	RAP associates and Partners, CPs		MTF
	c) 2nd Mediterranean Symposium on the Non-Indigenous Species organised: Scientific updates shared, Roundtables and Panels held to take stock of newest knowledge and address emergent issues related to NIS.	SPA/RAC	CU, REMPEC and other Components as relevant	RAP associates and Partners, CPs, GFCM		MTF
	d) At least one Sub-regional Action Plan on non-indigenous species and species introduction developed.	SPA/RAC	CU, REMPEC and other Components as relevant	GFCM, CPs		MTF
	e) Implementation of targeted NAPs measures on NIS supported in coordination with IMAP implementation in at least 4 Contracting Parties. f) Data contained in MAMIAS updated as appropriate.	SPA/RAC	CU and other Components as relevant, CPs	RAP associates and Partners, relevant national/regional Mediterranean scientific actors		MTF

	g) Share best practices and lessons learnt among Contracting Parties through regional meeting; h) measures to control and manage ships' biofouling to minimise the transfer of invasive aquatic species implemented; assistance provided i) Targeted technical support provided to CPs for the ratification and implementation of the Ballast Water Management Convention as well as for the implementation of the 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species.	REMPEC, SPA/RAC	CU	IMO, GEF, UNDP, EBRD		Both

MTS Foundational Programme 5: Governance						
Main activity (means of implementation)	**Expected deliverable**	**Lead Component**	**Other Component (s)**	**Partners**	**SDG Targets**	**MTF/External Resources/Both**
Outcome 5.2. Systemic strengthening and effective functioning and delivery of MAP decision-making and advisory bodies ensured, and efficiency enhanced with new digital approaches						
5.2.3. Deliver successfully the main institutional meetings of MAP (Bureau, MAP Focal Point, EcAp Coordination Group and Thematic/Components Focal Points).(in-house expertise, conference services, venue, travel arrangements)	e) 16th SPA/BD Focal Points meeting organised h) Technical products reviewed by the 16th SPA/BD Focal Points.	CU, MAP Components	All MAP Components	UNEP, MEA, IMO and all REMPEC's Partners,Host country authorities, MAP Partners, SPA/RAC partner organizations (observers)	All SDG 14 targets especially 14.c; 16.3; 17.14; to a lesser extent SDGs 6, 12, 13	MTF
5.2.5. Strengthen the MAP result-based programmatic framework including gender mainstreaming and sustainability of operations(in-house expertise, consultancy, MAP Task Force meetings, regional and international meetings)	c) Regional policy-makers meetings and donor conferences targeting the Post-2020 SAPBIO and Post-2020 Regional Strategy for MPAs and OECMs in the Mediterranean organised.	SPA/RAC	CU, PAP/RAC, REMPEC, Plan Bleu	Global and regional relevant actors (i.e. SCBD, FAO GFCM, UNFCCC, IUCN, IMO, UN-Oceans, UNESCO-IOC, IPBS, etc.) and relevant international and regional multilateral and bilateral donors	All SDG 14 targets especially 14.c; 16.3; 17.14; to a lesser extent SDGs 5, 6, 12, 13	MTF

				including private foundations		
5.2.7. Organise SAP BIO correspondent meetings (in-house expertise, regional meetings)	a) Two meeting reports of the SAP BIO National Correspondents (one presential meeting in 2022; one virtual meeting in 2023).	SPA/RAC	All MAP Components	CPs (SPA/BD FPs, SAPBIO Correspondents)	14.2; 14.5; 17.14	MTF
Outcome 5.3. Policy coherence and complementarity ensured among relevant work at global, regional and national levels and among MAP-Barcelona Convention system's policy and regulatory instruments						
5.3.2. Maximise synergies with Post 2020 Global agenda for the implementation of SAP BIO (in-house expertise, working sessions with partner institutions, regional meetings and donor conferences)	a) Effective working exchanges with Global institutions of relevance for the implementation of Post 2020 SAPBIO actions linked to their prerogatives ensured. b) Reports of working sessions celebrated with each relevant institution; list of agreed bilaterally coordinated actions with draft timelines.	SPA/RAC	CU, PAP/RAC, REMPEC, Plan Bleu	Relevant CPs, SCBD, FAO GFCM, UNFCCC, IUCN, IMO, UN-Oceans, UNESCO-IOC, IPBS	14.2; 14.5; 17.14	MTF or ext. Fund to be identified
Outcome 5.4. Enhanced partnerships and multi-stakeholder engagement, including with the private sector and science policy interface						

