UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA/RAC

POST-2020 SAP BIO

MONTENEGRO
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

MONTENEGRO
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

Ecological Status, Pressures, Impacts, their Drivers and Priority Response Fields

POST-2020 SAPBIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

United Nations Environment Programme
Mediterranean Action Plan
Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafat
B.P.337
1080 Tunis Cedex – TUNISIA
car-asp@spa-rac.org

The original version of this document was prepared for the Specially Protected Areas Regional Activity Centre (SPA/RAC) in the framework of the Post-2020 SAPBIO elaboration by Mr. Vasilije Bušković as national consultant for Montenegro guided by Mrs. Ivana Stojanović National SAPBIO Correspondent and supervised by Mrs. Milena Batakoviċ Focal Point for SPAs.

For bibliographic purposes, this document may be cited as:
UNEP/MAP-SPA/RAC, 2021. Montenegro marine and coastal biodiversity conservation for 2030 and beyond. By V. Bušković. Ed. SPA/RAC, Tunis: 95 pp + Annexes.

Cover photo
© Rocky coastline

This publication has been prepared with the financial support of the MAVA foundation.

For more information:

www-spa-rac.org

List of Acronyms

A.S.L.	Above Sea Level
BSAP	Biodiversity Strategy and Action Plan
CAMP	Coastal Area Management Programme of Montenegro
CBD	Convention on Biological Diversity
CEPF	Critical Ecosystem partnership Fund
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
C/MPA(s)	Coastal and Marine Protected Area(s)
COVID 19	Disease cause by SARS-COV2 virus infection
EIA	Environmental Impact Assessment
EU	European Union
GEF	Global Environmental Facility
GES	Good Environmental Status
IUCN	International Union for Conservation of Nature
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea
IMB	Institute for Marine Biology, Kotor
INTERREG	Programme for Inter-regional co-operation between regions in the European Union
IPA	Instrument for Pre-Accession (regional programme)
MARD	Ministry of Agriculture and Rural Development
MED Fund	Cooperation platform based on funding from bilateral and multilateral donors and other sources, particularly the private and philanthropic endeavors
Med PAN	Mediterranean Protected Areas Network (association of Mediterranean MPA managers)
MSDT	Ministry of Tourism and Environment
MPA(s)	Marine Protected Area(s)
NEPA	Nature and Environment Protection Agency of Montenegro
NETCET	Network for the Conservation of Cetaceans and Sea Turtles in the Adriatic
NSICZM	National Strategy for Integrated Coastal Zone Management
PECZM	Public Enterprise for Coastal Zone Management
RAC/SPA	Regional Activity Centre for Specially Protected Areas
SAP BIO	Strategic Action Plan for the Conservation of Biological Diversity in the Mediterranean Region
SEA	Strategic Environmental Impact Assessment
SPA/RAC	Regional Activity Centre for Specially Protected Areas
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change
WWTP	Waste Water Treatment Plant

© Renaud DUPUY

Executive Summary

This document studies the status of Marine and Coastal biodiversity in order to identify conservation priorities at national level for the forthcoming POST 2020 period, as requested by "Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region" (Post-2020 SAP BIO).

Diagnoses of the status of species and ecosystems have been done on the base of available documentation, as well as in a relation to new challenges for conservation policies.

Elaboration of the Post-2020 SAP BIO National Report has been conducted through a participatory approach limited by restrictions caused by COVID 19 pandemia / outbreak, so virtual – internet online meetings and national workshop have been applied instead of direct meeting of experts, institutions and authorities relevant for setting up national needs and priorities.

Identification of the conservation priorities, as well as national priority needs and response actions, including urgent actions has been primarily based on relevant national strategies (NSICZM), and other documents already adopted at national (CAMP), regional (NETCET) and international level. However, biodiversity related needs and priorities identified in wide literature base have been also considered and selectively included in respective chapters of the document, particularly those related to marine and coastal biodiversity.

Mainstreaming of the response actions into existing national response policies and other mechanisms for implementation (measures, plans, projects, research, monitoring, training etc.) has been followed to the possible extent and in compliance with expected financial / budgetary constraints and restrictions caused by consequences of COVID 19 pandemia / outbreak.

Out of proposed response and urgent actions, corresponding actions related to cross-cutting and transboundary cooperation issues have been provided as well.

Actions proposed by this document shall be implemented in cooperation with national institutions and relevant international agencies and donors.

1.

Reference documents and information consulted

© SPA/RAC, Simone Modugno

1.1. Documents provided by SPA/RAC (http://www.rac-spa.org/publications)

1 _ UNEP – MAP – RAC/SPA, COP 21, 2020: Decision IG.24/7 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 available at http://rac-spa.org/sites/default/files/doc_cop/cop21/decision_24_7_eng.pdf

Comment: Document important because of the conclusions of the COP 21 regarding Elaboration Process for the Post-2020 SAP BIO by planned activities and their timeliness.

2 _ UNEP – MAP – SPA/RAC, 2020: Advisory Committee Meeting Report on the Process for the elaboration of the Post 2020 – SAP BIO available at http://rac-spa.org/sites/default/files/meetings/post_sapbio/2020/post_2020_sapbio_online_report.pdf

Comment: Document provides recent info of the SAP BIO Advisory Committee documents related to Post-2020 SAP BIO Elaboration Process and Guidance elements.

3 _ Documents available at RAC / SPA web page for publications (http://www.rac-spa.org/publications) relevant for particular thematic areas, including:

UNEP/MAP-RAC/SPA, 2016. Montenegro: Platamuni and Ratac areas. Mapping of marine key habitats and initiation of monitoring network. By Torchia G., Pititto F., Rais C., Trainito E., Badalamenti F., Romano C., Amosso C., Bouafif C., Dragan M., Camisassi S., Tronconi D., Macic V., Sghaier Y.R. & Ouerghi A. Ed. RAC/SPA - MedKeyHabitats Project, Tunis: 77 pp + Annexes.

Detailed (PDF) maps of key marine habitats at localities Platamuni and Ratac available at: http://rac-spa.org/sites/default/files/doc_mkh/montenegro/platamuni_ratac_mapping_appendix.zip

UNEP/MAP-RAC/SPA, 2016. Montenegro: Platamuni and Ratac areas. Summary report of the available knowledge and gap analysis. By Torchia G., Pititto F., Rais C., Trainito E., Badalamenti F., Romano C., Amosso C., Bouafif C., Dragan M., Camisassi S., Tronconi D., Macic V., Sghaier Y.R. & Ouerghi A. Ed. RAC/SPA - MedKeyHabitats Project, Tunis: 32 p.

UNEP-MAP-RAC/SPA. (2015). Adriatic Sea: Status and conservation of fisheries. By Farrugio, H. & Soldo, A. Edited by Cebrian, D. and Requena, S., RAC/SPA, Tunis; 58 pp.

UNEP-MAP-RAC/SPA. (2015). Adriatic Sea: Status and conservation of Seabirds. By Carboneras, C. Edited by Cebrian, D. & Requena, S., RAC/SPA, Tunis; 17 pp.

UNEP/MAP-RAC/SPA. (2015). Adriatic Sea: Description of the ecology and identification of the areas that may deserve to be protected. By Cerrano, C. Edited by Cebrian, D. and Requena, S., RAC/SPA, Tunis; 92 pp.

RAC/SPA - UNEP/MAP, 2011. Rapid assessment survey of coastal habitats to help prioritize the suitable new areas needing a status of protection for the development of a network of Marine and Coastal Protected Areas in Montenegro. By Badalamenti F., Garcia Charton J.A., Treviño-Otón J., Mačić V., and Cebrian D. Ed. RAC/SPA - MedMPAnet Project, Tunis: 52 p + Annexes

RAC/SPA - UNEP/MAP, 2013. Fishery activities assessment in Montenegro: case study of five selected parts of Montenegrin coast. By Mirko Djurović and Olivera Marković. Ed. RAC/SPA - MedMPAnet Project, Tunis: 39p

RAC/SPA - UNEP/MAP, 2014. Marine biodiversity of Boka Kotor Bay - Pilot project on testing Ecosystem Approach (EcAp) application in Boka Kotor Bay (Montenegro) - Executive summary. By Petovic S. and Batakovic M. Ed. RAC/SPA - MedMPAnet Project, Tunis. 25 pages.

Montenegro and Marine Protected Areas: Legal and Institutional framework assessment for conservation of coastal and marine biodiversity and the establishment of MPAs. RAC/SPA and IUCN-Med. Ed. RAC/SPA - MedMPAnet Project, Tunis. 72 pp.

1.2. National documents and publications identified and available

(Documents related to UN Sustainable Development Goals (SDGs))

1 _ Ministry of Sustainable Development and Tourism, 2016: National Strategy for Sustainable Development by 2030 (NSSD) available at http://www.mrt.gov.me/ResourceManager/FileDownload.aspx?rId=280311&rType=2 and http://www.nssd2030.gov.me/

2 _ Ministry of Sustainable Development and Tourism, 2015: National Biodiversity Strategy with the Action Plan for the period 2016 – 2020 (NBSAP) available at https://www.cbd.int/doc/world/me/me-nbsap-v2-en.pdf.

3 _ GEF, UNEP, Ministry of Sustainable Development and Tourism, 2018: The Sixth National Report of Montenegro to the United Nations Convention on Biological Diversity available at https://www.cbd.int/doc/nr/nr-06/me-nr-06-en.pdf

4 _ Ministry of Sustainable Development and Tourism, 2016: National Strategy for Integrated Coastal Zone Management (NSICZM): English version of the Draft (2015) available at https://pap-thecoastcentre org/pdfs/Obalno%20Podrucje_Web_Engl.pdf [1] while version in national language available at https://www.gov.me/biblioteka/strategije?alphabet=lat%3fquery%3dupravljanje+obalnim+podru%c4%8djem&sortDirection= desc&pagerIndex=4

1 For easier reading, separated cahapters of the Staregy are available at https://www.oceanactionhub.org/national-strategy-integrated-coastal-zone-management-montenegro

(Documents related to draft CBD Post-2020 Global Biodiversity Framework)

1 _ CBD, 2019: Regional Consultation on the Post-2020 Global Biodiversity Framework for Central and Eastern Europe, 16 - 18 April 2019, Belgrade, Serbia available at https://www.cbd.int/meetings/POST2020-WS-2019-04

2 _ IUCN, 2020: IUCN position paper on Zero Draft Post 2020 Global Biodiversity Framework: OEWG-2, available at https://www.iucn.org/sites/dev/files/iucn_position_paper_-_zero_draft_post-2020_global_biodiversity_framework_-_oewg2_09022020.pdf

(Documents related to the Barcelona Convention's EcAp and the EU MSFD)

1 _ UNEP – MAP – RAC/SPA, COP 21, 2020: Decision IG.24/7 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 Region, and Reference List of Marine and Coastal Habitat Types in the Mediterranean, available at https://www.rac-spa.org/sites/default/files/doc_cop/cop21/decision_24_7_eng.pdf

2 _ UNEP 2013: Decision IG.21/3: the Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and targets. 18th 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, available at https://www.rac-spa.org/sites/default/files/ecap/ig21_3_eng.pdf

3 _ UNEP – MAP – RAC/SPA, 2015: Implementation of the Ecosystem Approach in the Mediterranean - For a Healthy Mediterranean with Marine and Biological Ecosystems that are productive and Biologically Diverse for the benefit of present and future generations, available at https://www.rac-spa.org/sites/default/files/ecap/ecap2015_eng.pdf

4 _ UNEP 2020: Towards GES assessment for Montenegro - Biodiversity and Non-indigenous species. Draft prepared by Ana Štrbenac, July 2020, in the frame of UNEP/GEF project "Implementation of Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning" (document is not available at internet, but approved by the Ministry to be used for preparing this National Report)

(Documents related to the strategies and other planning instruments defined under the relevant regional multilateral Agreements (GFCM, ACCOBAMS, etc.))

1 _ A/RES/73/292 - 2020 United Nations Conference to Support Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

1.3. Other documents identified and consulted

1 _ Documentation consulted from the GEF project "Promoting Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro", including Biological characterization of the project research area and Gap Assessment (both in national language, not available at internet)

2 _ Documentation of the Coastal Area Management Programme Montenegro (UNEP – MAP - PAP/RAC, 2010 - 2014) available at link the http://www.camp.mrt.gov.me/, while GIS layers available at http://www.geoportal.mrt.gov.me/layers/

3 _ Ministry of Sustainable Development and Tourism, 2018: Documentation of the Spatial Plan of Special Purposes for the Coastal Area (text and graphic documentation of the Spatial Plan) available at http://www.planovidozvole.mrt.gov.me/LAMP/PlanningDocument?m=BD

1.4. Quality and comprehensiveness of available information documents

Information given in the aforementioned documents are usually fragmented and insufficient for direct use / apply in respective chapters of the Report, so other available sources in professional and "grey" literature are used as complementary for completing the Report. Certain aspects of data / information related to longer time periods of data, particularly trends, haven't been provided as they are required in the annotated structure of the Report. Lack of long time series of data identified from before, but it hasn't been properly addressed / adjusted in developing National Monitoring Proogramme over the time.

Unfavourable working conditions (limited move and lack of direct contacts with professionals and responsible persons in the institutions) caused by COVID 19 pandemia have been taking place continuously during the process of preparing this National Report.

2.

Marine and coastal ecosystem status

© SPA/RAC, Artescienza

Montenegrin Coastal and Marine ecosystems are accommodated in the Eastern Adriatic that is strongly influenced by the Eastern Mediterranean.

Marine ecosystem is characterized by low nutrient content, high transparency, great depths and low productivity. It is composed of (i) Boka Kotor Bay and (ii) Outer Sea with coastal waters and deep sea (see map below).

Coastal ecosystems are diverse with typical Mediterranean species and habitats up to 400m a.s.l, while in higher altitudes mixing up with continental ones.

2.1. Biological characteristics

2.1.1 Description of water column biological communities

Description of species and biological communities in this chapter is given by major taxonomic / ecological groups, as follows: Algal species, Water column communities and Benthos including available data on variability of species and their seasonal and geographical distribution

Algal

Based on the available literature data 532 algal species in both phyto- and zooplankton communities have been recorded in the marine waters of Montenegro (see List of Algal species in the Appendix 1). Among other algal species in marine waters are present species important for conservation, such as *Fucus virsoides* (Barcelona Convention, Annex II) and *Cystoseira* species[1] with *Cystoseira amentacea* that is also protected by national legislation.

Phytoplankton is diverse and rich in number of species. The taxonomic composition shows seasonal variation caused by various physicochemical (light, temperature, salinity, amount of nutrients, etc.) as well as biological (herbivorous activity and excretion of organic matter) factors. Species diversity depends on environmental conditions or geographic areas. Diatoms (*Bacillariophyta*) and dinoflagellates (*Dinophlagellata*) are present in the ecosystems with increased intensity of eutrophication and they are very good indicators of the state of the environment. As a consequence of intensive eutrophication, phytoplankton organisms "bloom" i.e. increase number of the groups that are better adapted to the new conditions (increased concentration of organic material, reduced amount of oxygen, etc.). In the conditions one or several species dominate diversity of phytoplankton is very low, so maximum production has been recorded with 107 cells / litre (Drakulović *et al.,* 2012). Thus, in the Bay of Kotor has been recorded dominance of species of the genus *Skeletonema*, while Vuksanović et al. registered the dominance of the species *Leptocylindrus minimus* in 2003. After that *Thalassionema nitzschioides* has been identified as dominant (Drakulović & Vuksanović, 2010; Drakulović *et al.,* 2012). It is a species that is very common in the Adriatic Sea, and especially in nutrient-rich waters. In general, the maximum diversity of phytoplankton occurs in periods of lower total phytoplankton abundance (Caković D., Milošević D., 2013; Drakulović *et al.,* 2017).

The first research of phytoplankton in Montenegrin coastal waters were mostly taxonomic (period 1914-1928) and focused on Boka Kotor Bay. More intensive researches have been done in the second half of the 20th Century. Comparing spatial cover of the researches in Boka Kotor Bay and Outer Sea majority of recent date also refer Boka Kotor. For the time being, number of registered taxa was 109 including 48 Diatoms (Drakulović *et al.,* 2017). The phytoplankton community was dominated by representatives of Diatoms (*Bacillaryophita*), namely: *Thalassionema nitzschioides* (69, 61%), *Pseudonitzschia spp.*, (41.67%), *Chaetoceros affinis* (11.8%), *Skeletonema spp.*, (11.76%), *Coscinodiscus spp.*, (11.33%), *Navicula spp.*, (34.31%) and *Diploneis spp.*, (10.84%). In the group of *Dinoflagelate*, the following species are recorded: *Prorocentrum micans* as the most budding species (65.69%), *Protoperidinium crassipes* (29.41%), *Protoperidinium diabolum* and *Neoceratium furca* (both with 26.96%) and *Dynophisis fortii* (25.49 %). Among the *Dinoflagellates* are registered following six species that produce toxins have been registered: *Dinophysis acuminate, Dinophysis acuta, Dinophysis caudata, Dinophysis fortii, Phalacroma rotundatum, Prorocentrum minimum*. High abundance values of the toxic species *Dinophysis fortii* have been reported. Also significant is the presence of the species *Pseudonitzschia spp.* since it produces toxic domoic acid (neurotoxin $C_{15}H_{21}NO_6$). The presence of potentially toxic and toxic phytoplankton species such as species of the genus *Pseudonitzschia spp.* and *Dinophysis* indicates the importance of monitoring this area where intensive shellfish framings are present.

Phytoplankton researches in Boka Kotor Bay in the period 2009-2010 confirmed the presence of 192 taxa, of which 46.8% belonged to Diatoms. It include following species *Chaetoceros affinis* (13.16%), *Lioloma pacificum* (10.05%), *Lithodesmium undulatum* (16.51%), *Navicula spp. (32.06%), Pseudonitzschia spp. (65.31%), Thalassionema frauenfeldii* (11.48%), *Thalassionema nitzschioides* (95.69%) and *Thalassiosira* sp. (24.40%). *Thalassionema nitzschioides* is a dominant species (Drakulović *et al.,* 2017).

Dinoflagellates have maximum growth upon the great growth period of Diatoms (Drakulović *et al.,* 2017). one hundred three taxa of Dinoflagellates were found in Boka Kotor Bay during the period 1984-1991.

Since pelagic habitats, including phyto- and zoo- plankton, are important for IMAP GES assessment, as a part of EO1 Biodiversity descriptor, they have been recently included in the National Monitoring Programme (2018-2020) at 6 locations, but also in the analyses provided in GEF Adriatic project at 5 transects (2019), all in Outer Sea.