5.4.4. Promote the title of Partner to Regional Action Plan for the conservation of threatened species and marine key habitats «Regional Action Plans Partners" (in-house expertise, consultancy)	a) Conditions and criteria for the award of the Regional Action Plans Partners titles developed. b) The Mediterranean MPA Forum process and the Post-2020 Mediterranean MPA Forum Roadmap	SPA/RAC SPA/RAC, MedPAN, and other key partners	CU, relevant RACs	RAPs Partners, SPA/RAC Partners	14.2; 14.5; 17.17	MTF
Outcome 5.5. Coordinated approaches implemented to strengthen public institution capacities for the implementation of the Barcelona Convention and its Protocols						
5.5.2. Development of funding proposals to support Parties' institutions on initial implementation of Post-2020 SAPBIO (in-house expertise, consultancy, conference, project proposals)	a) 4+ years Project concepts and full proposals of regional/ subregional level for key priority strategic actions of Post-2020 SAPBIO.	SPA/RAC	CU /Other RACs as per thematic	Public and private donors, SCBD, FAO	14.2; 14.5; 17.14	a- MTF
	b) Mediterranean biodiversity funding conference involving public and private donors with policy makers organised.					b- MTF, External (MAVA foundation) under negotiation
	c) External funds secured to support the implementation of at least 2-3 key regional priorities of Post-2020 SAPBIO.					c- MTF

MTS Enabling Programme 6: Together towards a shared knowledge and foresight of the Mediterranean Sea and coast						
Main activity (means of implementation)	**Expected deliverable**	**Lead Component**	**Other Component (s)**	**Partners**	**SDG Targets**	**MTF/External Resources/Both**
Outcome 6.1. Inclusive and participatory foresight activities conducted at regional and national and local levels, with associated capacity-building						
Outcome 6.2. Science-based IMAP, foresight and other assessments and assessment tools for strengthened science-policy interface and decision making						
6.2.1. Strengthen the implementation of national IMAP-based monitoring programmes for all clusters and deliver quality assured data (in-house expertise, consultancy, IMAP TF, national assistance and trainings)	e) Technical and financial support provided for undertaking specific joint biodiversity and pollution monitoring programmes in MPAs and in high pressure areas, including provision of related quality of data, as well as respective national reporting using the IMAP Info System. National assessment fact sheets developed for selected indicators.	SPA RAC, CU				MTF; EcAp MED 3, IMAP-MPA, MED Marine Litter 2
	f) Joint Monitoring and Assessment programme on Non-Indigenous Species (NIS) implemented at national and sub-regional level and reporting of results through IMAP Info System; Baseline national, sub regional and regional assessment for NIS supported, National assessment fact sheets developed for selected indicators.	SPA RAC				
6.2.2. Upgrade the assessment component of IMAP including possible integrated assessment for all IMAP clusters:	a) Assessment criteria defined and discussed by CORMONs Biodiversity for a number of Common Indicators.b) Assessment scales defined for a number of Common Indicators.c) Baseline sub-regional assessments undertaken for NIS.	SPA RAC	IMAP Task Force, Plan Bleu, INFO/RAC	National IMAP competent laboratories/authorities; relevant national and international scientific institutions; EU	14.1; 14.a	

Focus Assessment criteria and thresholds (CI 1, 2, 6, 13, 14, 16, 17, 21, 22, 23)(in-house expertise, consultancy, IMAP TF, CORMONs)				MSFD technical bodies;		
6.2.3. Further develop IMAP Common Indicators (in-house expertise, consultancy, IMAP TF, CORMONs)	c) Common Indicators for EO 3 and EO 4 developed.	CU, SPA/RAC	IMAP Task Force	GFCM	14.1.; 14.2; 14. a	Both
6.2.4. Deliver 2023 MED Quality Status Report (QSR) (in house expertise, thematic assessments, consultations with partners, GIS maps, IMAP TF, CORMONs)	a) Thematic assessments for Ecological Objectives 1,2,3,4, 6 contributing to 2023 MED QSR whilst progressing towards integration with other Ecological Objectives as appropriate, CORMON Meeting.	SPA/RAC, CORMON Biodiversity	CU, SPA/RAC, PAP/RAC, IMAP Task Force	UNEP-GRID, UNIGE, EEA, ACCOBAMS, MED Region, ICES, JRC, etc	14.1; 14.a	MTF; EcAp MED 3, IMAP-MPA, MED Marine Litter 2
Outcome 6.3. [IMAP implementation and] Environment and Development Observation provide updated and quality assured data in support of decision-making by Contracting Parties and assessment of GES.						