Available data (UNEP 2020) from the National Monitoring Programme, presented as diversity indexes are given in following tables

Date: 07.2019. Locations	Margalef index (d)	Shannon index (H')	Pielou index (J)
Cape Mačka 0.5m	2.0	2.18	0.72
Rt Mačka 30m	2.5	1.94	0.60
Katič 0.5m	1.6	2.19	0.79
Katič 20m	1.7	2.25	0.79
Cape Komina 0.5m	1.7	2.12	0.75
Cape Komina 25m	1.7	2.13	0.77

Date: 10.2019. Locations	Margalef index (d)	Shannon index (H')	Pielou index (J)
Cape Mačka 0.5m	2.0	2.32	0.75
Rt Mačka 30m	2.4	2.18	0.68
Katič 0.5m	2.3	2.94	0.61
Katič 20m	2.3	2.19	0.70
Cape Komina 0.5m	2.2	2.25	0.72
Cape Komina 25m	1.7	2.12	0.75

1 excluding Cystoseira compressa

In the analyses provided in GEF Adriatic project 94 taxons relevant for GES are recorded (UNEP 2020), including 46 Diatoms (48.94%), 39 Dinoflagellates (41.49%), 6 Coccolithophores (6.38%), 1 Silicoflagellate (1.06%) and 2 Chlorophytes (2.13%). Constant presence of diatoms is explained by their ability to adapt to different, often very turbulent environmental conditions (Burić *et al.,* 2007). Coccolithophores were present in similar abundances as Dinoflagellates. The largest number of species that were dominant and recorded with the highest frequency of occurrence preferring areas enriched with nutrients (Pucher-Petković & Marasović, 1980). This indicates slow changes that must be continuously monitored, all with the aim of avoiding possible negative effects in the increased productivity of these organisms. The potentially toxic species were recorded, such as *Pseudonitzschia spp* and potentially toxic *Dinophysis acuminata, Dinophysis acuta, Dinophysis caudata, Lingulodinium polyedra, Phalacroma rotundatum, Prorocentrum cordatum* and *Prorocentrum micans*. The number of harmful organisms and pathogens (HAOP) has not yet increased, but indicates the need for monitoring to prevent possible negative consequences for the marine ecosystem and human health. According to phytoplankton characteristics area is oligo-mesotrophic to eutrophic. Some increased growth of phytoplankton appeared, but this growth was sporadically. Finally, it could be concluded that the composition and abundance of phytoplankton are in line with expected to the Adriatic, which indicate that GES is achieved. However, for a full GES assessment, long-time data series are required, based on systematic monitoring, preferably for a period of 6 years.

The research of Phytobenthos started practically only in the second half of the 20th Century and more than 200 taxa have been registered in Boko Kotor Bay (Mačić V., Krivokapić S., 2016). The largest numbers of taxa from Boka Kotor Bay belong to the Atlantic phytogeographic element (35.1%), but also followed by the Mediterranean (18.9%) and cosmopolitan (12.2%) phytogeographic elements. Endemic species of the Adriatic Sea are represented with only one species - Bracus (*Fucus virsoides*) which here reaches its southernmost boundary of the range. According to Antolić and Špan (1983, 1989, 1990) 57.3% of the total number of registered taxa were found in Boka Kotor Bay (412).

In addition to macroalgae, seagrasses make a significant part of Phytobenthos. It includes: *Posidonia oceanica*, *Cymodocea nodosa* and *Zostera noltei* (Mačić V., Krivokapić S., 2016). Posidonia assemblages are mostly present in the Outer Sea with coastal waters, but also in the outer part of Boka Kotor Bay. Opposite situation is with *Cymodocea nodosa* and *Zostera noltei* that are mostly present in Boka Kotor Bay where they build a large number of mixed communities. Recently all these communities are under intense negative anthropogenic pressures, primarily due to habitat destruction and wastewater discharges (Mačić V, Zordan C., 2018). In Boka Kotor Bay *Zostera marina* is present with only a few outcrops in Risan Bay (RAC / SPA - UNEP / MAP, 2013). It is possible that this species had larger communities in the past, but taxonomic errors in the earlier reports are also possible.

At solid ground of medio- and infra- littorals is inhabited by various species of algae, of which it is especially important genus *Cystoseira* that is protected by Barcelona Convention, excluding *Cystoseira compressa*. *Cystoseira barbata* is very often in Boka Kotor Bay while in Outer Sea dominating *Cystoseira amentacea.* In both, Outer Sea and Boka Kotor Bay are present *Cystoseira corniculata, Cystoseira spinosa and Cystoseira foeniculacea* (Mačić *et al.,* 2010). For these algae, as for many others, the main problem is destruction of their habitats usually in the Outer Sea because of illegal extraction of date mussels. In Boka Kotor Bay they are threatened by silting up causing embankment of existing or creation of new beaches and moorings (Mačić *et al.,* 2010).

Significant problem to both phyto- and zoo- benthos is spread of invasive species *Caulerpa cylindracea* and *Womersleyella setacea* that are very widespread along the coast, especially on Outer Sea (Petrović *et al.,* 2019).

Water column – vertical stratification

Vertical stratification of benthos is based on the concept of cascades or "stairways" ("A stairway is a vertical space of the marine benthic area where ecological conditions, the function of the situation in relation to sea level, are fairly constant, or always vary between two critical levels that mark the boundaries of the staircase", Pérès & Gamulin - Brida, 1973). Stairs each have their own characteristic settlements and their boundaries are seen as changes (alterations) of these settlements near critical levels.

a) Supra-littoral stairway is one in which there are organisms that tolerate or require constant emergence (emergence). It is a stage of wetting with sea water that experiences real immersion only occasionally. For the Mediterranean and even for the Adriatic, this sometimes happens during big waves.

b) The medio-littoral stairway characterized by organisms that tolerate and require somewhat longer emersions as a natural phenomenon, and do not tolerate constant or almost constant immersion. It can be considered that the medio-littoral stairway includes a part of the settlements of the tidal zone, more precisely those settlements of the tidal zone that are in some way specific because their level is such that they are most often subjected to the change of emersion and immersion. It is logical to consider the tidal zone only as a vertical space which is, if not constant, at least for most of the time, under the alternations of emersion and immersion. Thus we can limit the medio-littoral step from the level of the highest tide to the level of the lowest ebb tide.

c) Infra-littoral stairway - Its upper limit is the level from which settlements are constantly submerged (in continental seas where variations of sea ages are practically insignificant) or are very rarely surfaced. Its lower limit is the one that allows life for sea flowers and photophilic algae. This lower limit is located about 15 - 30 m for the Mediterranean, and can sometimes be lowered up to 80 m for some underwater meadows in some tropical areas where the waters are extremely clear.

d) The circumlittoral stairway extends from the extreme limit of the life of sea flowers (or photophilic algae) to the extreme depth that is compatible with the vegetation of the algae that are most tolerant of low light (most *Sciaphilic*).

The set of all four previously defined steps forms the littoral or coastal or phytal system because it is characterized by the presence of benthic autotrophic chlorophyll algae and plants. The vertical amplitude of two important factors: wetting for the two upper steps (supra-littoral and medio-littoral), and illuminance for the two lower steps (infra-littoral and circa-littoral) can vary considerably and cause larger differences in the vertical provision of the settlement, e.g. on a hard substrate, the supra-littoral stairway will be able to have a vertical amplitude of 50 cm on the protected shore, and 3 or 4 m on the shore exposed to waves.

The basic characteristic of the phytal (littoral) system is its richness in species, both qualitatively and quantitatively. All benthic autotrophic algae and plants are located in the littoral zone. As for the animal world, almost 99% of the known marine benthic animals inhabit this system.

These facts, the predominance in the number of species and their individual abundance in the littoral, are a consequence of the following conditions:

a) In the littoral (phytal) system, on a world scale (world sea), there are various temperature conditions. A wide variety of thermal requirements can be met here. e.g. some stenothermic species, in view of high temperature, will find its habitat in the littoral of tropical seas; stenothermic species, in terms of low temperatures, will find their habitat in the polar seas; between these two extremes there is room for all possible environmental temperature requirements.

b) In the phytal (littoral) system, the substrate conditions are the most diverse. There are rocks, pebbles, sand, larger stones, silt, and depending on the part of the world sea, these substrates are inhabited by unequal species. This system has the most organic matter. In the presence of light, intensive primary and thus secondary, organic production is enabled.

Benthos

According to their basic composition, the settlements of the bottom (benthic biocenoses) of the Adriatic Sea belong to the Mediterranean area. However, they are also characterized by some features that developed during the geological formation of the Adriatic, and these processes continue under the influence of various factors, primarily relative isolation and specific bioecological conditions. Most of the living world of the Adriatic Sea belongs to the littoral or coastal system.

In the coastal part of the Outer Sea (infra-littoral stairway) there are many types of substrates that predominantly dictate the types of communities built by various organisms. So far, 23 benthic communities have been identified.

Concerning benthic habitat types particular importance belong to those listed in EU Habitats Directive (92_43_EEC), Annex I, include following three priority habitat types:

- *1120 Posidonia beds (*Posidonia oceanica*)
- 1170 Reefs (underwater reefs) with coralligenous habitats and *Cystoseira* communities and
- 8330 Submerged or partially Submerged Sea Caves
- Characteristics of these Natura marine habitat types are given in the Chapter 2.2.
- More specific classification of marine habitats by RAC SPA (2019) is difficult to be directly applied in the country, so National Classification of Marine Habitats is seen as a necessity to previously encompass / cover all existing local specificities and then provide its harmonization with that one and the other internationally accepted classifications.

2.1.2. Information on invertebrate bottom fauna, macro-algae and angiosperms including species composition, biomass and annual/seasonal variability

As stated in the First National Biodiversity Strategy with the Action Plan for the period 2010-2015 (pg. 14) marine invertebrates have relatively high diversity but low degree of endemism of the species. For example, a bit more than 50% of *Echinodermata* registered in the Adriatic Sea has been recorded in Montenegrin coastal waters (57 of 101) (Kašćelan *et al.,* 2009). Among 354 species of mollusks registered in Montenegrin waters, some 127 species were recorded in Boka Kotor Bay (Petović & Marković 2016; Petović *et al.,* 2017). Following taxonomic groups of marine invertebrates are present in Boka Kotor Bay: *Anelida* (46 species), *Tunicata* (16 species), *Bryozoa* (28 species), *Cnidaria* (41 species), *Crustacea* (46 species), *Echinodermata* (42 species), *Echiuroidea, Mollusca* (133 species) and *Porifera* (43 species).

The list of invertebrate (along with fish) species in Montenegrin marine waters is given in Annex 2 of this National Report.

Among the listed invertebrate species, 24 species are protected by national legislation, while 28 species are listed in the Annexes to the Barcelona Convention.

The species *Lithophaga lithophaga* and *Pinna nobilis* are also on the list of protected species by EU Habitats Directive (92_43_EEC), Annex II.

There are also following 10 IUCN Red List marine invertebrate species:

- 2 LC (Least Concern) - *Nephrops norvegicus* and *Sepia officinalis*,
- 6 DD (Data Deficient) - *Scyllarides latus, Rossia macrosoma, Sepia elegans, Sepia orbignyana, Sepiola oweniana, Sepiola petersii*
- 1 EN (Endangered) - *Cladocora caespitosa*. and
- 1 CR (Critically Endangered) – *Pinna nobilis*

In the group of commercially / economically important species could be included Squid (*Loligo vulgaris*) and Cuttlefish (*Sepia officinalis*), which make up most of the catches of cephalopods in the marine waters. In this group of species belong some crustaceans (*Crustacea*), e.g. Shrimp *Parapenaeus longirostris* but also several species of mussels (RAC / SPA - UNEP / MAP, 2013, Ikica Z et al 2018).

Among the recorded species are members of plankton (zooplankton) and benthos (zoobenthos) communities.

In the zooplankton community of the Southern Adriatic dominate *Copepoda* (*Crustacea*) that make up to 80% of the total mass of zooplankton. Changes in the qualitative and quantitative composition of zooplankton have a seasonal character. Thus, the number of zooplankton is the lowest during the winter, while the maximum values occur in the spring. Within *Copepoda* group dominate *Ctenocalanus vanus*, which occurs with 10% in the total number of Copepods. It is also one of most often species in the Adriatic, but followed by *Centropages typicus* and *Temora stylifera* with 7% in the total number of Copepods. There are also present numerous species belong to genus *Oithona* (Caković D., Milošević D., 2013).

The fauna of copepods in the Bay of Kotor is characterized by a large number of mainly euryhaline and eurythermic species. In the research conducted during 2004, 2007/2008 in the Boka Kotor Bay registered is 42 taxa (Vukanić *et al.,* 2013). The overall zooplankton community is dominated by following Copepoda species: *Paracalanus parvus, Centropages kroyeri, Euterpina acutifrons, Oithona nana* and *Oncaea subtilis*. Zooplankton community achieves two maximums, one in March, and the other in August. At the first maximum in March dominant group *Copepoda*, while in the second one in August dominate group *Cladocera* with great abundance of *Penilia avirostris*. At the end of winter and the beginning of spring, a significant increase in Nauplius larvae and different larval stages of juvenile forms of these species has been observed (Caković D., Milošević D., 2013). Later researches in the Boka Kotor Bay indicate some changes in the composition and density of zooplankton communities (Pestroić B. et al 2016). The dominance of small copepod species, including predominance of the introduced species *Muggiaea atlantica* in relation to the autochthonous *Muggiaea kochi* has been noted, especially in the inner part of the Bay; but also changes in the Jellyfish fauna with the first mass occurrence of *Bolinopsis vitrea* in the Mediterranean and more frequent / numerous occurrence of Syphomedusae. These changes appear to have a more lasting character and are linked to climate change and global warming (Pestrorić *et al.,* 2017).

In the area of new marina Porto Montenegro (Tivat) recently are registered 61 taxa within 11 groups of zooplankton (Pestroić B. et al 2016) while in the earlier period (2009-2010) a total number of 70 taxa were found (Pestorić B. et al 2012). The highest number of individuals has been recorded in August (10819 individuals / m3 for 2016 and 22845 individuals / m3 for 2009) and the differences in the number of taxa as well as their number are caused by different research methodologies and dynamics. In addition, it should be noted that gelatinous organisms did not have a significant share in the total zooplankton, except occurrence of the Hydromedusa *Pobelia spp*. in January 2016 This phenomenon happened before in Tivat bay and it is associated with the period of high concentration of chlorophyll A (Pestorić B. et al 2012). In the period 2013-2017 presence of following 6 Syphomedusae has been registered in Boka Kotor Bay: *Aurelia spp, Chrysaora hysoscella, Cotylorhiza tuberculata, Discomeduza lobata, Drymonenma dalmatinum* and *Rhizostoma pulmo*, which were present in large numbers in different winter and spring periods (Violić et al 2019). The appearance of gelatinous organisms in large numbers has a negative impact on the state of ecosystems due to their large feeding capacity and may indicate the degradation of ecosystems (Pestorić B. et al 2012; Violić *et al.,* 2019).

Generally speaking, the researches on benthic invertebrates were much productive and detailed in the area of the Boka Kotor Bay than they was in the Outer Sea. The first detailed study on mollusks has been done in 1967 (Stjepčević, 1967), and 50 years later it was significantly supplemented with newer data (Petović *et al.,* 2017). According to the latest data, Boka Kotor Bay is inhabited by 312 species of mollusks (Petović S 2018). In addition to the group of mollusks, detailed research has been done on the presence and diversity of *Echinodermata* in the Boka Kotor Bay, so 42 species have been recorded in that area, of which 6 are endemic to the Mediterranean, as follows: *Antedon mediterranea, Astropecten irregularis pentacanthus, Astropecten spinulosus, Lentopenctata hogest* with two Mediterranean subendemics *Echinocardium fenauxi* and *Schiazaster canaliferus*. Among the registered species following are protected by national legislation: *Paracentrotus lividus, Holothuria forskali, Holothuria impatiens, Holothuria poly, Holothuria tubulosa* and *Ophidiaster ophidianus*. Also, on the list of conservation important species of Barcelona convention (Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean) are following species *Paracentrotus lividus* (Annex III), *Ophidiaster ophidianus* and *Centrostephanus longispinus* (Annex II). In the recent researches are registered 3 new species for the fauna of the Bay of Kotor (*Holothuria mammata, Holothuria sanctori* and *Mesothuria intestinalis*). For the species *Holothuria mammata* and *Mesothuria intestinalis*, this is the first finding for Montenegro (Petović, 2011).

More detailed researches of Boka Kotor Bay, in the Risan Bay, have shown that in this area are present extremely valuable zones with coralligenous habitats prioritized for conservation in the (RAC / SPA - UNEP / MAP, 2013) that . These habitats are identified as a priority under the EU Habitats Directive EU Habitats Directive (92_43_EEC). Specificity of these habitats is presence of a large number of protected species of sponges and corals. Localities Dražin vrt and Sopot are characterized by good preservation of these communities at a relatively shallow depth (about 12 m). Among the species dominate *Savalia savaglia* (Bertoloni, 1819), which with its dense and well-developed colonies makes coralligenous habitats at these localities special, and perhaps unique in the Mediterranean (Mačić V & Trainito E 2019).

Analyses of benthic organisms have shown that the bottom of Tivat Bay is inhabited by representatives of different groups of marine animals such as *Porifera, Cnidaria, Mollusca, Echinodermata* and others. Among the representatives of these groups are species of economic importance such as *Sepia officinalis, Loligo vulgaris, Mytilus galloprovincialis, Lithophaga litophaga, Venus verrucosa, Ostrea edulis* etc. (LAPB, Municipality of Tivat 2013).

Due to changes in the coastline and activities performed in the area of the former Arsenal composition of species consequently changed. The decline in the quality of sea water including seabed in this area caused reduction / regression of previously present species and their replacement with opportunistic species. Benthic organisms in the port aquatorium are greatly influenced by grit deposits at the bottom but also with the wastewaters from the city sewage system. Research conducted in 2007 showed that 38 species of invertebrates were present on the walls of the docks. The dominant fauna species included *Mytilus galloprovincialis, Pomatoceros triqueter, Phallusia mamilata, Schizobrachella sanguinea, Sabella spallanzani, Balanus eburneus and Protula tubularia*. Researches of the biodiversity cover have been conducted some 10 years later and higher number of macro-zoo-benthos species has been identified, i.e. 68 taxa (Institute for Marine Biology, 2016). Within the fauna, numerous were colonial species of following groups: *Tunicata* (9), *Bryozoa* (5), *Mollusca* (25), *Porifera* (7), *Cnidaria* (5), *Annelida* (6), *Arthropoda* (4), *Echinodermata* (7). In the group of *Annelida / Sabellidae* dominant is *Sabella spallanzani* while among mollusks dominate *Mytilus galloprovincialis* and *Ostrea edulis*, followed by *Bittium reticulatum, Rocellaria dubia* including several allochthonous species such as *Pinctada imbricata radiata, Paraleucila magna, Styela allicata* (Petović et al 2019).

A part of Boka Kotor Bay, Herceg Novi Bay, has been also recently researched and these data mainly refer to the area towards Outer Sea, including mapping of benthic communities in Topljanski Bay and Žanjice Bay (EPA State on Environment report for 2018, published in May 2019).

Old specimen's population of conservation important *Pinna nobili* has been registered in Trašte Bay in Outer Sea. It was estimated (2012) as a densiest population of this protected species in the country. In the following years, primarily in the bay but also in the high seas,

a large mass of young individuals of *Pinna nobilis* shell have been identified (Mačić *et al.,* 2016). Unfortunately, as it was present in most of Mediterranean countries, parasite *Haplosporidium painnae* caused massive, almost 100% mortality of this species in 2019 (Cabanellas-Reboredo *et al.,* 2019; Kersting *et al.,* 2019).

There are numerous influences of anthropogenic origin on marine biodiversity. Ports and marinas could be indicated as places important for changed living conditions. In addition to changing the substrate or habitat for the species that are there, the values of environmental parameters also change. That's why in these zones are present eurivalent species. The presence of cruisers and other larger vessels has a particularly negative impact on sessile organisms in Boka Kotor bay by changing water turbidity and increasing sedimentation inhibits lighting and causing backfilling and the death of organisms that feed by filtering water.

The presence of non-native species is a phenomenon that has been recorded along the entire coast of the Montenegrin coast (see more in chapter 2.1.4.). In the Outer Sea are present algae Sonder (*Caulerpa cylindracea* Verlaque, Huisman & Boudouresque, 2004) and Hollenberg (*Womersleyella setacea* RE Norris, 1992) while Blue Crab (*Callinectes sapidus* Rathbun, 1896) is much more common. In Boka Kotor Bay widespread distribution have *Pinctada imbricata radiata, Paraleucila magna, Styela plicata* (Petović et al 2019). Vessels that transport various species and their juvenile stages through ballast water or overgrowth are considered as vectors for the introduction of new species (Spagnolo *et al.,* 2017). Another important route of species entry is equipment, food and younger / youvenil stadiums of the organisms used in mariculture. This is also supported by the fact that non-native species are most numerous in ports, marinas and mariculture farms.

2.1.3 Information on vertebrates other than fish

Marine mammals

Five conservation important (IUCN) Cetacean species have been identified (Đurović M et al, 2016) in Montenegrin part of the Adriatic Sea, as follows: 1. Bottlenose Dolphin (*Tursiops truncatus*) DD - identified from photos and aerial survey 2. Striped Dolphin (*Stenella coeruleoalba*) VU - identified from photos and aerial survey 3. Cuvier's Beaked Whale (Ziphius cavirostris) DD – identified by aerial survey 4. Risso's Dolphin *(Grampus griseus*) DD - identified by aerial survey and 5. Fin Whale (*Balaenoptera physalus*) VU – visually observed in Boka Kotor bay. Occasional presence *Physeter macrocephalus* EN is expected. Bottlenose and Striped Dolphins have been further surveyed upon 2016 until 2019 (Awbery T. Et al, 2019). Bottlenose Dolphin has been observed in 302 groups by 191 sightings while Striped Dolphin observed in 15 groups by 11 sightings. As critical habitats / locations, for Bottlenose Dolphin are identified the entrance to the Boka Kotor bay and coastal waters of Katič, Bar, Utjeha and Ulcinj, while for Striped Dolphin are offshore waters of Platamuni.

Presence of Monk Seal (*Monachus monachus*) CR in Montenegro has not been documented since 1970's. However, sightings of this species have been sporadically provided (14 sightings until 2010) and these information are published (Panou, A, et al 2017). Local NGO activists, but also scientists believe that Monk Seal from neighboring countries could inhabit well sheltered caves along Montenegrin coastline, as well (Mačić *et al.,* 2018).

Data on population dynamics for aforementioned conservation important species of marine mammals are missing and situation in Montenegro doesn't differ to neighboring countries and Adriatic region, in general.

Out of population demographics / dynamics (including trends for longer time periods), incidental mortality rate and other data are missing for mammals, but also for sea turtles and seabirds.

There is still no systematic monitoring at national level, necessary for planning and applying appropriate conservation measures.

So far, available are estimates of population abundance and relative density for Bottlenose Dolphin (*Tursiops truncatus*) that are provided on the base of 2010 and 2013 summer aerial surveys, as it is given in the table below (Source: UNEP-MAP-RAC/SPA. (2015), Fortuna C. et al, 2018, UNEP 2020)

Area	Abundance (N) (CI=confidence interval)	Relative density (ind/km²)
Adriatic	5.700 (CIs = 4.300 – 7.600)	0,042
Northern Adriatic	2.600 (CIs=2.200 – 2.900)	0,057
Central Adriatic	1.100 (CIs=800 – 1.500)	0,034
Southern Adriatic	1.800 (CIs=1.500 – 2.400)	0,032
Non-EU 12 nm - Montenegro	100 (CIs=40-200)	0,049
Non-EU CSM[1] - Montenegro	200 (CIs=100 – 300)	0,029

Sea turtles

In the marine waters of Montenegro are present following three conservation important Sea Turtle species (Gvozdenović S, et al 2016): Leatherback (*Dermochelys coriacea*) **VU**, Green Seat turtle (*Chelonia mydas*) **EN** and Loggerhead Turtle (*Caretta caretta*) **LC**

Concerning state of populations of these species available are data for abundance and relative density of Loggerhead Turtle (*Caretta caretta*), but in the frame of Adriatic, and Southern Adriatic (Fortuna C et al 2015, UNEP-MAP-RAC/SPA. (2015), UNEP 2020) that include Montenegrin territorial Sea. Its relative density in the Southern Adriatic is below the Adriatic average with 0,114 specimens / km² and measured relative density in Montenegrin territorial waters is lower, while on the continental shelf margin it is even higher. A comparative review of population abundance and relative density for various areas in Adriatic, based on 2010 and 2013 summer aerial surveys is given in the table below (Source: Fortuna C. et al, 2018, UNEP 2020).

Area	Abundance (N) (CI=confidence interval)	Relative density (ind/km²)
Adriatic	27.000 (CIs=24.000 – 31.000)	0,203
Northern Adriatic	18.200 (CIs=17.700 – 20.000	0,405
Central Adriatic	1.900 (CIs=1.600 – 2.200)	0,057
Southern Adriatic	6.300 (CIs=5.000 – 7.500)	0,114
Non-EU 12 nm - Montenegro	200 (CIs= 100 – 200)	0,078
Non-EU CSM[2] - Montenegro	1.200 (CIs=800 – 1.400)	0,166

Sea birds

In Montenegrin part of Adriatic Sea are presents only small fractions of all the seabirds found in the Mediterranean (UNEP-MAP-RAC/SPA, 2015).

Among Sea Birds present in the country(CZIP, 2015, Saveljic D 2015) following are of conservation importance (IUCN): Yellow-legged Gull (*Larus michahhellis*) LC, Mediterranean Gull (*Larus melanocephalus*), Slender-billed Gull (*Larus genei*) LC, Sandwich Tern (*Thalasseus sandvicensis*) LC and Ferruginous Duck (*Aythya nyroca*) NT. Along Montenegrin part of Adriatic also potentially are presented (RAC / SPA, 2015) endemic Sea Birds such as: *Puffinus yelkouan* – Yelkouan shearwater, *Calonectris diomedea* – Cory's shearwater, *Larus audouinii* – Audouin's gull.

Available List of SPA BD Protocol – Annex II Coastal and Sea Birds present in Montenegro includes following species and estimation of the state of their populations (Saveljic D. 2015, UNEP 2020)

Species	No of breeding pairs	Wintering population	Trends	Remarks
Calonectris diomedea	n/a	unknown	unknown	
Puffinus yelkouan	n/a	unknown	unknown	
Phalacrocorax aristotelis	n/a	unknown	unknown	
Microcarbo pygmeus	3500 bp	up 7000	increasing	
Pelecanus onocrotalus	n/a	up 10	stabile	
Pelecanus crispus	55 bp	147 *Ulcinj Salina	increasing	
Phoenicopterus roseus	up 170 bp	up 2400 *Ulcinj Salina	stabile	br.success 0
Pandion haliaetus	n/a	n/a	unknown	
Falco eleonore	ex br *2 pairs	n/a	unknown	
Numenius tenuirostris	n/a	n/a	unknown	
Larus audouinii	n/a	1	Unknown	
Sterna sandwicensis	n/a	120	decreasing	
Sternula albifrons	50-70 bp	n/a	stabile	
Sterna caspia	n/a	Up 5	stabile	
Larus genei	up 2 bp	n/a	unknown	
Larus melanocephalus	n/a	unknown	unknown	
Charadrius alexandrinus	up 50 bp	20-30	stabile	
Ceryle rudis	ex br	n/a	unknown	

2.1.4 Inventory of the temporal occurrence, abundance and spatial distribution of non-indigenous, including invasive, species

There is no integrated inventory of non-indigenous, including invasive, marine species in the country but certain data on the presence and spatial distribution of these species are given in professional literature data sources separated on phyto- and zoo-benthic species and fishes including crabs.

Current inventories of phyto- and zoo-benthic non-indigenous, including invasive, marine species includes (Mačić V. et al 2016 and Petovic S. et al 2019 Note: data sources remained in the text as given in the paper):

a) Phytobenthic species

Antithamnion amphigeneum A.J.K. Millar, 1990 – collected on the Montenegrin coast at Tivat, Boka Kotor Bay (Mačić & Ballesteros 2016) as fouling organism from the pier in Porto Montenegro Marina. This is the first record for the Adriatic Sea.

Caulerpa cylindracea (Sonder) Verlaque, Huisman & Boudouresque, 2004 – firstly recorded at Budva (Mačić 2005), this alga, as one of the 100 most invasive species, has since propagated intensely and has disturbed the balance of benthic communities. In Montenegro, it has been recorded mostly in the area of island Sveti Nikola near Budva, up to the Luštica Peninsula where it is widely distributed.

Asparagopsis taxiformis (Delile) Trevisan de Saint-Léon, 1845 – red alga that is widespread in the Mediterranean Sea. Firstly recorded at Herceg Novi, Boka Kotor Bay, in 2006 (Zenetos et al. 2011).

Asparagopsis armata Harvey, 1855 – initially recorded from the entrance of the Boka Kotor Bay (Špan & Antolić 1983). Currently, it is widespread in the Mediterranean Sea.

Womersleyella setacea (Hollenberg) R. E. Norris, 1992 – invasive red alga described for the Mediterranean Sea in 1987. Firstly registered along the Montenegrin coast in 2003 at the entrance of the Boka Kotor Bay (Žanjice, Mamula) (Batteli & Rindi 2008). Subsequently, it has become widespread (Mačić 2008).

b) Zoobenthic species

Paraleucilla magna Klautau, Monteiro & Borojevic, 2004 – initially recorded on the pier in the Porto Montenegro marina (Tivat, Boka Kotor Bay) during winter and spring in 2016 (Mačić & Petović 2016). Subsequently, it has been found in many locations across the Boka Kotor Bay, mainly at mariculture sites as a fouling species on ropes and nets.

Aplysia dactylomela (Rang, 1828) – firstly recorded at Herceg Novi, Boka Kotor Bay (Mačić & Kljajić 2012), although subsequent surveys found no specimens. This species has wide distribution in tropical and warm temperate waters. It is common in tropical Indian and Pacific Oceans, also quite well represented in the Caribbean and near Atlantic islands, located along the west coast of Africa.

Bursatella leachi de Blainville, 1817 – a gastropod species with a worldwide distribution in warm temperate and tropical waters. Along the coast of Montenegro, initially found at Sveta Nedjelja, Boka Kotor Bay (Zenetos et al. 2011) and has since been recorded in many localities inside the bay (personal data).

Melibe viridis Kelaart, 1858 – an Indo-Pacific gastropod species recorded along all Mediterranean coasts. First record from Montenegrin coast in 2003 near Herceg Novi, Boka Kotor Bay (Jančić 2004). Subsequently, many specimens have been observed during field research throughout the bay (personal data).

Thecacera pennigera (Montagu, 1813) – a nudibranch gastropod; a specimen was recorded on 17th April 2017 during a biological monitoring program focused on fouling communities, performed in Porto Montenegro (Tivat, Boka Kotorska) marina by SCUBA diving (Petović & Lipej 2017).

Anadara transversa (Say, 1822) – native to North-west Atlantic, from Cape Cod to Texas, introduced to the Aegean and Adriatic Seas. Specimens have been collected from the Boka Kotor Bay (Petović et al. 2017).

Arcuatula senhousia (Benson in Cantor, 1842) – a mussel species native to the Pacific Ocean from Siberia to Singapore, accidentally introduced and now invasive in numerous other areas worldwide. It has been recorded for the first time in the study region as a fouling organism in the Port of Bar (Petović et al. 2017).

Ruditapes philippinarum (Adams & Reeve, 1850) – native to South-Eastern Asia (IndoPacific), introduced for commercial purposes in the Mediterranean Sea (although only in the Adriatic Sea and tentative aquaculture in the Tyrrhenian Sea). Collected from soft-bottom open-sea sites (Petović et al. 2017).

Teredo navalis (Linnaeus, 1758) – the so-called naval shipworm is a saltwater clam. It has been recorded for the first time in the study region by Stjepčević (1967) in the Boka Kotor Bay; later, Stjepčević & Parenzan (1980) and Petović et al. (2017) have reported it from open-sea sites.

Pinctada imbricata radiata (Leach, 1814) – known as the 'pearl oyster', widespread in shallow waters of tropical and subtropical continental shelf regions, particularly abundant in the Indo-Pacific. Considered the first Lessepsian bivalve species reported for the Mediterranean Sea (Monterosato 1878). In Montenego, this species is, very numerous in the Porto Montenegro Marina (Tivat, Boka Kotor Bay) (Petović & Mačić 2017) and at many other sites across the Boka Kotor Bay (personal data).

Magallana gigas (syn. *Crassostrea gigas*, Thunberg, 1793) – Pacific or Japanese oyster, native to the Pacific coast of Asia, introduced in North America, Australia, Europe and New Zealand. It has been introduced in the Boka Kotor Bay for aquaculture purposes (Stjepčević et al. 1977). However, no shells have been observed in the area for the last ten years (personal data).

Penaeus aztecus (syn. *Farfantepenaeus aztecus*, Ives, 1891) – a species native to the western Atlantic coast. The first record in the Adriatic Sea was from the Boka Kotor Bay (Marković et al. 2014). It is tolerant to a wide range of temperatures and salinities. One specimen of this species has been caught in the spring 2016 in a great depth, 10 nautical miles from Bar, using trawl net.

Callinectes sapidus Rathbun, 1896 – first specimen collected from Ulcinj (Port Milena), Jaz and Oblatno (Zenetos et al. 2011), later in the Boka Kotor Bay at Tivat (Marković & Djurović 2014). Currently, it is widely distributed and very abundant along the Montenegrin coast (personal data).

Amphibalanus eburneus (Gould, 1841) – a species occurring on the east coast of North America as well as from the Caribbean Sea and Gulf of Mexico. In Montenegro, it has been recorded as a fouling organism on aquaculture equipment (Igić 1983).

Hydroides dirampha Mörch, 1863 – a polychaete species, firstly collected from the Port of Bar as a fouling organism on piers (Spagnolo et al. 2017).

Palola valida (Gravier, 1900) – firstly recorded in the Port of Bar (Spagnolo et al. 2017).

Bugula neritina (Linnaeus, 1758) – widespread in port waters and mariculture sites across the study area as a fouling species. First record in the Port of Bar (Spagnolo et al. 2017).

Styela plicata (Lesueur, 1823) – numerous on piers in the Porto Montenegro Marina (Tivat-Boka Kotor Bay) and on mariculture equipment (personal data).

c) Fish and crab species

forty-six new fish species have been recorded in the Adriatic Sea that enlarged total number of its fish species above the 450, compared to the previous checklist with 407 species (Dulčić and Dragicevic, 2011, Jardas 1996). In the comprehensive reviews of data are presented data on following non-indigenous, including invasive, marine fish and crab species (Joksimović et al. 2015 and Joksimović et al. 2016 Note: data sources remained in the text as given in the papers):

Sphoeroides pachygaster Muller & Trochel 1848 Atlantic arrived through the Suez Canal, first record on 5 January, 2008, in front of Budva, at a depth of 80 meters.

Fistularia commersonii Rüppell, 1838 also arrived through the Suez Canal, first record in February 2008 in front of the Great Sand beach (Velika plaža), two subsequent / repeated findings of this species were in November and December 2013. One specimen was caught in a gillnet called polandara near Tivat in the Boka Kotor Bay, while second was caught with a spear gun near Budva (Joksimovic, *et al.,* 2008; Dulčić, *et al.,* 2014).

Tylosurus acus imperialis (Rafinesque, 1810) has been firstly caught on 9th June 2011 in front of St. Nikola Island, Budva in shallow waters (6.5 m depth). The fish was found still alive, entangled in a gillnet ("polandara") with a 42 mm diamond mesh size. On 26 June 2014, a specimen of T. acus imperialis (Fig. 2) was caught in front of Platamuni, Budva (Montenegro) in shallow waters (6.5 m depth) (Dulčić, *et al.,* 2014b).

Syganus luridus (Rüppell, 1829) has been captured in Bigova Bay on 7th September 2014 with a trammel net. In the Adriatic Sea, this species was caught and recorded three times previously in Piran Bay and Mljet Channel in 2010 and in Konavle in 2011 (Đurović *et al.,* 2014).

Caranx crysos (Mitchill, 1815) has been firstly registered in Montenegrin waters by a fisherman from Ulcinj on 1st March 2013 (Dulčić *et al.,* 2014). Another specimen of this species was caught near Orahovac, Kotor in Boka Kotor Bay by beach seine called srdelara on 9th December 2013. Considering the information that juveniles and adults have been recorded in the area of the whole eastern Adriatic, it seems that Caranx crysos established its population in the Adriatic (Dulčić et al 2014).

Callinectes sapidus (Rathbun, 1896) two adult male specimens have been caught in December 2013 in Boka Kotor Bay by gillnet ("polandara") at a depth of 15 m on sandy-mud bottom in Tivat Bay (Kapiris *et al.,* 2014)

Siganus rivulatus Forsskål & Niebuhr – In general, most specimens from family *Siganidae* have been caught in Bigova marine zone with trammel and gillnets, while the species of the family *Tetraodontidae* were usually captured in the part of Budva region – Rafailovići

Other identified non-indigenous, including invasive, marine fish and crab species (Petovic S. et al 2019 and Joksimović et al. 2016) are as follows:

Sphyraena chrysotaenia Klunzinger, 1884 – identified in 2012

Sphoeroides pachygaster (Müller & Troschel, 1848) - identified in 2008

Stephanolepis diaspros FraserBrunner, 1940 - identified in 2002 and then in 2102 one individual, at a depth of 18 m in Katič.

Cheilopogon furcatus (Mitchill, 1815) - identified in 2012 in Perast, in Kotor Bay, at a depth of 25 m

Iniistius pavo (Valenciennes, 1840) - identified in 2012

Balistes capriscus Gmelin, 1789 - identified in 2016 an later on at several location along the coast

2.1.5 Information on species of commercial interest for fishing (fish, mollusk and shellfish)

Country is situated in Adriatic that inhabits populations of 449 marine fish species, which is about 66% of all species and subspecies recorded in the Mediterranean (Dulčić & Dragičević, 2011).