6.3.13. Expand and improve the monitoring and forecasting capacities in the marine environment through integrating networks of observing and forecasting systems (oceanographic observatories) across the Mediterranean Sea (in-house expertise, consultancy, trainings and working meetings)	b) Coordination, training and working meetings organised for interfacing oceanographic observatories exchange among Parties of respective countries with EU ILIAD Project Consortium through the UNEP/MAP system, to support an enhanced implementation of the IMAP through access to observatories' regular/real time data on ocean water parameters, NIS, litter including microplastic, spills, etc.	SPA/RAC	CU, INFO/RAC, other components as per parameter monitored	Consortium of Euromediterranean Partners of ODYSSEA Project follow up (56 partners)	14.2; 14.a	MTF/External budget
6.3.14. Maintain Biodiversity databases as appropriate, regularly update databases content and elaborate operational strategy of marine biodiversity data management in line with the UNEP/MAP Data	a) SDF web **and SPA Directory web** applications finalised and operational and linked to the Mediterranean biodiversity Platform.	SPA/RAC	CU, INFO/RAC, MED POL, SCP/RAC, PAP/RAC, Plan Bleu, REMPEC	Action Plans Partners, MedPAN network, MEDACES, ACCOBAMS, GFCM…	14.2; 14.5; 14.a	MTF
	b) MAPAMED and MAMIAS web applications maintained and fully operational within the Mediterranean Biodiversity Platform.					MTF
	c) Data available online on the Mediterranean Biodiversity Platform and contributing to the 2023 MED QSR.					MTF

Management Policy (in-house expertise, consultancy platform)	d) Operational Strategy for Data Management within SPA/RAC developed in line with the UNEP/MAP Data Management Policy.					

MTS Enabling Programme 7: For informed and consistent advocacy, awareness, education and communication						
Main activity (means of implementation)	**Expected deliverable**	**Lead Component**	**Other Component (s)**	**Partners**	**SDG Targets**	**MTF/External Resources/Both**
Outcome 7.1. Stakeholders and policy makers properly informed about the state of the Mediterranean Sea and coast and aware of the environmental priority issues						
7.1.7. Celebrate the MAP Days in the Mediterranean Sea (in-house expertise, Communication TF, regional events)	b) SPAMI Day celebrated and SPAMI Certificates delivered to SPAMIs.	SPA/RAC	CU and other MAP component as relevant	SPAMI managers, CSOs, national & local authorities, private sector, etc.	14.2; 14.5	MTF
Outcome 7.2. Citizen and general public awareness and outreach raised through citizen science and digital campaigns						
7.2.2. Enhance public awareness and outreach on UN Days observance and their topics (in-house expertise, external expertise, Communication TF, digital campaigns, web platforms, outreach events, publications)	c) Knowledge on Biodiversity enhanced through digital campaign on UN Biodiversity Day observance and other communication products (1 annual calendar (illustrated with messages), 48 website articles, publications, focus feature in MAP newsletter, Interactive brochure, outreach events); Relevant communication material and events to enhance knowledge on SPA/RAC mandate and action developed (1 agenda per year, at least 24 web articles per year, 2 webinars/events for the general public per year, at least 2 reports published per year)	SPA/RAC, INFO/RAC	CU and other MAP components as relevant	Relevant partners/actors depending on events		Both (MTF + external funds to be identified)

	g) Networking among SPAMIs enhanced and visibility of the SPAMI List increased through the SPAMI Collaborative Platform. h) Information on SPAMIs (management unit, documentation, ecology, photos …) are updated at least once a year in collaboration with the SPAMI managers. i) The webpage on the SPAMI Day is created and integrated within the SPAMI Collaborative Platform. j) At least 12 web articles on SPAMIs published with the support of SPAMI managers. k) The SPAMI Collaborative Platform is used as a tool for information exchange through the SPAMI forum (1 subject per month).	SPA/RAC	CU and other MAP component as relevant	Relevant SPAMI managers, CSOs, national & local authorities, private sector		Both MTF + external funds: ENI CBC MED (ENSERES project), IMELS
7.2.5. Co-create and implement education and awareness programmes also in cooperation with academic institutions, focusing on marine and coastal issues, with the aim to promote education on sustainable development. (in-house expertise, external expertise,	a) Education and awareness programmes on biodiversity conservation co-created and implemented in collaboration with CSOs within at least 2 SPAMIs.	SPA/RAC	CU and other MAP component as relevant	CSOs, national & local authorities, private sector	4.7; 14.2; 14.5	Both (MTF + external funds: ENI CBC MED (ENSERES project), IMELS)
	b) At least 6 MoU signed with CSOs to develop education and awareness actions within SPAMIs.	SPA/RAC	CU and other MAP component as relevant	Relevant SPAMI managers, CSOs, national & local authorities, private sector		7.2.1. Both MTF + external funds: ENI CBC MED (ENSERES project), IMELS)

Communication TF, partnership Agreements)						
Outcome 7.3. Towards a digital transformation: use of digital technologies to improve networking and MAP visibility						
7.3.1. Enhance networking among SPAMIs and increase the visibility of the SPAMI List through the SPAMI Collaborative Platform (in-house expertise, external expertise, Communication TF, web platform)	a) Information on SPAMIs (management unit, documentation, ecology, photos …) are updated at least once a year in collaboration with the SPAMI managers. b) The webpage on the SPAMI Day is created and integrated within the SPAMI Collaborative Platform. c) At least 12 web articles on SPAMIs published with the support of SPAMI managers. d) The SPAMI Collaborative Platform is used as a tool for information exchange through the SPAMI forum (1 subject per month).	2	CU and other MAP component as relevant	CSOs, national & local authorities, private sector	14.2; 14.5	Both (MTF + external funds: ENI CBC MED (ENSERES project), IMELS)
7.3.3. Promote MAP educational capacity through E-Learning(in-house expertise, external expertise, Communication TF, web platform, training)	d) Streamline MAP BC system and Protocols in university and postgraduate curricula through online platforms	CU, MAP Components			4,7	MTF

Annex XIV

Conclusions and recommendations of the Fifteenth Meeting of SPA/BD Focal Points

Fifteenth Meeting of SPA/BD Focal Points
Videoconference, 23-25 June 2021

Conclusions and recommendations

Introduction

I. Following the kind invitation of the Maltese Government, the Fifteenth Meeting of the Specially Protected Areas and Biological Diversity (SPA/BD) Focal Points was to be held in Malta. Because of the sanitary conditions imposed by the COVID-19 pandemic and according to the recommendation of the Coordinating Unit for the Mediterranean Action Plan, Barcelona Convention Secretariat (UNEP/MAP), all meetings scheduled up to July 2021 are to be conducted by teleconference.

II. The Fifteenth Meeting of SPA/BD Focal Points (hereinafter referred to as "the meeting") was hosted by Malta and held by videoconference on 23–25 June 2021.

Participation

III. All the SPA/BD focal points were invited to attend the meeting or to designate representatives. The following Contracting Parties were represented at the meeting: Albania, Algeria, Croatia, Cyprus, Egypt, European Union, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Morocco, Montenegro, Slovenia, Spain, Syrian Arab Republic, Tunisia and Turkey.

IV. The Ad Hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) was represented by its Chair and Vice-Chair.

V. The secretariats of the following United Nations bodies, conventions and agreements and intergovernmental organizations were represented as observers: the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), the Convention on Migratory Species (CMS), the Council of Europe - Bern Convention and the International Union for Conservation of Nature (IUCN).

VI. The following governmental organization was also represented as observer: the European Topic Centre of Spatial Analysis and Synthesis, University of Malaga (ETC/UMA).

VII. The following nongovernmental organizations were also represented as observers: the Mediterranean Association to Save the Sea Turtles (MEDASSET), the Network of Marine Protected Areas Managers in the Mediterranean, (MedPAN), the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), and the World Wide Fund for Nature (WWF).