Information on species of commercial interest for fishing (fish, mollusk and shellfish) are presented in the recent reviews (Joksimović A. et al 2019, Ikica Z et al 2018, Pesic A., 2019) providing data on the state of marine fishery in the country, including data on main fisheries target species, catch analysis and abundant species in the biomass, but also new data on rare and endangered fish species.

According to Joksimović A. et al 2019, main fisheries target species are the European Hake (*Merluccius merluccius*), Red Mullet (*Mullus barbatus*), and Deep-water Pink Shrimp (*Parapenaeus longirostris*). Important are also Common Squid (*Loligo vulgaris*), Shortfin Squid (*Illex coindetii*), Octopus (Octopus vulgaris and *Eledone spp*.), and Norway Lobster (*Nephrops norvegicus*). On the other side, Bogue (*Boops boops*) has no economic importance but it is often presented in small-scale fisheries (trammel nets) (Ikica Z *et al.,* 2018).

Catch analyses of species has been carried out by each fishery type separately. Single gillnets are the most frequently used fishing gear in small coastal fishing. The total number of species in the catch is 28, including 24 fish species with representation of 94% in the catch while 2 species of Cephalopods (Octopus and Cuttlefish) participate with 3.1% and Crustaceans (Lobster, Shrimp) with 3%.

By weight, Atlantic bonito (*Sarda sarda*) is mostly represented (by 31.5%) in the catch caught using single gillnets while Common Pandora (*Pagellus erythrinus*) participated by 8.5%. Greater Amberjack (*Seriola dumerili*) is represented by 7.1%. Other species are represented by smaller percentages. Among Cephalopods, Cuttlefish is represented by 2.5%, but Octopus by 0.5%. Common Lobster and Norway Lobster are represented by 0.5% each. The average number of fishing days per month is 22.9 and on each of these days fishermen make 1.6 fishing operations of total duration of 3.9 hours (that is, each fishing operation lasts 2.4 hours average). The total average daily catch per day per boat was 53.8 kg, or 1400 kg for the total number of single gillnets, with the average annual catch by this fishing gear totaling 352.8 tons. The estimated catch per unit effort (CPUE) is 13.9 kg/h (Ikica Z *et al.,* 2018).

Similar to single gillnets, Atlantic Bonito (*Sarda sarda*) prevailed in catches by triple gillnet, with its share in weight of 30.3%. Less than 10% representation have following species: Greater Amberjack (*Seriola dumerili*) - 8.6%, Bullet Tuna (*Auxis rochei*) - 8.2%), Red Mullet (*Mullus barbatus*) - 7.2% and Cuttlefish (*Sepia officinalis*) - 5.4%. Other from total 29 species is represented by less than 5%. Representation of Cephalopods is 8.2% (Cuttlefish 5.4 and Octopus 2.8%), while Crustaceans have representation of 2.4% (Lobster 1.6% and Shrimps 0.8%). Average daily catch ranges near 50.6 kg, or about 759.5 kg for all triple gillnets. Estimation of total annual catch is 31.1 tones. The catch per unit effort (CPUE) is 13 kg/h (Ikica Z *et al.,* 2018).

Beach seines have been applied in Boka Kotor Bay since traditional fishing gear used for centuries in that area. In the catch are registered 12 species. Most represented species is European Anchovy (*Engraulis encrasicolus*) with 35.3% followed by European Pilchard (*Sardina pilchardus*) with 29.2%. Mullets are represented by 18.3% while other species by <10%. Average daily catch by Beach seines is estimated as 311.3 kg per boat or 3.4 tons per day for all Beach seines. Annual catch by Beach seines is estimated as 304.8 t. The catch per unit effort (CPUE) is 51.9 kg/h, (Ikica Z *et al.,* 2018).

Concerning weight of the catches by bottom longlines Conger (Conger conger) is represented by 43%, Common Seabream (*Sparus pagrus*) by 29.8%, European Hake (*Merluccius merluccius*) by 8% and Searobins (fam. *Triglidae*) by 6.2%. Average daily catch by bottom longlines is 57.1 kg (or 456.8 kg for all longlines per day), or around 29.7 t per year for all longlines. The estimated catch per unit effort (CPUE) is 9.4 kg/h, (Ikica Z *et al.,* 2018).

The most significant species in the catch by purse seiners is European Pilchard (*Sardina pilchardus*), which accounts for 49.5% of the total catch weight. Other species are Chub Mackerel (*Scomber japonicus*) by 27.2%, Atlantic Horse Mackerel (*Trachurus spp*.) by 15.5% and Bogue (*Boop boops*) by 7.8%). Average daily catch is 295.8 kg and the average number of fishing trips is 14.6 per month. Average annual catch can be estimated at 30.2 t. The catch per unit effort (CPUE) is 57 kg/h, (Ikica Z *et al.,* 2018).

With the years, long research of trawling resources under the EU MEDITS programme, the Institute of Marine Biology has been surveying these resources in 10 sites at depths from 50 up to 750 meters, using standard methodology. A total of 160 demersal species were caught and examined during the MEDITS surveys (Djurović M & Regner S, 2009). The most abundant species in biomass (kg/km2) were the following:

- ***Merluccius merluccius*** (65.4 kg/km2)
- ***Scyliorhinus canicula*** (37.1 kg/km2)
- ***Mullus barbatus*** (30.3 kg/km2)
- ***Parapenaeus longirostris*** (25.7 kg/km2)
- ***Lophius budegassa*** (23.2 kg/km2)
- ***Illex coindetii*** (20.7 kg/km2)
- ***Trachurus trachurus*** (18.4 kg/km2)
- ***Aspitrigla cuculus*** (14.5 kg/km2).

Comparing results from the MEDITS survey and data from the HVAR expedition (1948/49), a sharp decline of elasmobranches has been found. Sharks and Rays, which accounted for 36 - 42% of the total fish catch in the early 1970', have declined to 17 - 30% in total fish catch in 2000'. With the exception of *Scyliorhinus canicula* and *Squalus blanvillei,* a decrease or disappearance occurred for all the most common Selachians species. Teleosteans fish did not show a clear pattern, in particularly Hake and Red Mullet. Anglerfish (*Lopius budegassa*) and Horse Mackerels (*Trachurus spp*.) seem to be more abundant in more recent surveys than in previous investigations. The opposite situation has been observed for John Dory (*Zeus faber*) (Đurović M & Regner S, 2009, Pešić A, *et al.,* 2011).

According to 2018 data, Montenegro's fishing fleet comprises 190 vessels including 19

trawlers, 18 seiners and 153 small coastal fishery vessels. VMS devices are installed on all vessels over 12 m LOA, as well as on several vessels below that length. Currently a total of 20 vessels in the Montenegrin fleet have active VMS devices. Unlike other Adriatic countries which have modernized and renewed their trawling fleet pretty much in the previous period, Montenegro did not same. This is why Montenegrin fishing fleet even today consists of very old vessels, with an average age of around 40 years, low capacity, outdated, low-power engines, very limited range of motion due to the insufficient safety at sea, and overall quite limited possibilities for smooth operation. That is why Montenegrin fisherman limited their operations in the territorial waters of Montenegro. As mentioned above European Pilchard (*Sardina pilchardus*) and European Anchovy (*Engraulis encrasicolus*) are most important commercial fish species in Boka Kotor Bay while in Outer Sea with coastal waters and deep sea are important European Hake (*Merluccius merluccius*) and Red Mullet (*Mullus barbatus*) (Ikica *et al.,* 2018). At an average ex-vessel price of 4 Euro/kg for sardine and 3 Euro/kg for anchovy, the total annual value of the catches is in the order of 164 000 Euro. Participate in the fishery a total of 181 fishers, including those involved in the large purse seine and pelagic trawler fisheries currently out of activity[2].

2.1.6 Others

For the purpose of this National Report important are marine fish species of conservation importance. They were identified in the documentation for preparing 1st NBSAP (MTEP Country Study, 2008) and include following marine fish species:

Latin name	English name	Red list IUCN[3]	Red list EU[4]	Status Bern[5]	Status CITES[6]	Conserv. status MNE[7]
Acipenser naccarii, Bonaparte, 1830	Adriatic sturgeon	VU		**A II**	**A II**	+
Acipenser sturio, Linneaus, 1758	Sturgeon	CR		**A III**	**A I**	+
Acipenser stellatus, Pallas, 1771	Starry sturgeon	EN		**A III**	**A II**	+
Huso huso, Linneaus, 1758	Beluga	EN		**A III**	**A II**	+
*Cetorhinus maximus,*Gunnerus, 1765	Basking shark	VU			**A II**	+
Carharodon carharias, Linneaus, 1758	White shark	VU		**A III**		+
Lamna nasus, Bonnaterre, 1788	Porbeagle	VU				+
Mobula mobular, Bonnaterre, 1788	Sea devil	EN				+
Hippocampus guttulatus, Leach, 1814	Sea horse	DD		**A I**		+
Hippocampus hyppocampus, Linneaus, 1758	Sea horse	DD		**A II**		+

2 As given in: UNEP-MAP-RAC/SPA. (2015). Adriatic Sea: Status and conservation of fisheries. By Farrugio, H. & Soldo, A. Edited by Cebrian, D. and Requena, S., RAC/SPA, Tunis; 58 pp., page 13
3 IUCN Red list categories available at https://portals.iucn.org/library/node/10315
4 European red list of globally threatened animals and plants and recommendations on its application as adopted by the Economic Commission for Europe at its 46th session (1991) by decision D (46).
5 Bern convention (Convention on the Conservation of European Wildlife and Natural Habitats) - Resolution No. 6 (1998) listing the species requiring specific habitat conservation measures.
6 CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora) – Appendices I, II and III
7 Rješenje o stavljanju pod zaštitu rijetkih, prorijeđenih, endemičnih i ugroženih biljnih i životinjskih vrsta ("Official Gazette of R MNE" no 25/06).

Concerning species given in the annexes of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean following marine fish species are identified in the country (Caković D., Milošević D., 2013):

Annex II species:

- *Aphanius fasciatus*
- *Hippocampus hippocampus*
- *Pomatoschistus tortonesi*
- *Mobula mobular*
- *Oxynotus centrina*

Annex III fish species (species whose exploitation is regulated)

- *Alopias vulpinus*
- *Epinephelus marginatus*
- *Mustelus asterias*
- *Mustelus mustelus*
- *Prionace glauca*
- *Squalus acanthias*
- *Thunnus thynnus*
- *Umbrina cirrosa*
- *Xiphias gladius*

Importance of the Mediterranean killifish (*Aphanius fasciatus*) for conservation is also recognised by EU Habitat Directive (92_43_EEC, Annex II, article 17.).
As a "flagship species" popular to promote public awareness John Dory (*Zeus faber*) has been identified (Pesic A., 2019).

2.2. Main habitat types

As mentioned in Chapter 2.1., direct use of specific classification of marine habitats by RAC/SPA (2019) (Classification of Benthic Marine Habitat Types for the Mediterranean Region and Reference List of Marine and Coastal Habitat Types in the Mediterranean) is not possible at this moment, so available data on equivalent Natura 2000 Marine habitat types important for conservation are presented in this chapter.

Inventory and mapping of Natura 2000 marine habitats and species is in starting phases and cover zones of 3 potential priority Marine Protected Areas (Platamuni, Katič and Stari Ulcinj)[8] so far

In current version (3) of the Catalogue of habitat types of EU importance of Montenegro available at internet (link here) following Natura Maine habitat types (excluding Coastal habitats!) are present in Montenegrin Marine Coastal waters:

1110 Sandbanks which are slightly covered by sea water all the time (PAL.CLASS.: 11.125, 11.22, 11.33, 11.331, EUNIS2007: A5.1, A5.2, A5.4, A5.5, A5.531, A5.533, A5.54)

*1120 Posidonia beds (*Posidonion oceanicae*) (PAL.CLASS.: 11.34 EUNIS2007: A5.5, A5.53, A5.535)

1130 Estuaries (PAL.CLASS.: 13.2, 13.21, 13.22, 13.23, EUNIS2007: A1.2, A1.3, A1.4, A2.1, A2.12, A2.2, A2.3, A2.4, A2.5, A2.6, A2.7, A3.2, A3.3, A3.36, A3.7, A4.2, A4.3, A5.1, A5.2, A5.22, A5.3, A5.32, A5.4, A5.42, A5.5, A5.6, A7.1, A7.2, A7.3, A7.4, A7.5, A7.8, X01)

1140 Mudflats and sandflats not covered by seawater at low tide (PAL.CLASS.: 11.332, 11.3321, 11.3322, 14, EUNIS2007: A2.1, A2.2, A2.24, A2.3, A2.31, A2.32, A2.4, A2.6, A2.61)

1150 Coastal lagoons (PAL.CLASS.: 21, 21.2, 21.3, 23.21, 23.211, 23.22, EUNIS2007: A1.3, A2.2, A2.3, A2.4, A2.5, A3.3, A3.34, A5.1, A5.2, A5.3, A5.31, A5.4, A5.41, A5.5, A5.6, A7.1, A7.2, A7.3, A7.4, A7.5, A7.8, C1.5, C1.521, C3.4, C3.44, X02, X03)

1160 Large shallow inlets and bays (PAL.CLASS.: 12, 12.2, 12.4, 12.52, 12.6, EUNIS2007: A1.1, A1.2, A1.3, A1.4, A2.1, A2.2, A2.3, A2.4, A2.5, A2.6, A2.7, A3.1, A3.2, A3.3, A3.7, A4.1, A4.2, A4.3, A4.7, A4.71, A5.1, A5.2, A5.3, A5.4, A5.5, A5.6, A7.1, A7.2, A7.3, A7.8, A7.9)

1170 Reefs (PAL.CLASS.: 11.25, 11.251, 11.252, 11.253, 11.254, 19.2, EUNIS2007: A1.1, A1.2, A1.22, A1.3, A1.4, A2.7, A3.1, A3.2, A3.23, A3.3, A3. 7, A4.1, A4.2, A4.24, A4.3, A4.7, A4.71, A5.6, A6.1, A6.6) and

8330 Submerged or partially submerged sea caves (PAL.CLASS.: 65, EUNIS2007: H1.1, H1.2)

Main features and biological **characteristics** of selected Natura Marine habitat types important for conservation are given as follows:

*1120 Posidonia beds (*Posidonia oceanica*)

8 GIS Data base and Documentation from the GEF project „Promoting Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro" that is not available at internet, so far

Equivalent to following RAC SPA (2019) habitat types :

MB2.54 *Posidonia oceanica* meadows

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

MB2.545 Natural monuments/Ecomorphoses of *Posidonia oceanica* (fringing reef, barrier reef, atolls)

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*

Habitat types / communities included: Posidonietum oceanicae

Indicator species:

Plants: *Posidonia oceanica, Flabellia petiolata, Peyssonnelia* sp., *Hydrolithon* sp.

Animals: Echinodermata: *Paracentrotus lividus, Holothuria tubulosa, Echinaster sepositus*, shells / Bivalvia: *Pinna nobilis*, Bryozoa: *Electra posidoniae*, Ascidias: *Halocynthia papillosa*, Fishes: *Sarpa salpa, Sympodus ocellatus, S. rostratus, Chromis chromis etc.*

Posidonia oceanica is an endemic species of the Mediterranean and is the dominant plant in Mediterranean coastal waters, where it forms monodominant underwater meadows – sea beds. This plant is mostly present at movable sea bottoms in the infra-littoral (sandy-muddy bottoms), to a depth of about 40 m (in very clean water), while in Montenegro it comes up to 30 m depth. Posidonia meadows represent a very important and productive ecosystem with a multiple role in maintaining ecological balance in the coastal waters by: stabilizing sandy marine zone, protecting sandy beaches from erosion, providing oxygen enrichment from the process of photosynthesis, providing shelter for many marine organisms (fish, cephalopods, shellfish, snails, echinoderms, tunicates), producing food for coastal and pelagic organisms, including substrate for many epiphytic algae that live on their leaves, etc.

However, Posidonia meadows are located in the coastal waters, which is often under intense anthropogenic influence. Anthropogenic impact sometimes refers to the direct destruction of meadows, and sometimes it is an indirect impact that is manifested as a decrease in water and sediment quality, including decrease in water transparency. The diversity of fish communities inhabiting this habitat is very important, so more than 70 fish species connected to this habitat are recorded in the Mediterranean area (Francour, 1990; Miniconi *et al.,* 1990). In the Posidonia meadows cold be found *Pinna nobilis,* the largest shell of the Adriatic, which is protected by national legislation and Barcelona Convention, Annex II. Although in the last few years the population of this shell has been adversely impacted by parasite *Haplosporidium painnae* in some Mediterranean regions causing its mortality up to 100% and this species is now Critically Endangered (EN) according to IUCN (Cabanellas-Reboredo *et al.,* 2019; Kersting *et al.,* 2019).

Posidonia meadows have been recorded on a number of localities in Montenegrin coastal waters, from 1-2 m up to ~30 m deep. Upper limit of Posidonia meadows is about 6-7

meters deep (DFS, 2012). Only at the site near the underwater cave Mikovica, the upper limit is at a depth of 12 m. In the coastal zone of Cape Ademov kamen (near Stari Ulcinj island), the upper limit of the meadow is already at a depth of 5 meters.

In the Outer Sea, along the coastline, numerous settlements of Posidonia have been identified, starting with well-preserved communities in front of Petrovac and Buljarica, and in Trašte Bay. Due to the reduced transparency of the water in Boka Kotor Bay, Posidonia meadows are present in shallower waters, at lower depths than in the Outer Sea. At some locations, e.g. in front of Herceg Novi, the underwater Posidonia meadows are degraded or in regression, but historical data are missing for accurate comparison of the significance of these changes.

Average lower limit of Posidonia meadows in Montenegrin coastal waters is ~ 20 m depth (average), but in some localities it goes to greater depths, e.g. 27 m at Seka Albaneze and even 32.5 m at Mirište. From the south to the north lower limits of Posidonia meadows is increasing that could be related to the increase of water transparency. The exception is the Boka Kotor Bay, especially the inner part where the lower limit of Posidonia meadows is at much smaller depth (~11m).

Presence and state (density and cover) of Posidonia meadows is an indicator of the degree of preservation of natural habitats in a particular zone. Density and cover of Posidonia meadows depends on many factors, such as: type of the substrate, algal communities associated to etc.

Larger zones with Posidonia meadows are at the following localities: Kalafat (Seka Albaneze) (80% at a depth of 15-20 m), Ademov kamen (80% at a depth of 15-20 m), Stari Ulcinj (90% at a depth of 10 to 20 m), cape Meret (90% at a depth of 10 to 20 m), but much larger zones are in front of Petrovac, in the vicinity of Sveti Nikola island near Budva and in Trašte Bay.