VIII. The UNEP/MAP Coordinating Unit, the Information and Communication Regional Activity Centre (INFO/RAC), the Priority Action Programme Regional Activity Centre (PAP/RAC) and the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) were represented at the meeting.

IX. The Specially Protected Areas Regional Activity Centre (SPA/RAC) acted as the secretariat of the meeting.

Organizational matters

X. The meeting agreed that the rules of procedure for meetings and conferences of the Contracting Parties to the Convention for the Protection of the Environment and the Coastal Region of the Mediterranean and its Protocols (UNEP/IG.43/6, Annex XI) would apply mutatis mutandis to their deliberations.

XI. The meeting unanimously elected the following officers:

Chairperson:	Mr. Duncan BORG (Malta),
Vice-Chairpersons:	Ms. Melina MARCOU (Cyprus),
	Mr. Zamir DEDEJ (Albania),
Rapporteur :	Ms. Samia BOUFARES (Tunisia).

XII. The Meeting agreed on the following conclusions and recommendations:

Agenda item 3 Status of implementation of the Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD) in the Mediterranean

1. The meeting expressed appreciation for the effort made by some Contracting Parties to report on implementation of the SPA/BD Protocol but stressed that it was difficult to have an overview on the status of its implementation from only a few reports.

2. The meeting called upon the Contracting Parties to submit implementation reports in a timely manner and in accordance with the reporting requirements of the Convention so that the status of and gaps in implementation of the Protocol could be better assessed.

3. The meeting noted that the online form was difficult to access and that it was difficult to provide the required data without access to data submitted previously. Receipt of only 12 reports from the 22 Contracting Parties indicated that there was a problem. The meeting stressed that countries have obligations to report to many conventions and asked for assistance to improve and streamline reporting.

4. The meeting suggested that a workshop be organized or a working group established to analyse the difficulties encountered by Contracting Parties with the online reporting system and to propose solutions to simplify reporting and improve the form and make it user friendly.

Agenda item 4 Progress report on activities carried out to implement the Biodiversity and Ecosystems core theme since the Fourteenth meeting of SPA/BD Focal Points

5. The Meeting welcomed with appreciation the progress report presented by the Secretariat on the many, varied activities undertaken since the 14th Meeting of SPA/BD Focal Points and acknowledged the work of SPA/RAC in implementing the Programme of Work, despite the difficulties due to the COVID-19 pandemic during the period.

6. The meeting acknowledged the continuous commitment of the Secretariat and encouraged it to strengthen existing synergies with relevant regional partners to achieve regional objectives under the SPA/BD protocol, in particular for activities to conserve endangered species and key habitats, monitoring and surveillance of marine and coastal biodiversity, capacity-building and development of a coherent network of marine protected areas.

Agenda item 5 Conservation of species and habitats

5.1. Updating of the Action Plan for the conservation of cetaceans in the Mediterranean Sea

7. The meeting reviewed and endorsed the draft updated Action Plan for the conservation of cetaceans and agreed on its submission, as amended, to the MAP focal points meeting and the Twenty-second Conference of the Parties (COP22) for adoption.

5.2. Updating of the Action Plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea (Dark Habitats Action Plan)

8. The meeting recognized the importance of the updated action plan for conservation of dark habitats and the associated species and noted that financial and technical assistance would be necessary to implement the provisions of the plan in several countries. It stressed the importance of multisectoral cooperation in deep-sea conservation and called for strengthening of cooperation among SPA/RAC and its partners on conservation and sustainable use of the high seas and the deep-sea environment.

9. The meeting reviewed and approved the draft updated action plan for the conservation of habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena in the Mediterranean Sea (Dark Habitats Action Plan) and invited SPA/RAC to submit it, as amended, to the MAP focal points meeting and to COP22 for adoption.

5.3. First elements to elaborate the List of Reference of Pelagic Habitat Types in the Mediterranean Sea

10. In considering the first elements proposed for the List of Reference of Pelagic Habitat Types in the Mediterranean Sea, the meeting (i) invited SPA/RAC to take into account, as appropriate, written comments received from the focal points on the subject in amending working document WG 502/7, and (ii) endorsed the proposal of the secretariat and agreed to its submission to the meeting of MAP focal points and to COP 22 with a recommendation to establish a multidisciplinary group of experts to elaborate the List for consideration by COP 23.