1170 Reefs (Underwater Reefs) with coralligenous habitats and *Cystoseira* communities

Equivalent to following RAC SPA (2019) habitat types :

MB2.53 Reefs of *Cladocora caespitosa*

Habitat types / communities included: *Catenelletum caespitosae, Entophysalidetum deustae, Acetabulario-Padinetum pavonicae, Cystoseiretum amentaceae, Cystoseiretum barbatae, Cystoseiretum crinitae, Cystoseiretum crinitophyllae, Cystoseiretum spinosae, Sargasso-Cystoseiretum foeniculaceae, Fucetum virsoidis, Corallinetum elongatae, Corallinetum officinalis, Halimedetum tunae, Lithophylletum byssoidis, Peyssonnelietum squamariae, Peyssonellietum rosae-marinae, Rytiphloeo-Vidalietum volubilis*

Indicator species:

Plants: *Cystoseira amentacea, C. barbatae, C. crinita, Fucus virsoides, Bangia atropurpurea, Corallina officinalis, Lithophyllum lichenoides, Flabellia petiolata, Peyssonnelia rubra, P. squamaria, Padina pavonica, Acetabularia acetabulum, Halimeda tuna, Osmundaria volubilis, Sargassum* sp.

Animals: Corals: *Cladocora caespitosa, Eunicella* sp., *Madrepora* sp. *Savalia savaglia*; spongies: *Axinella* sp.; Cnidaria - Anthozoa: *Actinia equina*; snails: *Melaraphe neritoides, Patella* sp.; shels: *Lithophaga lithophaga, Mytilus galloprovincialis*; Echinodermates: *Paracentrotus lividus, Arbacia lixula*; crabs - Decapods: *Euraphia depressa*; Bryozoa:: *Retteporella beaniana, Myriapora truncata*.

Sensu stricto, Coralligenous formations are unique limestone formations of biogenic origin in the benthic zone of the Mediterranean, which are formed by the accumulation of algae that grow in low light conditions. Algae and invertebrates that live in low light conditions are called scyaphilic (opposed to photophilic ones) that grow in good light conditions and inhabits coralligenous habitats. Usually, these habitats are present in the circumlittoral zone but could be also seen in the infralittoral zone at vertical ridges and in deep crevices.

This type of habitat has been recorded in a number of localities in the coastal waters: in Boka Kotor Bay around underwater springs (locally named as "vrulja"), including Risan Bay, but also in Outer Sea in front of stretches Luštica-Donji Grbalj, and Cape Volujica - Cape Mendra.

Coralligenous habitats haven't been investigated in Deep Sea so far, same as other relevant biodiversity.

Cystoseira Communities are also considered as internationally important habitats and, like coralligenous habitats, according to the EU Habitats Directive, they belong to the same habitat type - 1170 Reefs / Underwater reefs. A characteristic species of this association in the upper infralittoral zone (depth 0–1 m) is *Cystoseira amentacea* occurring on exposed, unpolluted, solid substrates and represents a climax community in successions of photophilous algae. Therefore, the presence of species of the genus *Cystoseira* is an indicator for determining water quality. *Cystoseira* species in the deeper parts of infralittoral are community builders on a solid base and, excluding *Cystoseira compressa*, all are by Barcelona Convention.

Cystoseira communities in Montenegrin coastal waters are well developed, particularly *Cystoseira amentacea* in front of Luštica and Donji Grbalj, but also in the zone from Cape Volujica to the South. In these zones are present other *Cystoseira* species, as well because of appropriate solid substrate. Cystoseira barbata has been registered in Boka Kotor Bay at a large number of locations less exposed to waves and reduced salinity. However, this species, like many others in the Bay, is particularly under pressure from habitat destruction in terms of silting up caused by building of new moorings and other construction works at the cost.

8330 Submerged or partially Submerged Sea Caves (underwater caves)

Equivalent to following RAC SPA (2019) habitat types

MA1.52 Mediolittoral caves

MB1.56 Semi-dark caves and overhangs (see MC1.53)

MC1.53 Semi-dark caves and overhangs

MC1.53d Brackish water caves or caves subjected to freshwater runoff

ME1.52 Caves and ducts in total darkness

Underwater caves are located below or at least partially below the sea surface, at high tide. They have unique composition of biocenoses and represent a specific or characteristic

feature of the Mediterranean area. Underwater caves are considered as "hot spots" of biodiversity. Scyaphilic communities of marine invertebrates and algal species inhabit their bottom and walls while from the entrance to the end of the cave they are getting poorer.

There are a significant number of underwater caves in Montenegro and some 70 semi-submerged caves have been registered including 2 caves of 17 m length and 22 caves of +25 m length. Most of the caves are anchihaline (with fresh water overlying the sea water) while only few are euhaline (completely under marine conditions). Caves with morphological features suitable to be inhabited with Mediterranean Monk Seal (*Monachus monachus*) have been recognized, as well (Mačić *et al.,* 2018). All identified caves are divided in two groups: one for the area Luštica - Donji Grbalj and the other in the area Ulcinj - Cape Đerane. In these caves are registered 74 taxa including 6 protected species. In the zone of Marine Protected Area Katič biocenoses in three caves were examined: Mala Krekavica, Mikovićeva pećina and Plava špilja (DFS, 2012)

The Mala Krekavica cave in the zone of Marine Protected Area Platamuni has a large crack in the rock wall that starts at a depth of about 30 m and extends to the water surface. The cave is wide in its base but towards the surface it decreasing. Since this cave is easy accessible and has very rich invertebrate communities on its side walls, it is often visited by scuba divers. In this cave are registered 24 species including Anellida - 2, Bryozoa - 3; Cnidaria - 2; Crustacea - 3; Echinodermata - 2; Pisces - 9; Porifera - 3.

Mikovica cave is about 7 m deep, and there is a large hall at the entry. It is about 150 meters long and after the large "hall" is divided into two horizons / rooms. It is often visited by divers, especially the first room. In this cave are registered 26 species including Anellida - 2, Ascidiacea - 1, Cnidaria - 2; Crustacea - 5; Echinodermata - 3; Pisces - 7; Porifera - 6.

The Blue Cave has two large entrances, so small boats can pass through it. It is popular not so much for divers, but as a tourist destination for smaller boats and swimmers. The water depth in the cave is between 6 and 12 m. In this cave are registered 15 species including Anellida - 3, Cnidaria - 1, Crustacea - 2; Echinodermata - 1; Pisces - 6; Porifera - 3. Subsequent researches identified presence of bats.

2.3. Singular habitats in the country

Unique, singular habitats that differ to standardized habitat types in the region have not been identified so far in the country.

In relation to this it has to be mentioned that national classification of the habitat is not provided so far, so possible presence and characteristics of singular habitats in Montenegro should be assessed in the frame of developing that classification.

2.4. Transboundary issues

At this moment particular transboundary issues have not been identified as critical or problematic in the country.

Previously, until 2015, there was a project for applying IRMP (ICZM and IRBM) methodologies in the transboundary (Montenegro and Albania) area of Bojana / Buna River tributary to Adriatic Sea. Project completed by preparing a Transboundary Management Plan (GWP-Med, PAP/RAC, UNESCO-IHP (2015): Integrated Resources Management Plan (IRMP) for the Buna/ Bojona Area, Paris, France).

In terms of exchanging knowledge, experience and data UNEP/MAP in cooperation with the Ministry of Sustainable and Tourism of Montenegro and respective institutions in Albania is currently implementing a GEF project focusing on the Implementation of the Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning. The projects has supported the introduction of the Ecosystem Approach and the Integrated Monitoring and Assessment Programme in both countries Montenegro and Albania, revising/introducing national monitoring programmes of the marine environment aligned with EcAp/IMAP requirements. The project has also supported the preparation of the Marine Spatial Plan in Montenegro by applying the ecosystem approach (Implementation of Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning)

Also, Project NETCET provided (aerial) surveys for Adriatic subregion and produced strategies for conservation both, Cetaceans and Sea Turtles (2015) and during 2018. Accobams Survey Initiative conducted by Accobams Convention provided second (aerial) surveys for Adriatic subregion.

2.5. Identification of the country's marine and coastal biodiversity gaps needed for scientifically sound based conservation

Site specific Gaps and Deficiencies in knowledge on marine and coastal biodiversity has been done for two potential MPAs Platamuni and Ratac (UNEP/MAP – RAC/SPA, 2016, Chapter 7.0, Table 6., pgs 26-29). For potential MPA Platamuni some Deficiencies / Gaps are identified in the field of data on geophysical, geomorphological and oceanographic features (Side Scan Sonar coverage map) but they are classified as Medium significant. For potential MPA Ratac lack of data on geophysical, geomorphological and oceanographic features but also poor data on seabed features have been classified as a High Gap. Since new field data provided after publishing RAC/SPA Gap Analysis this Gap isn't high or significant furthermore.

Identification of gaps in knowledge on coastal and marine biodiversity in entire Coastal Area for both, marine and coastal[9] components have been also done for GIS data on habitats and species important for conservation in the frame of GEF project "Promoting

9 Related to the terrestrial – coastal zone with typical mediterranean character spread in the altitude range between 0 and 400 meters asl

Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro". Analyses / Assessment of the Gaps related to GIS data is provided in national language and include following findings: (i) most of data in (11) available databases could be further used for various purposes, primarily

for setting up Coastal (terrestrial) and Marine Protected Areas but also for delineation of other ecologically valuable areas, (ii) data and knowledge on coastal biodiversity is varying among different taxonomic groups and geographic areas along the Coast but for conservation purposes more investigation shall be given to: habitat inventory in the zones not covered by the surveys in 2019, including Boka Kotor Bay (Verige, Vrmac, Grbalj) and Ulcinj area (along Bojana river, Vladimirsko and Klezansko field etc.), as well as in species inventory in existing / planed protected areas and other ecologically important areas (KBA, Natura etc.) and (iii) future investigations / inventories of marine biodiversity shall continue in coastal waters in Tivat and Herceg Novi Bay and zone of Velika plaža.

A view on MPA Katič

3.

Pressures and impacts

© SPA/RAC, University of Sevilla

3.1. Biological disturbance

Biological disturbance is considered as a disturbance causing non-indigenous species, including presence and expansion of invasive species, microbial pathogens, but also impact of fisheries and aquaculture on target and non-target species and habitats. In order to avoid repeating data on (i) non-indigenous, including invasive, species already given in chapter 2.1.4 and (ii) species of commercial interest for fishing (fish, mollusk and shellfish) given in 2.1.5., here are presented remaining thematically structured data on the *causes* such as origin and pathway. Since less studied, specific evidence based data on disturbances related to microbial pathogens as well as data related to the impacts of fisheries and aquaculture on target and non-target species and habitats, all related to the biodiversity in Montenegrin marine waters, couldn't be presented in this National Report, as initially required in its annotated structure. Concerning relevance for entire marine ecosystem, key identified disturbances in marine biodiversity in Montenegro come from invasive species while disturbances related to pathogenic marine microbes and Impact of fisheries and aquaculture on target and non-target species and habitats remained to be estimated upon providing more relevant data.

Invasive species

There are 23 invasive species recorded in the Montenegrin waters so far, and the predominant group is Mollusca. Majority of invasive species have been recorded in the last 20 years. Almost half of recorded species originate form Indo West Pacific and were most likely transported through the Suez Canal.

Data on origin, pathways and occurrence of invasive species in Montenegrin waters are given in the table below (source UNEP 2020)

	Origin	Pathway	Occurrence
RHODOPHYTA			
Antithamnion amphigeneum	Indo Pacific	Shipping	Tivat
CHLOROPHYTA			
Caulerpa cylindracea	Indo West Pacific	Aquarium trade	Žanjice, Mirišta, Cape Arza, Mamula, Strmac (between Žanjice and Dobreč), Zlatna Uvala bay, Cape Mačka, Cape Veslo, Cape Kočište, Žukovica bay, Žabica bay, Cape near Velika Krekavica bay, Podrupice bay (Trsteno), Cape Jaz, island Sveti Nikola, Skočidjevojka, Crni rt cape, Žukotrlica, Port of Bar
Asparagopsis taxiformis	Indo West Pacific	Suez/shipping	Herceg Novi
Asparagopsis armata	Western Australia	Aquaculture / shipping	Trašte bay
Womersleyella setacea	Indo West Pacific	Shipping	Žanjice, Mirišta, Cape Arza, Mamula, Strmac (Cape between Žanjice and Dobreč), Cape Mačka, Cape Veslo, Cape Kočište, Žabice bay, Seka Kalafat, Cape Platamuni, island Sveti Nikola (south), Kamenovo bay

	Origin	Pathway	Occurrence
PORIFERA			
Paraleucilla magna	South West Atlantic	Shipping?	Tivat, Kotor
MOLLUSCA			
Aplysia dactylomela	Circumtropical	Shipping	Herceg Novi
Bursatella leachi	*Circumtropical*	*Suez/shipping*	*Herceg Novi*
Melibe viridis	*Indo West Pacific*	*Suez/shipping*	*Herceg Novi*
Thecacera pennigera	*Cosmopolitan*	*Shipping?*	*Tivat*
Anadara transversa	*West Atlantic*	*Shipping*	*Kotor*
Arcuatula senhousia	*Indo Pacific*	*Aquaculture / Shipping*	*Port of Bar, Velji pijesak*
Ruditapes philippinarum	*Indo Pacific*	*Aquaculture / Shipping*	*Bar, open sea*
Teredo navalis	*Circumtropical*	*Shipping*	*Kotor*
Pinctada imbricata radiata	*Indo West Pacific*	*Suez/shipping*	*Tivat, Kotor*
Magallana gigas	Indo Pacific	Aquaculture	Kotor
CRUSTACEA			
Penaeus aztecus	*North West Atlantic*	*Shipping?*	*Tivat*
Callinectes sapidus	*West Atlantic*	*Shipping*	*Jaz, Budva Marina, Kruče bay, Valdanos, Port Milena, Ada Bojana*
Amphibalanus eburneus	West Atlantic	Aquaculture / Shipping	Kotor
ANNELIDA			
Hydroides dirampha	*Circumtropical*	*Shipping*	*Bar*
Palola valida	Red Sea	Shipping	Bar
BRYOZOA			
Bugula neritina	Unknown	Shipping	Port of Bar, islet Mamula
TUNICATA			
Styela plicata	Western Atlantic	Aquaculture / Shipping	Trašte bay, port of Bar

Out of already identified, there are 10 potential / new invasive species that could be introduced in Montenegro in the near future (see table below, source National Integrated Monitoring Program – NIMP, GEF Adriatic project 2020). Invasive species could have high impact on biodiversity and/or economy. Lionfish (*Pterois miles)* is known as dangerous for human health because of its poisoning spines, but it could be also a food source.

Potentially introduced invasive species	Overall impact in ecosystem services	Overall impact on biodiversity
Plotosus lineatus	625	125
Mnemiopsis leidyi	542	108
Pterois miles	542	108
Brachidontes pharaonis	400	100
Anadara kagoshimensis	333	100
Rapana venosa	315	85
Codium fragile	267	67
Charybdis japonica	235	64
Fulvia fragilis	191	55
Stylea clava	118	39

Microbial pathogens

Concerning pathogenic marine microbes, only Fecal Indicator Bacterias (FIBs) *Escherichia coli* and intestinal *Enterococci* are regularly monitored in the marine waters. They are part of the Annual Monitoring Program for the sanitary quality of sea waters at ~100 public bathing locations that implementing Public Enterprise for Coastal Zone Management since 1996. Since 2010 this Program has been implemented in compliance with the Regulation on Water Classification and Categorization (Official Gazette of the Republic of Montenegro 02/07), as well as in compliance with other national and international regulations including main requirements of "new" EU Bathing Water Directive 2006/7/EC[1]and the International Blue Flag Program, as well. Data obtained from this monitoring program (classified in K1 class: excellent and K2 class: satisfactory) are available and easy accessible to the public at following web link address http://monitoring.morskodobro.com/monitoring/?lang=en_US. Out of FIBs no other pathogenic marine microbes monitored or occasionally analysed in the country, including bifidobacteria, Clostridium perfringens, human viruses and F-RNA coliphages or similar. Theoretically, disturbances caused by pathogenic microbes could include very broad list of challenges that haven't been covered by researches and practical solutions in the country, including: indicator organisms, and their relationship to water quality, non-point sources of contamination, direct pathogen detection, virulence, non-enteric diseases resulting from recreational water use, animals and environments as sentinels of water quality, zoonotic and emerging diseases etc. Similar to other Mediterranean countries, a massive mortality of *Pinna nobilis* caused by endoparasite *Haplosporidium pinnae sp*., has been registered in Montenegrin coastal waters, including zones of MPAs.

Impact of fisheries and aquaculture on target and non-target species and habitats -

Similar to previous, disturbances related to the impacts of fisheries and aquaculture on target and non-target species and habitats, haven't been covered by appropriate monitoring but also researches and applying practical solutions in the country. Since evidence based data on this type of disturbances in the country are missing we could only recall on data in professional / scientific literature from other countries or principal / general knowledge related to this challenge.

1 Directive concerning the management of bathing water quality and repealing Directive 76/160/EEC

However, there is one emerging issue related to this type of disturbance that is currently related to "regulation" (in terms of applying full ban, or selective control) of fishery in Marine Protected Areas that are now "potential" but going to be established soon. It seems that discussion on the issue "Fishery in Marine Protected Areas" require more lights on the understanding impacts of the fishery on marine biodiversity, in general, but also understanding of direct impacts of the fishery on benthic species and habitats specifically in Marine Protected Areas.

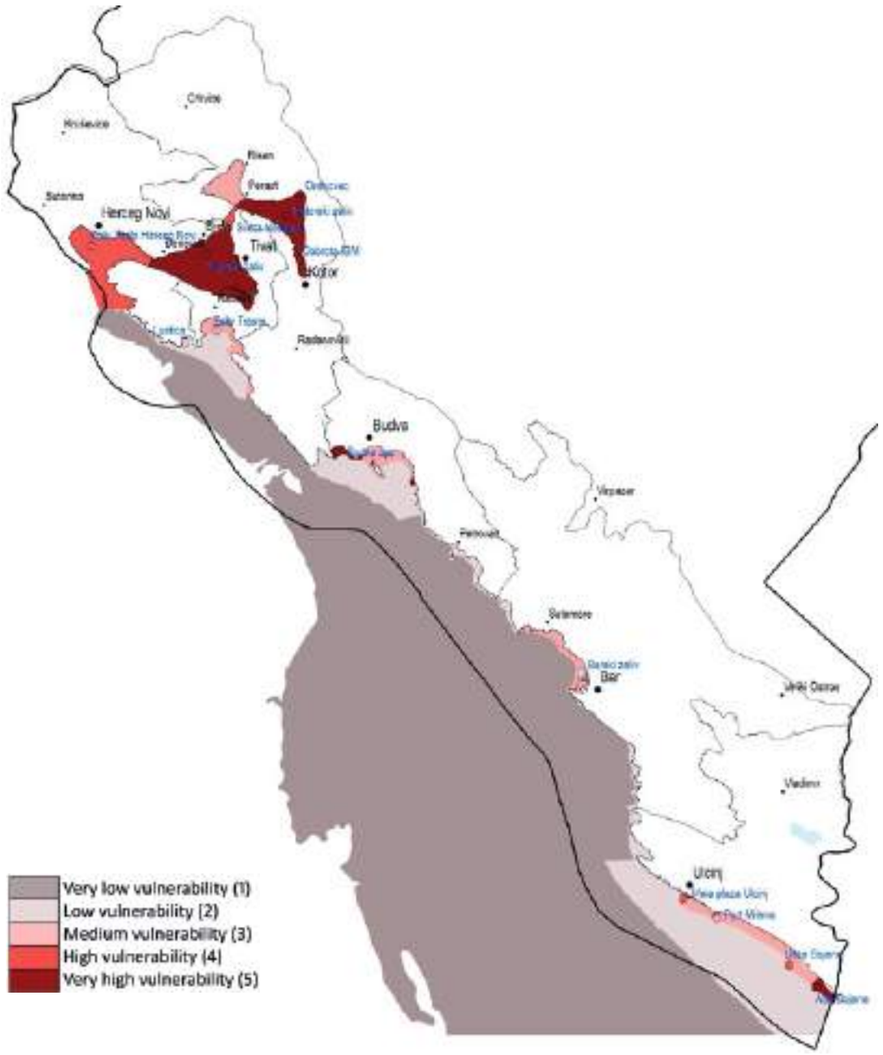
There were significant national efforts in eliminating dynamite fishing in last 2 years. Within the Action Plan of the Working Group for conquesting and eliminating use of Explosive Devices and other illicit fishery tools and equipment, a program of harmonized and continuous actions have been carried out, as a part of regular police activities, but in 2018 territorially expanded on most critical poaching locations in the Coastal area. In the fishery or poaching intensive periods police controls were more frequent and poaching and use of dynamite much less present then before. In 2019 this work continued by both Police Directorate and Fishery inspectorate due to new equipment provided for the work of fisheries inspectors.