5.4. Ballast water management strategy for the Mediterranean Sea: 2022–2027

11. The meeting welcomed the draft Ballast Water Management Strategy for the Mediterranean Sea (2022–2027) prepared by REMPEC in cooperation with SPA/RAC and reviewed by the Fourteenth Meeting of REMPEC focal points and agreed to its submission to the next meeting of MAP focal points and COP 22 for adoption.

Agenda item 6 Conservation of sites of particular ecological interest

6.1 Report by the Chair of the Ad hoc Group of Experts for Marine Protected Areas in the Mediterranean (AGEM) on the Group's works during 2021

12. The meeting welcomed the report of the AGEM and acknowledged with appreciation the work of the secretariat and the AGEM during the period 2020–2021.

13. The meeting highlighted the role of the AGEM in providing scientific and technical advice to the Contracting Parties and to the secretariat with regard to advancing marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean region and recommended that the mandate of its members be extended to cover 2022–2023. The meeting also recommended that the terms of reference and the programme of the AGEM be aligned with the MPA and OECM agenda in the Mediterranean for the forthcoming period.

6.1.1 Criteria for inclusion of Specially Protected Areas (SPAs) in the Directory of Mediterranean SPAs

14. The meeting welcomed establishment of the Directory of Mediterranean SPAs and the proposed definition of a SPA and thanked SPA/RAC and AGEM for their valuable work on the matter.

15. The meeting proposed that the SPA Directory covers also the assessment of the effectiveness of conservation measures, in order to strengthen the listed SPAs, especially in terms of management and enforcement and to provide data for the MAPAMED database.

16. The meeting reviewed and endorsed the definition of SPAs and the draft criteria for inclusion of SPAs in the Directory of Mediterranean SPAs and invited SPA/RAC to submit them for the consideration of the next meeting of MAP focal points and COP22.

6.1.2 Guidance on identifying and reporting other effective area-based conservation measures (OECMs) for the Mediterranean marine and coastal environment

17. The meeting welcomed the proposed considerations on OECMs elaborated by the Secretariat and AGEM and invited them to assist the Contracting Parties in using the new concept.

6.2. Post-2020 Regional Strategy for marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean

18. The meeting welcomed and discussed the draft Post-2020 Regional Strategy for marine and coastal protected areas (MCPAs) and OECMs in the Mediterranean and provided comments and proposals to be considered for the revision of the document.

19. The meeting highlighted the importance of aligning the Post-2020 MCPA and OECM Regional Strategy with the Post-2020 SAPBIO targets and activities and particularly those related to protected areas.

20. The meeting endorsed the draft Post-2020 Regional Strategy for MCPAs and OECMs in the Mediterranean and invited SPA/RAC to submit it to the next MAP focal points meeting and COP22 for adoption.

6.3. List of Specially Protected Areas of Mediterranean Importance (SPAMI List)

6.3.1. Ordinary Periodic Review of SPAMIs

21. The meeting commended the efforts made for the evaluation of Specially Protected Areas of Mediterranean Importance (SPAMIs) during the biennium despite the challenging circumstances imposed by the COVID-19 pandemic and approved the recommendations of the technical advisory

commissions that evaluated the 11 SPAMIs. Therefore, all the 11 evaluated SPAMIs remain in the ordinary evaluation process.

22. The meeting took note of the corrective measures identified and launched by Lebanon and Tunisia for their respective SPAMIs included in a period of a provisional nature by COP 21, and commended the efforts made by both countries and the support provided by SPA/RAC and donors.

23. The meeting took note of the SPAMIs to be reviewed in 2022 (Karaburun Sazan National Marine Park, Albania) and 2023 (Banc des Kabyles Marine Reserve, Algeria; Habibas Islands, Algeria; Calanques National Park, France and Portofino Marine Protected Area, Italy).

6.3.2. Inclusion of areas on the SPAMI List

24. The meeting took note of the information that no proposals had been received for inclusion of areas on the SPAMI List during the intersessional period.

6.3.3. Establishment of a SPAMI Day and a SPAMI Certificate

25. The meeting welcomed the concepts to set up the SPAMI Day and SPAMI Certificate and invited SPA/RAC to submit them to the next MAP focal points meeting and COP22 for adoption.

6.4. Draft guidance document for the identification and designation of Particularly Sensitive Sea Areas in relation to SPAMIs

26. The meeting welcomed, as a useful, practical tool, the draft guidance for identifying and designating Particularly Sensitive Sea Areas in relation to SPAMIs, prepared by REMPEC in cooperation with SPA/RAC and reviewed by the Fourteenth Meeting of REMPEC focal points.

Agenda item 7: Status of implementation of the Ecosystem Approach (EcAp) Roadmap

7.1. Implementation of the second phase (2019-–2021) of the Integrated Monitoring and Assessment Programme (IMAP - Biodiversity and non-indigenous species) in the framework of the EcAp Roadmap

27. The Meeting acknowledged the progress made in implementation of the Integrated Monitoring and Assessment Programme (IMAP), related to the biodiversity cluster, in the framework of the Ecosystem Approach (EcAp) Roadmap, including mobilization of national experts through the informal online working group and the Correspondence Group on Monitoring (CORMON).

28. The Meeting endorsed the (i) “updated protocols for benthic habitats” and (ii) the “monitoring and assessment scales, assessment criteria, thresholds and baseline values related to marine mammals and marine turtles”, emphasizing their importance for preparation of the 2023 Mediterranean Quality Status Report (2023 MED QSR). It encouraged the Secretariat to amend the “monitoring and assessment scales, assessment criteria, thresholds and baseline values on non-indigenous species” with the thematic informal online working group before its submission to the next CORMON meeting (2022) for consideration.

29. The Meeting reviewed the draft revised guidance fact sheet for IMAP Common Indicator 6 related to non-indigenous species and agreed on its submission to the 8th EcAp Coordination Group Meeting for endorsement.

7.2. Status of implementation of the ODYSSEA project on Mediterranean observatories

30. The Meeting took note of the document ODYSSEA project: Opportunities for supporting the IMAP through integrated marine observing systems, capacity-building and information services. It expressed its appreciation for the support provided to development of numerous ocean observatories around the Mediterranean and the engagement of several Parties in the initiative and requested the Secretariat to strengthen existing synergies with other useful data sources for the 2023 MED QSR.

7.3. Status of implementation of the GEF Adriatic project on EcAp and MSP

31. The meeting expressed its appreciation for the work and results achieved in the GEF Adriatic project, which contribute to implementation of the IMAP and marine spatial planning (MSP) processes under the Barcelona Convention in the Adriatic Sea and particularly in Albania and Montenegro.

Agenda item 8: Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAP BIO)

32. The meeting took note of the conclusions and recommendations of the 8th Meeting of SAPBIO national correspondents held on 22 June 2021. The meeting welcomed synergies with CBD post 2020 GBF and mandated the Secretariat to align this document where appropriate, once the CBD GBF is adopted.

33. The meeting reviewed and endorsed sections 1 to 5 of the document UNEP/MED WG.502/17 Rev.1 and established a working group to review the remaining sections of the document. The working group will meet online on Thursday afternoon and Friday morning (1-2 July 2021). The meeting agreed that the focal points will provide the Secretariat, by email before the meeting of the working group, with their written comments and remarks in relation to Annex II (Correspondences of the Post-2020 SAPBIO Objectives and Targets with international biodiversity-related frameworks), Annex IV (Post-2020 SAPBIO National Correspondents terms of reference) and Annex V (Post-2020 SAPBIO Advisory Committee terms of reference). The Secretariat will prepare a consolidated version of the revised draft document and circulate it to the focal points for endorsement as an annex to the report of the 15th Meeting of the SPA/BD focal points, with a view of submitting it to the next MAP focal points meeting and COP 22 for adoption.

Agenda item 9: Draft Programme of work of SPA/RAC for the biennium 2022–2023

34. The meeting congratulated the Secretariat on the quality of the document and welcomed the ambitious draft programme of work of SPA/RAC for the biennium 2022–2023.

35. The meeting made some comments and suggestions on the programme of work, which SPA/RAC will forward to the MAP Secretariat for inclusion in the relevant draft decision to be submitted to the COP 22.