Similar situation to fishery disturbances is with the disturbances related to the impacts of aquaculture (mariculture) on nont-terget species and habitat that haven't been studied and relevant data are missing in the country so far, even there are 19 active aquaculture farms (mariculture producers) in the country and Institute for Marine Biology in Kotor is acting as scientific advisor to all mariculture producers (source FAO).

3.2. Vulnerable marine ecosystems

A vulnerability assessment of entire Coastal Area in the country has been carried out in the frame of the Coastal Area Management Programme Montenegro – CAMP (UNEP – MAP - PAP/RAC, 2010 - 2014) that is available at this link. Various segments / elements of the environment[2] are considered in this complex assessment of their vulnerability, including Cumulative Vulnerability (Chapter 3.1., pg. 40) that included identification of the areas with highest vulnerability. In marine part of the Coastal Area highest cumulative vulnerability is assigned to Boka Kotor Bay, (pg. 47; see excerpted map with legend below).

2 Include following thematiculy structured environmental elements: 1. Environment and human health (noise; air pollution; soil pollution at hot spot locations; joint vulnerability model for environment and human health); 2. Flora and fauna – biodiversity (flora and fauna; nature protected areas; marine biodiversity; joint vulnerability model for flora and fauna i.e. for biodiversity); 3. Soil (erosion; agriculture and agricultural land; seismic hazard); 4. Water (terrestrial surface waters; terrestrial groundwater; sea); 5. Air/ Climate, climate change (droughts; forest fires; heavy rains; storm winds; joint vulnerability model for climate change); and 6. Landscape.



Vulnerability of the Sea – marine waters

GIS layers produced in CAMP are available at http://www.geoportal.mrt.gov.me/layers/ while Marine part of the Cumulative Vulnerability Map and GIS layers (in Montenegrin language) could be visited or downloaded at/from this web link http://www.geoportal.mrt.gov.me/layers/geonode:ranjiv_more_reg

Building upon the results of the CAMP project which was implemented in Montenegro in cooperation with the Ministry of Sustainable Development and Tourism, the same Ministry allocated funding for the implementation of a pilot project in the period 2016-2017 to design and test a methodology for marine vulnerability assessment, based on the Ecosystem Approach to be potentially used within an MSP process. The proposed methodology enabled to assess vulnerability of the marine area, therefore identifying most fragile and valuable areas of the Boka Kotor Bay that need to be preserved from future degradation.

This pilot project set a basis for the implementation of the ongoing, sub-regional project "Implementation of the Ecosystem Approach in the Adriatic Sea through Marine

Spatial Planning" in Albania and Montenegro, in the framework of the cooperation among UNEP/MAP – PAP/RAC – SPA/RAC with competent national authorities. In the case of Montenegro, the Ministry of Sustainable Development and Tourism has been coordinated the activities of this project, consisting first in the revision and alignment of the national monitoring program of marine environment with the Integrated Monitoring and Assessment Programme (IMAP). This means that future monitoring of marine environment in Montenegro will include more comprehensive and regular data on the marine environment, in line with internationally accepted and agreed methodologies. The activities also involved a field survey testing the national integrated monitoring program drafted in the framework of the project covering the entire territorial sea of Montenegro and involving collection of additional data on marine biodiversity. The project has been also dealing with the preparation of inputs for the future Marine Spatial Plan of Montenegro, in line with the Maritime Spatial Planning Directive and ICZM Protocol. This is a very relevant process for future protection of coastal biodiversity and sustainable planning of the maritime activities of Montenegro, which will produce a map of marine habitat distribution encompassing all biodiversity related data available by now and which will serve for future planning of biodiversity conservation and monitoring in Montenegro and which will be regular updated with newly collected data.

In addition, it is important to mention the recently started IPA project "Support to Implementation and Monitoring of Water Management, Montenegro" which will support transposition and implementation of MSFD in Montenegro. The project will be completed by November 2022 and will support additional data collection, with consideration on the data gaps identified by now and building on the data collected in the framework of the GEF Adriatic project.

3.3. Emerging issues such as climatic change effects and open sea including deep-sea ecosystem concerns

Concerning climate change effects on marine biodiversity, there were efforts made on preliminary assessment of vulnerability and impacts of climate change on marine and coastal biodiversity at country level (Bušković V., 2008) that were consequently included in the sub-regional report for Adriatic region (UNEP-MAP RAC/SPA 2009). In general obligations of the country regarding UNFCCC are fulfilled to certain extent (Initial / 1st and 2nd National Communications on Climate Change, 1st and 2nd Bienal Update Report). Also, national priorities (9) for applying to Green Climate Fund have been identified, but none of them[3] included or considered climate change effects on marine biodiversity / ecosystem. Effects of plastic pollution in the open sea in the country have been considered in the frame of GEF Adriatic Project, through the preparation of the national integrated monitoring program involving E010 Marine Litter. The project will also produce an initial assessment of GES under this Ecological Objective. The same project supported the preparation of a study on marine litter as one of the inputs to the draft Maritime Spatial Plan. Quiet recently is published a policy brief document entitled *"Priority areas of intervention to curb marine litter from food and beverage plastic packaging in Albania, Bosnia and Herzegovina and Montenegro"*, that included data on waste characteristics and their pathways in Montenegro. There are also articles published oh the analyses of collected waste (Mačić V. et al 2017, Peraš et al, 2017, (Gvozdenović et al 2019,). Plastic packaging, particularly from the food and beverage (FB) sector, represents the largest fraction of marine litter to be found on the beaches, the seafloor and in the water column in the Sea and along the Sea Coast. The majority of these plastics come from land based mismanaged waste, mainly from households and food services, often related to tourism and recreational activities.

Researches on the biodiversity in the deep se haven't been provided so far so these researches shall take place in future plans regarding scientific research, investigations / surveys on habitats and species important for conservation (Natura etc.) as well as potential Marine Protected Areas.

3 Identified (9) national priorities are as follows:
Nature based solutions with particular emphasis on DRR preparedness and prevention in Montenegro
Designing a study Assessing the vulnerability of the health sector to climate change
Development of the National Action Plan for Heat Waves
Educating health professionals about the link between different diseases and climate change
Ecologically accepted management of „remained" chemicals
Energy powerty reduction - Implementation of energy efficiency measures in buildings
Implementation of agri-environmental measures for sustainable land use, forest management, mitigation and LDN targets
Support for a paradigm shift towards low-carbon transport in Montenegro
Preventive protection and rehabilitation of forest ecosystems in national parks of Montenegro

4.

Current response measures

© SPA/RAC, University of Sevilla

4.1. Marine protected areas and other area-based conservation measures

Applying area based direct conservation measures is provided by establishing first 3 Marine Protected Areas (MPAs): Platamuni, Katič and Stari Ulcinj. This process has been supported by GEF project „Promoting Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro" that provided recent field data for preparing Nature Protection Studies for these 3 MPAs. Objective of the project is to support the country in establishing aforementioned MPAs. Process succsefuly completed and 3 MPAs Platamuni, Katič and Stari Ulcinj covering 4761,22 hectares in total have been proclaimed as MPAs during 2021. According to the Law on Nature Protection (2016) Manager of the MPAs is Public Enterprise for Coastal Zone Management. Thanks to GEF Project processes of developing Management Plans for 3 MPAs and a joint Bussiness Plan of the MPA Manager have been initiated and by the end of 2022 preparation of all these plans shall be completed.

On the other side, The Municipality of Kotor submitted to the Agency for Nature and Environmental Protection an initiative for applying the procedure of preventive protection of Coralligenous communities in Sopot – Risan bay and below Šalovina near Dražin vrt in Kotor Bay. Currently, Act on preventive protection of these sites is in the process of mutual harmonization

4.2. Legal and institutional frameworks governing the conservation and sustainable use of marine and coastal biodiversity

Institutional framework related to marine and coastal biodiversity

There are several authorities and institutions at **central government** level that are relevant for marine and coastal biodiversity.

Ministry of Ecology, Physical Planning and Urbanism - Administrative and governance responsibilities in the following areas: environmental protection including biodiversity and nature protection, spatial planning, construction, tourism, sustainable development and integrated coastal zone management. Ministry is responsible for integrated coastal zone management, which mainly focus on implementation of the Barcelona Convention and its Protocols, including the Protocol concerning Specially Protected Areas and Biological Diversity and the Integrated Coastal Zone Management Protocol, as well as the implementation of National Strategy on ICZM adopted in 2015.

Ministry of Agriculture and Rural Development is responsible for setting policies, developing regulations, maintenance of compliance with EU policies and legislation on forest management and protection, fishery, hunting, agrobiodiversity, Cartagena protocol, bio-safety, GMOs, pesticides regulations and water management and protection regulations. The Ministry performs administrative supervision over the work of several public institutions, including: Water Directorate, Forest Administration, Veterinary Administration, etc.

Ministry of Transport and Maritime Affairs Administration for Inspection Supervision is responsible for maritime traffic, security protection of merchant ships and ports open to international traffic, prevention and taking emergency measures in case of sea pollution from vessels, transport of dangerous goods via sea in accordance with the specific law, maritime economy, safety of maritime navigation, monitoring, and study of economic conditions and economic position of entities in these areas. The Ministry performs administrative supervision over the work of Port Authority and Maritime Safety Department of Montenegro. Port Authority is in charge for maintenance, managing, protection and promotion of ports, port development plans, providing for conditions set by international and national regulations by which prevention of pollution from ships is regulated and similar.

Nature and Environmental Protection Agency (NEPA) has numerous competences related to nature protection, such as monitoring of the state of habitats and species, development of Nature Protection Studies in the process of establishment of PAs, preparation and realization of monitoring programs, preparation and maintenance of the database on the environment (including biodiversity); review and issuance of consents for strategic environmental assessment (SEA) and the EIA (Environmental Impact Assessment) studies; approvals for the collection, use, breeding, keeping and trafficking of wild animal species; approvals for the picking, collection, use, cultivation, keeping and movement of protected wild herbs and fungi; approvals for scientific and educational research on protected natural resources as well as for speleological activities; defining measures of protection of strictly protected and protected species of plants, animals and fungi, and measures to protect their habitats; issuance of consents for nature appropriate assessment, assessment of imperative reasons of overriding public interest, and compensatory measures; education activities; and providing free access to information regarding nature protection. Internal organizational units of the NEPA include: Sector for nature protection, monitoring, analysis and reporting; Sector for the issuance of permits; Sector for communication and information system management; and Department or ionizing radiation.

Public Enterprise for Coastal Zone Public Management of Montenegro (PECZMA) - has a key role in managing the maritime public domain for general and special public purposes according to the provisions of the National Law on Maritime Domain. The most important activities of the PECZMA are: management of PAs covering the public maritime domain, renting-leasing of beaches and locations for temporary tourist and service facilities during the summer season, construction and maintenance of coastal infrastructures such as walls, harbours, docks and other public areas, management of local ports, monitoring bathing water quality at beaches, international cooperation and participation in international projects, promotion of environmental protection, participation and cooperation with local municipalities and national agencies in management of PA and other environmental issues. PECZMA includes the following sectors: Service for general and legal affairs, Economic and financial service, Department of planning and building (permits and licenses) in the Public Maritime Domain, Department of Sustainable Development, Department for inspection (monitoring small harbours and marine environment) and Department for building and maintenance in the coastal zone. PECZMA does not have inspection/ enforcement functions (but is relying on the relevant national inspectorates). General supervisory and inspection tasks related to environmental protection are shared between national and local institutions.

Institute for Marine Biology - is a unit of the University of Montenegro responsible for the scientific and technical research in the field of marine biology and fisheries. Experts from the Institute participated in numerous projects and researches related to various aspects of marine biological diversity.

Also, **local governments** have an important role in the management of PAs (and thus C/MPAs). Jurisdiction of local governments regarding integrated coastal zone management is achieved through the work of the various municipal bodies, including secretariats for development (and in some municipalities, development agencies), secretariats for planning, urbanism and construction, secretariats for public utilities (water supply, waste, sewage, etc.), and many other. Jurisdictions of the local governments in the field of spatial planning have been recently reduced by changes in the Law on physical planning and construction. Six municipalities in the coastal area (Ulcinj, Bar, Budva, Tivat, Kotor and Herceg Novi) have a sector for environment or staff (one or more persons) responsible for environmental issues. At the local level there is also communal inspection. For the three priority C/MPAs as identified in the previous section, the following local governments – municipalities include Ulcinj, Bar, Budva and Kotor.

Local governments are also in charge for: Implementation of Biodiversity Strategy through development of Local Action Plans for Biodiversity; Spatial and urban development planning; Development of pertinent Location studies; Financial and budgetary provisions; Proclamation of PAs of Category III and appointment of Managers of PAs; Providing for management of PAs declared at local level including nature parks and monuments of nature.

Along with authorities and institutions at both, central and local government levels, following two Non-governmental organizations are active in the field of marine biodiversity:

Mediterranean Centre for Environmental Monitoring (MedCem) founded in 2005 in Sutomore. This NGO is Med PAN partner since 2010 who participates or supports various project related to Adriatic Sea, including awareness rising in local communities by printed materials, films and educational training.

Green Home from Podgorica currently implementing CEPF funded project "Support local community's involvement in protection and promotion of the potential Marine Protected Area – Katič", but previously (2015-2017) implemented project Cross Border Marine Natura 200 Mapping, Monitoring and Management (4M)

The 2016 Nature Protection Law delegates competences for proclamation and management of certain categories (lower categories of protection than national parks and nature reserves) of nature PAs to local government level. Local administrations are thus responsible for proclamation and management of regional/nature parks, natural monuments, and landscapes with outstanding characteristics. Similar provisions were already in place under previous legislation, although the actual performance of municipalities in relation to these competences remained limited because of the lack of financial resources, technical and human capacities. Competences on establishing - Proclamation and Management of Marine Protected Areas in the zone of Maritime Public Domain (Morsko dobro) are given to (central) Government (article 34) while for the Management of these Marine Protected Areas is appointed Public Enterprise for Coastal Zone Public Management of Montenegro (article 55 para 5).

List the relevant International Agreements to which Montenegro is a Contracting Party is given below

International Agreements	Date of succession, ratification or accession	Competent authority for implementation
UN Convention on Biological Diversity (CBD)	3 June 2006	MSDT[1]
UN CBD Cartagena Protocol on Biosafety	23 October 2006	MSDT
Convention on conservation of wetlands of international importance especially as waterfowl habitat (Ramsar Convention)	3. June 2006	MSDT
UN Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES– Washington Convention)	26 March 2007	MSDT
UNESCO Convention on Protection of the World Natural and Cultural Heritage (World Heritage Convention)	3 June 2006	National Commission for UNESCO
Revised Convention on the protection of the Mediterranean Sea against pollution (Barcelona Convention)	Ratified in 2007 as well as the four accompanying Protocols.	MSDT
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)	1 March 2009	MSDT
Convention on Migratory Species (UNEP/CMS) (Bonn Convention)	1 March 2009	MSDT
Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)	1 March 2009	MSDT
FAO: General Fisheries Commission for the Mediterranean - GFCM	31 January 2008	MARD
European Landscape Convention (CoE, Florence 2000)	November 2008	MSDT

New national (action) plans concerning conservation Coastal and Marine species haven't been provided upon preparing first one for Dalmatian pelican in the frame of First SAP BIO National Report (Bušković V. et al 2004)

4.3. Transboundary issues and existing, planned or needed coordination / harmonisation at sub regional or regional level

In compliance with national circumstances following 3 transboundary issues are identified as relevant:

- Networking of new Marine Protected Areas in the MEDPAN, upon providing their proclamation
- Cooperation with neighboring countries in the regional initiatives in Adriatic and Mediterranean that are dedicated to monitoring, conservation and sustainable use of Coastal and Marine biodiversity by applying ecosystem services, including (joint) regional GEF, INTERREG, IPA and other projects that could assist in applying relevant international standards etc.

In order to rise up importance of the South Adriatic, as a significant part of Adriatic and Mediterranean, specific subregional but also national actions are already recognized in the NETCET strategies for cetaceans and sea turtles. Out of the continuity of distribution / abundance surveys and monitoring of migratory species that are obvious subregional priority, following national actions shall be particularly streamlined to the subregion level: harmonisation of the legislature, cooperation between inspections, designation of the areas for conservation of both, cetaceans and sea turtles, as well as establishing (Adriatic) Emergency Task Force and building up capacities in national institutions relevant for conservation of marine and coastal biodiversity.

1 Ministry of Sustainable Development and Tourism

5.

Assessment of marine and coastal status and pressures and impacts on the marine and coastal biodiversity

© University of Alicante

From the variety of approaches for better assessing pressures and impacts on the Marine And Coastal Biodiversity, Vulnerability Assessment already applied in CAMP (UNEP – MAP - PAP/RAC, 2010 - 2014) is selected to elaborate ***serious concerns*** and ***hot spot areas*** where urgent action is needed.

Since status of Marine Biodiversity presented in previous chapters key facts regarding Status of Coastal Biodiversity (with mediterranean character) are presented in following chapter 5.1., including aspects that are not only biodiversity related such as pollution, tourism development and enlargement of constructed areas (littoralization phenomena).

Having in mind mandate of this National Report results from CAMP Vulnerability Assessment related to pressures and impacts are selectively used and presented at the end part of chapter 5.1., in compliance with guiding notes given in the annotated structure of the National Report. Section of the Vulnerability Assessment related to Marine Component is as already given in chapter 3.2., pgs 38-39 and consequently not repeated in this chapter.

In this way analytic consistency (in elaborating important aspects for protection of marine and coastal biodiversity) is provided.

5.1. Marine and coastal status and pressures relevant for national marine and coastal areas

Marine and Coastal (biodiversity) status – Since status of Marine Biodiversity presented in previous chapters, key facts regarding Status of Coastal Biodiversity (with mediterranean character) are presented in this (sub)chapter, including those not only biodiversity related such as pollution, tourism development and enlargement of constructed areas (littoralization phenomena)

DIVERSITY of Coastal species and habitats in the Coastal Area of Montenegro with biologically typical mediterranean character (from the sea coast up to 400 m a s l) is presented in the tables below (source: Caković D., Milošević D., 2013).

SPECIES

Plants

Taxonomic group	Number of species in the Coastal Area	Protected species (national legislation)	IUCN Red list species	European Red List species
Vascular plants	1540	87	7	155
Mosses	283	5	38	-
Lichens	113	-	-	-
Fungi - Mushrooms	920	28	-	27

Animals

Taxonomic group	Number of species in the Coastal Area	Protected species (national legislation)	IUCN Red list species	Barcelona convention – Annex II
Invertebrates	289	10	12	-
Ichthyofauna	NA	2	21	-
Herpetofauna	41	32	32	2
Ornithofauna	249	207	-	12
Mammals	69	24	6	-

HABITATS

Natura 2000 code	Habitat type
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1150	Coastal lagoons
1210	Annual vegetation of drift lines
1240	Vegetated sea cliffs of the Mediterranean coasts with endemic ***Limonium spp***.
1310	Salicornia and other annuals colonising mud and sand
1410	Mediterranean salt meadows (***Juncetalia maritimi***)
1420	Mediterranean and thermo-Atlantic halophilous scrubs (***Sarcocornetea fruticosi***)
2110	Embryonic shifting dune
2120	Shifting dunes along the shoreline with ***Ammophila arenaria*** (white dunes)
2190	Humide dune slack
2220	Dunes with ***Euphorbia terracina***
2230	***Malcolmietalia*** dune grasslands
2240	***Brachypodietalia*** dune grasslands with annuals
2270*	Wooded dunes with ***Pinus pinea*** and/or ***Pinus pinaster***
3170*	Mediterranean temporary ponds
3280	Constantly flowing Mediterranean rivers with ***Paspalo-Agrostidion*** species and hanging curtains of ***Salix*** and ***Populus alba***
5210	Arborescent matorral with ***Juniperus spp***.
5230*	Arborescent matorral with ***Laurus nobilis***
5310	***Laurus nobilis*** thickets
5330	Thermo-Mediterranean and pre-desert scrub
6110*	Rupicolous calcareous or basophilic grasslands of the ***Alysso-Sedion albi***
6220*	Pseudo-steppe with grasses and annuals of the ***Thero-Brachypodietea***
62A0	East sub-Mediterranean dry grasslands (***Scorzoneretalia villosae***)
6420	Mediterranean tall humid herb grasslands of the ***Molinio-Holoschoenion***
6540	Sub-Mediterranean grasslands of the ***Molinio-Hordeion secalini***
8210	Calcareous rocky slopes with chasmophytic vegetation
91M0	Pannonian-Balkanic turkey oak – sessile oak forests
9250	***Quercus trojana*** woods
9260	***Castanea sativa*** woods
9290	***Cupressus*** forests (***Acero-Cupression***)
92A0	***Salix alba*** and ***Populus alba*** galleries
92D0	Southern riparian galleries and thickets (***Nerio-Tamaricetea*** & ***Securinegion tinctoriae***)
9340	***Quercus ilex*** and ***Quercus rotundifolia*** forests
9540	Mediterranean pine forests with endemic Mesogean pines

PRESSURES AND IMPACTS

The initial assessment of pressures (at national level) show that geographically most extensive pressures in Montenegro are coming from tourism sector, in particular microbial pathogens (UNEP 2020[1]). Urbanization and industry also contribute with pressures to certain extent, while the other sectors are still with estimated low pressure extent. A relative spatial / geographical extent of the pressures on Marine and Coastal environment is assessed by IMAP's pressure based Ecological Objectives and presented in following table (UNEP 2020, based on CAMP Montenegro, Vulnerability Assessment of the Narrow Coastal Zone, 2013)

Sector – source of pressures	Pressures (IMAP's pressure based Ecological Objectives)	Geographical extent of pressures*	Total per sector
Urbanization and	Physical loss – Seabed integrity (EO6)	Low	Low-Medium
industry**	Litter (EO10)	Medium	
	Nutrient and organic matter enrichment (EO5)	Medium	
	Contamination by hazardous substances (EO9)	Low	
	Microbial pathogens (EO9)	Medium	
Maritime transport	Litter (EO10)	Low	
	Noise (EO11)	Medium	
	Non-indigenous species (EO2)	Not known	
	Physical loss (EO6)	Low	q
	Contamination by hazardous substances (EO9)	Low	
Energy sector**	Noise (EO11)	Low	
	Physical loss (EO6)	Low	
	Indirectly – focus on fossil fuels – promotor of	Low	
	climate change		
	Contamination by hazardous substances (EO9)	Low	
	Noise (EO11)	Low	
Agriculture	Contamination by hazardous substances (EO9)	Low	Low
	Microbial pathogens (EO9)	Low	
	Nutrient and organic matter enrichment (EO5)	Low	
Fishery (incl. aquaculture)	Removal of target and non-target species (lethal) EO3)	Low	
	Physical damage (abrasion) (EO6)	Low	
	Litter (EO10)	Low	
	Non-indigenous species (EO2)	Low	
	Contamination by hazardous substances (EO9)	Low	

1 UNEP 2020: Towards GES assessment for Montenegro - Biodiversity and Non-indigenous species. Draft prepared by Ana Štrbenac, July 2020, in the frame of UNEP/GEF project "Implementation of Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning" (document is not available at internet, but approved by the Ministry to be used for preparing this National Report)

	Nutrient and organic matter enrichment (EO5)	Low	
	Microbial pathogens (EO9)	Low	
Tourism	Physical loss – Seabed integrity (EO6)	Low	Medium
	Litter (EO10)	Medium	
	Nutrient and organic matter enrichment (EO5)	Medium	
	Noise (EO11)	Low	
	Microbial pathogens (EO9)	High	
	Contamination by hazardous substances (EO9)	Low	

CAMP Vulnerability Assessment of indicated a high vulnerability of marine ecosystem in Boka Kotor Bay, but also at certain locations in Outer Sea (Budva, Petrovac, Sutomore, Bar and Ulcinj). This is particularly related to urbanization and tourism that is in compliance with the assessment of geographical extent of pressures in the table above.

CAMP assessments / analyses have been also used for preparing National Strategy for Integrated Coastal Zone Management for Montenegro (NSICZM 2016) that additionally provided comprehensive assessment of the pressures and impacts in the Coastal Area including Marine environment, as presented in following adapted table

ELEMENTS OF NATURAL AND MANMADE ENVIRONMENT	CAUSES/ DRIVING FORCES	PRESSURES	STATE	IMPACTS
Biodiversity	• high demand and profitability in real estate business • inefficient control of building processes and investors` preferences • lack of expert base-lines on the distribution and state of habitats and species • limited capacities (especially managerial ones) in nature conservation system • inefficient control and supervision of activities endangering values of ecosystems and protected natural resources in the coastal zone • lack of awareness about significance of natural values and importance of their preservation • abandoning of agriculture and homogenisation of landscapes	• **urbanisation processes** • **land use conversion** • **development of tourism**, dining and recreational facilities in valuable areas • **pollution caused by wastewat**er • unsustainable tourism activities and increased level of visits • excessive and illegal hunting (of birds) and fishing • disturbance of wildlife	• Out of the total sur-face of the coastal zone, terrestrial protected natural areas account for only 8.6%, and marine protected areas for 0% (estimated surface of potentially valuable terrestrial natural areas to be protected amounts to 18.8% in relation to the total surface of the coastal zone, and there are approximately 9,000 ha to be designated as marine protected areas) • excessive land and **marine pollution** at certain locations • **fragmentation** and conversion of land and marine habitats • lost properties of protected areas and areas planned to be protected (e.g. Slovenska and Bečićka beaches, Spas hill, dunes on Velika beach) • reduced hunting game population • reduced fish population	• biodiversity **loss** • loss of valuable, rare and endemic habitats and species inland and in the sea • increased number of endangered species • reduced functionality and stability of eco-systems, particularly of aquatic ecosystems • loss of agro-biodiversity (local varieties and breeds)

ELEMENTS OF NATURAL AND MANMADE ENVIRONMENT	CAUSES/ DRIVING FORCES	PRESSURES	STATE	IMPACTS
Cultural assets	• unfinished systematic mapping and insufficient availability of expert baselines on the state of and conditions for conservation of cultural assets • inefficient system for cultural assets management and conservation, insufficient capacities	• urbanisation processes • illegal acquirement of cultural assets	• degradation of cultural assets, particularly of the submarine ones	• endangering authenticity, integrity and degree of preservation of cultural assets • loss of core functions of cultural assets
Landscape values	• unsustainable spatial and tourism development • depopulation of rural areas • lack of instruments (legal ones, integration etc.) and capacities for landscape conservation • lack of awareness about importance of landscape values and the need to preserve them	• expansion of construction activities, urban sprawl • construction of infra-structural corridors • neglecting (traditional	• high share of dispersed urban areas • overgrowing of cultural landscapes with vegetation	• loss of environmental and cultural values of landscapes • loss of recognisability of landscapes, homogenisation of natural, cultural and agricultural landscapes • visual quality of landscapes impaired
Sea	• **urbanisation** which is not aligned with sensitivity of surface water and ground-water and is not ac-companied by proper utility infrastructure • outdated technologies in shipbuilding and industry • pronounced seasonality of tourism • inadequate pollution control and prevention system, lack of capacities • incomplete emergency interventions system	• **landbased sources of pollution – wastewater**, waste, phytopharmaceutical products • **pollution from marine activities** (from ports and vessels) • shipbuilding/ overhaul, industrial activities • overburdened communal infrastructure during summer months • inadequate siting of aquaculture (Boka Kotorska Bay) • marine accidents • high water consumption	• excessive pollution at some locations (**Boka Kotorska Bay**, **Ulcinj; and Budva and Bar to a lesser extent**); • eutrophication of the sea	• **endangering the state of marine ecosystem** • reducing sanitary quality of bathing water • endangering state of the environment and change of hydrological properties of river water flows • reducing sanitary quality of potable water • loss of peloids and quality of thermal mineral water • change of chemical and physical properties of groundwater
Water			• occasional deviation in the quality of water of Bojana and Sutorina rivers compared to statutory norms • impaired quality of certain water sources, deposits of peloids and sources of thermal mineral water • reducing quantity and salinization of groundwater	

ELEMENTS OF NATURAL AND MANMADE ENVIRONMENT	CAUSES/ DRIVING FORCES	PRESSURES	STATE	IMPACTS
Soil	• insufficient investment and institutional technical support to agriculture • unfavourable age and qualification structures of rural population • lack of efficient sup-port to sustainable agricultural practices • inefficient system for control, prevention and mitigation of pollution	• urbanisation and development of infra-structure • land use which is not aligned with land vulnerability and land quality • erosion caused by torrential flows • illegal waste disposal	• save agricultural land • conversion of agricultural land • soil pollution at certain locations • inconsistent data on soil quality and agricultural areas	• loss of valuable agricultural land and ecosystems connected with agricultural and forest land • deteriorated properties of agricultural land • impairment of sanitary quality of groundwater
Natural hazards	• **climate variability / change** • insufficient regulations • lack of technical capacities • insufficient application of building standards • construction land in the zones with high seismic risk • insufficient inter-ministerial cooperation in harmonisation of environmental goals with other sectoral goals	• sea level rise • storms, heavy rains, drought, fires • seismic hazard	• floods, particularly in the Bojana river area • beach areas reduced due to erosion • lack of maintenance of torrential flows	• endangering human life and health • endangering material resources • high rehabilitation costs • **loss of resource** basis for tourism
Space – land use	• lack of economic activity and unemployment • lack of preparedness and incentives for economic diversification • attractiveness of the coastal zone for secondary housing or what is referred to as 'residential tourism' • profitability of real estate business • lack of fiscal policy instruments to discourage over-planning • inefficient instruments for adequate arrangement of construction land • lack of implementation of planning documents, and particularly of the declared planning goals • lack of quality sectoral input data for spatial plans • unsatisfactory level of coordination within state administration • inefficient and non-transparent operation of public administration	• demand growth, high prices and profit-ability of real estate businesses • pressures to constantly expand construction areas • planning and siting of inacceptable structures in highly vulnerable areas • inefficient control and inefficient sanctioning of illegal and unplanned construction	• oversized construction areas (CA) • planned CA cover 46.3% of the surface of the 1 km coastal strip • share of CA in the total surface of the coastal zone amounts to 15.5%; only 18.5% of all CA are developed • 31.9% of the coastline are built-up areas • 80% of all the undeveloped construction areas is on the locations of high and very high vulnerability • area with illegally built structures is estimated at around 560 ha • considerable areas are devastated by illegal and unplanned construction of low quality • disproportionate settlements, poor architecture	• impairment and degradation of original landscape and natural values • linear coastal urbanisation • increased costs of provision of communal infrastructure due to dispersed construction • increased pollution due to the lack of communal infrastructure • on average, low quality of built environment • loss of tourism potential and of attractiveness for development of quality tourism

(Marine) Pollution

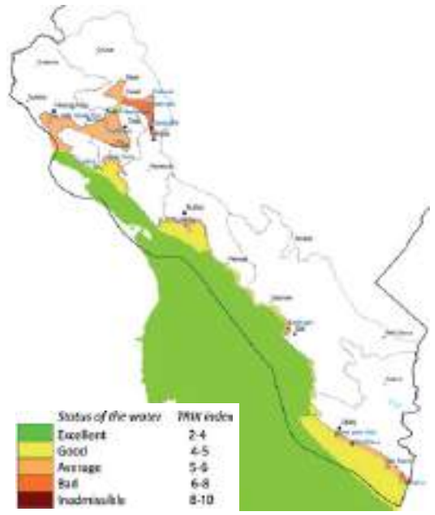
Marine pollution was analysed in CAMP on the base of bathing water quality, eco toxicology of the Sea, marine pollution at hot spot locations and wastewater pollution with, all in compliance with predetermined criteria for assessing magnitude of the impacts (pollution) which can be very low (1 - green), low (2 - yellow), medium (3 – light red), high (4 – red-light brown) and in-admissible (5 dark-brown).

In general, quality of the coastal water is in A1 or A2 classes (by national classification) over the year with an exception is period July – October when the coastal sea quality is in A2 – A3 classes or falls outside of these classes. Available data indicate that problem of communal wastewater discharges needs to be resolved urgently providing treatment of these waters prior their discharging in the Sea (sea outflows) or any other coastal natural recipient at the coast. Most significant problem in maintaining marine water quality is marine eutrophication with high content of nutrients (NO2, NO3, NH4, PO4) that fluctuates over the seasons in the year.

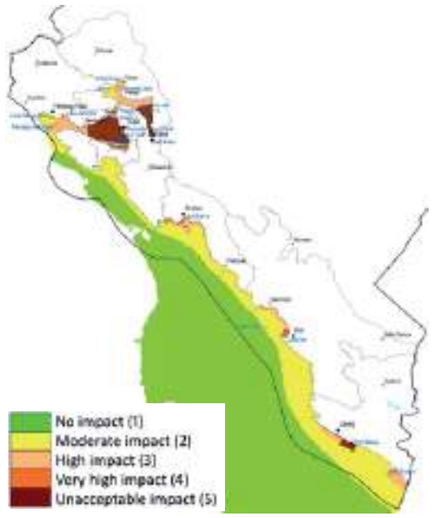
Level, i.e. extent of pollution threatening the Sea at hot spot locations from eco toxicological aspect, has been determined on the base of data from National Monitoring programme for marine ecosystem (MEDPOL program) which is continuously conducted since 2008 providing analysis of biological and chemical pollution indicators. Measured indicators are in compliance with EU Bathing Water Directive 2006/7/EC[2] while obtained results published in annual State on Environment Reports available at the website of Nature and Environment Protection Agency (NEPA).

Pollution extent at hot spot locations in the Sea is presented on the maps bellow, and corresponds to the findings – results in the Cumulative Vulnerability Assessment for marine ecosystem presented previously in the chapter 3.2. Vulnerable Marine ecosystem (pg. 38). From various aspects related to pollution Boka Kotor Bay is identified as most threatened zone / location of the marine ecosystem

Eutrophication by TRIX index



Impact of the pollution HOT SPOTS



2 Directive concerning the management of bathing water quality and repealing Directive 76/160/EEC

Cumulative / total pollution impact

Cumulative vulnerability to the pollution impacts

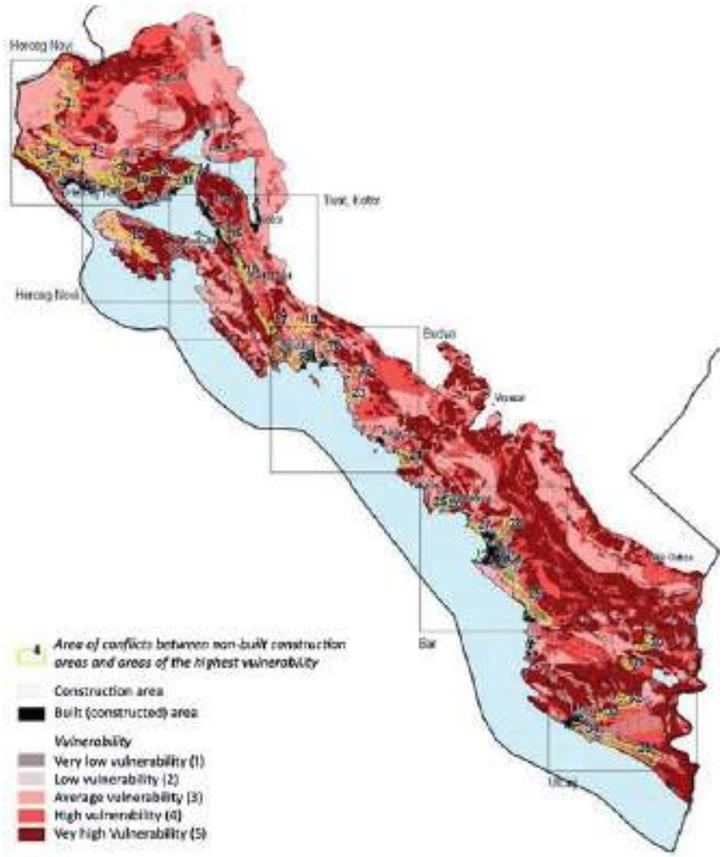
Construction areas and Tourism development

The results of CAMP's analyses showed that construction areas in the Coastal Area are noticeably oversized in relation to population and tourist capacities.

In addition to the pléonasme of construction areas, in the Coastal area there is a phenomenon of low construction, i.e. utilization of these areas (at the level of 18.5%) which is significantly lower than in coastal regions of neighboring Croatia.

Out of oversized, construction of (new) tourist facilities is often in conflict with the environment (see map of CAMP map of identified conflicts, below), particularly in terms of wastewater collection, treatment and discharge. As previously emphasised, marine water quality, especially in the Boka Kotor bay is critically impacted and has no capacity to receive new wastewater. Construction of Waste Water Treatment Plants (WWTP) is stipulated in numerous official documents. Certain improvement has been done recently with construction WWTPs for municipalities Kotor, Tivat and Budva. The results of physical and chemical analysis of wastewater at the main sewage outlets of (new) WWTP for Budva as well as WWTP for Tivat – Kotor indicated that measured wastewater quality parameters are in compliance with relevant national regulation (NEPA, State on Environment Report for 2018, short version, pg. 17)

Area of conflicts (yellow polygons) between non-built construction areas and areas of the highest vulnerability – depiction of land uses



In connection with the mentioned problems, there is an additional problem of the spatial position of construction areas, which in the practice of planning and construction have been forced at the very coast coastline (i.e. "at the foam of the sea"). Therefore, on the coastline is present phenomenon of littoralization - linear urbanization - expansion and interconnection of built-up parts of the coastline has significantly advanced.

Littoralization at the coastline in Herceg Novi

From a wide documentation base of CAMP, including Vulnerability Assessment in particular, relevant serious concerns related to the Status of Marine and Coastal Biodiversity are selected / identified

- Boka Kotor bay as a multiple hot spot area is significantly impacted and require appropriate respond in eliminating pollution impacts on marine ecosystem
- Decrease or mittigate oversized construction areas, including their spatial positioning at the coastline (littoralization phenomena)
- Eliminate conflicts of new construction areas with environment, particularly valuable ecological zones and habitats important for conservation
- Eliminate barriers (such as fishery) and continue with efforts in establishing new Marine Protected Areas in order to provide ins situ conservation of marine species and habitats important for conservation
- Revision of the status of existing Coastal Protected Areas remained less important for a moment and shall be further field of work upon completing process of establishing new Marine Protected Areas

5.2. Critical impacts and effects on marine and coastal biodiversity

Out of the issues of serious concern mentioned above, there are no particular **critical** impacts/ areas identified in official documents while numerous effects on Marine and Coastal Biodiversity identified in both, official documents and professional literature and these effects are previously presented in the context of PRESSURES AND IMPACTS in previous chapters

6.

Assessment of national priority needs and response actions

© SPA/RAC, Simone Modugno

6.1. Needs

Identification of national priority needs included primarily relevant national strategies (NSICZM) and other associated documents (CAMP), but also regional documents (NETCET strategies) and available literature related to marine and coastal biodiversity.

Response policies

At policy level National Strategy for Integrated Coastal Zone Management (NSICZM 2016) has determined key response measures – response actions and needs for entire Coastal Zone / Coastal Area. Response actions and needs related to Coastal and Marine Biodiversity are given in the Action plan of the NSICZM, outlined in the frame of Strategic goal 1.1. Protect Nature, Landscape and Cultural assets efficiently (pgs 129-132) and Strategic goal 1.2. Manage Protected Natural assets, ecologically valuable habitats and ecosystems of the Coastal Zone sustainably (pgs 133-134), but also in other Strategic goals dealing with: GES (2.1.), waste disposal (2.2.), Green infrastructure (2.3.) Risk management for hazards (2.4.), Sustainable planning system (3.1.), Precondition for planning system (3.2.), Sustainable management of the resources in the Coastal zone (4.1.), "Green-ing" of the development in the Coastal zone (4.2.), Establish Monitoring of the Coastal processes (5.3.). Having in mind relevance of Strategic goals 1.1. and 1.2. for Coastal and Marine Biodiversity outlines of their measures / sub-measures and targeted outcomes by 2030 are presented in Annex III of the National Report.

As a support to implementation of NSICZM, but also as an (technical) input for policy documents, preparation of National Planning Framework for the Sub-system of Coastal and Marine Protected areas is ongoing in the frame of GEF project "Promoting Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro". This document could be further used for preparing other, official planning documents, including sector policies and strategies relevant for both Marine and Coastal Ecosystems and Biodiversity.

There are no other policy documents or technical inputs for policy documents that shall be prepared soon.

Concerning further support response policy document(s) following response actions shall be provided

- Revision of the List of protected wild species of plants, animals and fungi
- Mainstreaming and integration of conservation / nature protection measures for species important for conservation, including: (i) regulation - prohibition of anchoring harmful to Posidonia meadows, (ii) setting up conditions for issuing fishing permits and determining fishing tools in Marine Protected Areas etc.- Strengthening of the direct control (inspectorates, police, maritime safety authorities etc.) at the Sea, particularly illegal activities related to MPAs, as a prerequisite for efficient management of these areas
- Strengthening and supporting of the manager of MPAs to be prepared for efficient management of these areas
- Development of a new Biodiversity Strategy Action Plan for the period after 2020 in order to harmonize national goals with the CBD Post 2020 framework and the new EU Biodiversity strategy 2030

- National Classification of marine habitats is missing and its preparation shall be provided including testing at the field as a precondition for more effective professional work in the inventory and building up functional Database for surveyed Marine habitats

Measures

Currently, most of the efforts regarding Coastal and Marine Biodiversity are given to the process of establishing 3 new MPAs that shall consequently continue in (already planned) revision of existing Coastal Protected Areas.

These and other supporting activities (preparation of Management plans for 3 new MPAs, followed by their Bussiness plans etc. are planned to be implemented in the frame of GEF project „Promoting Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro".

For a successful establishing 3 new MPAs there is a need to rise up / improve technical and human resources of the MPA Manager (Public Enterprise for Coastal Zone Management) by providing necessary equipment and basic infrastructure in the MPAs.

Since establishment of MPAs in Montenegro completed as a first step, more future efforts should be put in constant capacity building of the manager of MPAs as well as other institutions that have enforcement responsibilities and local communities active in the MPAs.

As complementary to other efforts dedicated to better protection of MPAs, Coastal PAs and Marine and Coastal biodiversity, in general, following responsive measures are of particular importance:

- Further identification of Marine Protected Areas, including inventory of habitats and species important for conservation for setting up sites of Marine component of the National Ecological Network
- Continuation with systematic Biological Monitoring including monitoring of seabirds, marine mammals and sea turtles, selected habitat types, but also NIS – invasive species
- Development of acoustic mapping to build a comprehensive picture of the spatial and temporal distribution of anthropogenic noise sources
- Establishment of National Stranding Network for marine mammals and sea turtles
- Setting up protective infrastructure such as anchoring buoys that contribute to the conservation of important habitats and species

Plans

Spatial planning system important for Coastal Ecosystems, including Biodiversity, was elaborated in the NSICZM 2016, Action plan, Strategic goal 3. 1. Sustainable planning system), while elaboration of Marine Spatial Planning (planning of the purpose of the Sea) resulting with the preparation of the draft Marine Spatial Plan for Montenegro will be provided in the frame of GEF Adriatic project

As functional documents, plans for tourism development in 3 new MPAs and their surroundings are planned to be prepared in the frame of GEF project „Promoting Protected Areas Management through Integrated Marine and Coastal Ecosystems Protection in Coastal Area of Montenegro". Integration of these plans in official planning documents (such as General Regulation (Spatial) Plan) needs to be provided

Projects

Since several project ideas recently outlined, it is necessary to find way / ways for their functional use, for direct applying to available funds or further developing for possible applying to certain Fund, or reshape them if necessary.

Research

There is an obvious need to continue with inventory and mapping of Marine habitats and species for the purpose of setting up National Ecological Network in the Sea on the base of data collected and processed in the inventory and mapping, including Deep Sea areas.

Monitoring

Improvement of the National Monitoring program is needed in order to achieve relevant international standards regarding (status of) Marine and Coastal Ecosystem / Biodiversity, including those related to MSFD, IMAP etc.. GEF Adriatic project supported the preparation of the national Integrated Monitoring Programme in both Montenegro and Albania, in line with IMAP/EcAp requirements which implementation should be ensured in the future, especially in terms of allocated budget. In addition, the ongoing IPA project has supported the implementation of MSFD in Montenegro since February 2020. This project will build on the results of the GEF Adriatic project and update the national integrated monitoring program aligning it with IPA requirements.

Training and capacity building

Concerning training related to MPAs, a list of trainings has been developed and Draft Program for priority trainings prepared by international expert. Out of training for preparation Management Plans for the MPAs, following specific trainings are identified as needed in near future:

- Capacity building of the manager of MPAs as well as other institutions that have enforcement responsibilities and local communities active in this MPAs.
- Strengthening the inspection control system through training of relevant inspectors and increasing the number of inspectors
- Strengthening the capacity of all competent authorities (Maritime Safety Administration, Police, Veterinary), but also awareness rising of responsible persons with executing powers that control or directly apply protection measures regarding protected species.

Transboundary actions

Similar to previous, activities in the GEF Adriatic project shall be undertaken in terms of the preparation of national integrated monitoring programs, assessments towards determination of GES, applying the ecosystem approach through marine spatial planning in Montenegro etc. which will contribute to further transboundary actions / activities with neighboring Albania. The following transboundary activities and measures can be further proposed:

- Regular monitoring of highly migratory species such as marine mammals and sea turtles should be agreed at subregional level of Adriatic and performed by all countries in synchronized approach. Official Agreement between countries is needed in relation to this issue.
- Protection measures for EBSA recognized areas and approach to implement it should be future discussed and agreed by relevant countries.

International cooperation and assistance

Out of regular participation in regional and global ecological initiatives, including various initiatives in the frame of Barcelona convention, it could be expected joining of the country to the MEDPAN Network, as a consequence of establishing 3 new MPAs.

Also, engaging of international sources of funding (GEF – Global Environmental facility, INTERREG, MED Fund) shall be provided for possible new projects regarding Coastal and Marine Biodiversity.

This aspect of international cooperation is very important in the circumstance of COVID 19 pandemia / outbreak causing significant drop of national economy and budgetary constraints taking place already.

6.2. Urgent actions proposed

The following urgent actions are identified and proposed for implementation in the coming period:

(Human activities control)

- Improvement of the control of human activities at the Sea in both Outer Sea and Boka Kotor Bay in order to prevent or eliminate illegal activities (dynamite fishing, poaching, spillouts / discharge of waste and ballast waters from the vessels

(Network of Marine Protected Areas)

- Establish 3 new MPAs, as planned that require removal of current barriers related to fishery in these MPAs
- Mainstreaming of enforcement responsibilities of different inspectorates and institutions, in regard to illegal activities in the MPAs as a tool for more efficient management of the areas

(Monitoring)

- Monitoring and Assessment of fish stocks are recently promoted as important for Marine Protected Areas and require a systematic approach in their future conducting, particularly their direct effects on permitting procedures for issuing fishery licenses / permits, in general, but also for possible fishery licenses / permits in Marine Protected Areas

- Monitoring of the sites (caves) that are suitable for Monk Seal in order to provide evidence of the presence of this species in the country

(Inventory of marine biodiversity)

- National Classification of marine habitats is missing and its preparation shall be provided including testing at the field as a precondition for more effective professional work in the inventory and building up functional Database for surveyed Marine habitats.
- Further identification of Marine Protected Areas, including inventory of habitats and species important for conservation for setting up sites of Marine component of the National Ecological Network

Urgent actions given above have to be mainstreamed to existing national response policies and other available mechanisms and adjusted to financial / budgetary constraints and restrictions caused by COVID 19 pandemia / outbreak.

7.

Funding problems and opportunities

© SPA/RAC, Simone Modugno

7.1. Regular national sources, potential co-financing for international funding

Since National economy threatened and shivering in current COVID 19 pandemia / outbreak national sources for funding are expected to be drastically restricted particularly budgetary lines for so called "environmental programmes". Restrictions are not expected for the salaries in state / public sector and pensions but all other way of Budget expenditures shall be cut off (excluded from the Budget) or drastically restricted.

That's the reason why funds from the National budget couldn't be considered at this very moment for direct interventions regarding Coastal and Marine Biodiversity at the field of possible co-financing with relevant international funding sources.

7.2. Other sources (private, public, partnership)

Practice in providing or engaging financial sources from private companies is not developed in the country, so far. There are only very few cases of establishing public private partnership in the field of environment. Well known case of such a public private partnership is adaptation and visitor management in the Cave named Lipska near Cetinje.

7.3. International funds, projects, programmes, national eligibility for international programmes/funds (e.g. green funds) identified.

Following international sources of funding are identified as possible addresses for new projects regarding Coastal and Marine Biodiversity:

- GEF – Global Environmental facility
- INTERREG
- Green Climate Fund
- MED Fund

8.

Conclusions and recommendations

© SPA/RAC, University of Sevilla

Identification of the conservation priorities at national level for the forthcoming POST 2020 period has been done on the base of available documentation, as well as in a relation to new challenges for conservation policies.

Because of restrictions caused by COVID 19 pandemia / outbreak, elaboration of the Post-2020 SAP BIO National Report has been conducted through a limited participatory approach and virtual – internet online meetings and national workshop have been applied instead of direct meeting of experts, institutions and authorities relevant for setting up national needs and priorities.

Consequently, priority needs and urgent response actions mostly remained as identified by engaged national consultant, as well as SAP BIO Correspondent and SPA Focal Point. Significant support in formulating actions related to transboundary issues has been provided by Adriatic subregional expert.

Out of needs and response actions given in Chapter 6, mainstreaming and integration into response policies and other available mechanisms have to be provided for actions / recommendations related to following **cross-cutting** issues:

- Provide more funds from State Budget but also from other sources, including fundraising, for Monitoring programmes producing data compatible with IMAP and MSFD in order to have better planning of measures. This shall be undertaken regarding marine ecosystem and biodiversity, in particular.
- Establish advanced GIS Data base integrating relevant data for Coastal and Marine biodiversity and improvement / standardization of data collection practices and procedures.

Having in mind further use of this National Report transboundary **cooperation** with neighboring countries in following aspects have to be recommended for solving problems in a horizon beyond 2030

- Monitoring of marine Mammals, primarily Cetaceans but also Sea Turtles that should provide continuation of existing activities based on aerial surveys and on/off-shore sightings (Cetaceans, Sea Turtles). Monitoring of Monk Seal should be provided by camera traps in the caves suitable for life cycle of this species.
- Networking of MPAs and other ecologically important areas in the regions (Adriatic, Mediterranean) as a possibility for providing joint synchronized actions, exchange of the knowledge and experience etc.
- Monitoring and undertaking joint actions regarding migratory species that ecologically connecting neighboring countries and entire regions

References List

Awbery et al (2019) The Identification of Critical Habitats for Cetaceans in the Southern Adriatic Sea, Poster presentation. DMAD – Marine Mammals Research Association

Burić, Z., Cetinić, I., Viličić, D., Mihalić, C.K., Carić, M. & Olujić, G. (2007). Spatial and temporal distribution in a highly stratified estuary (Zrmanja, Adriatic Sea). Marine Ecology, 28, 169-177.http://doi.org/10.1111/j.1439-0485.2007.00180.x.

Buskovic, V., Macic, V., Ivanovic, A., 2004: Status, problems and conservation of Coastal and Marine Biodiversity in Montenegro (State Union Serbia and Montenegro), National Report produced within the project Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region (SAP BIO). Mediterranean Action Plan – UNEP, Regional Activity Centre for Specially Protected Areas, Tunisia and Ministry of Environmental Protection and Physical Planning of Montenegro, Podgorica.

Buskovic, V. (2008): Vulnerability and impacts of Climate Change on Marine and Coastal Biodiversity in Montenegro, National Overview produced within the project Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region (SAP BIO). 38 pg. Findings from the document included in the subregional report for Adriatic region: UNEP-MAP RAC/SPA 2009. Sub-regional report on vulnerability and impacts of climate change on marine and coastal biological diversity in the Mediterranean Adriatic countries. By Pavasovic, A., Cebrian, D., Limam, A., Dedej, Z., Vucijak, B., Radovic, J., Guidetti P., Buskovic V., Dobrajc Z., Ed. RAC/SPA, Tunis; 48 pages.

Caković D., Milošević D., (2013): Studija biodiverziteta i zaštite prirode Obalnog područja Crne Gore. Program integralnog upravljanja obalnog područja crne gore (CAMP CG). 348 p

DFS (2012): Start Up of "Katič" MPA in Montenegro and Assessment of Marine and Coastal Ecosystems along the Coast, Task 2 Support the Start up of "Katič" Pilot MPA in front of Petrovac, Marine Habitats Monitoring Survey 18-23 October 2011 Technical Report, version Rev.1 - February 2012

Drakulović, D. & N. Vuksanović (2010): Phytoplankton assemblages and density in the Montenegrin coastal sea. 39th CIESM Congress, 10–14 May, Venice, Italy. Conference proceedings: 351.

Drakulović, D., Pestorić, B., Cvijan, M., Krivokapić, S. & Vuksanović, N., (2012): Distribution of phytoplankton community in Kotor Bay (south-eastern Adriatic Sea). Central European Journal of Biology. 7(3): 470-486.

Drakulović, D., Gvozdenović, S., Joksimović, D., Mandić, M., Pestorić, B. (2017): Toxic and Potentially Toxic Phytoplankton in the Mussel and Fish Farms in the Transitional Area of Montenegrin Coast (South-Eastern Adriatic Sea). Turkish Journal of Fisheries and Aquatic Sciences, 17:885-900. ISSN 1303-2712. DOI: 10.4194/1303-2712-v17_5_05.

Drakulović, Dragana & Vuksanovic, Nenad. 2020: PHYTOPLANKTON ASSEMBLAGES AND DENSITY IN THE MONTENEGRIN COASTAL SEA.

Đurović, M. & S. Regner (2009): Preliminary results of investigation of demersal resources on Montenegrin coast (MEDITS protocol). IV International Conference „Fisheries", 27-29 May 2009. Zemun, Belgrade, Serbia. Conference proceedings: 371-376

Đurović, M., Holcer, D., Joksimović, A., Mandić, M., Fortuna, C., Ikica, Z., & Vuković, V. (2016). *Cetaceans in the Boka Kotor Bay. The Boka Kotor Bay Environment, 411–437.* doi:10.1007/698_2016_46

Fortuna, C. M., Holcer, D., Mackelworth, P. (eds.) 2015. Conservation of cetaceans and Sea turtles in the Adriatic Sea – status of species and potential conservation measures. 136 p. Report produced under WP 7 of the NETCET project, IPA Adriatic Cross-border Cooperation Programme

Gvozdenović S et al (2016) Distribution records of sea turtles in the Montenegrin waters. Studia Marina, Kotor, 29(1): 31–46

Institute for Marine Biology / Institut za biologiju mora (2016): Porto Montenegro izvještaj o monitoringu, Zima 2015-2016 sa Zaključcima i poređenjem sa studijom iz 2007. godine, 53p.

Ikica, Z., M. Đurović, A. Joksimović, M. Mandić, O. Marković, A. Pešić, E. Arneri, L. Ceriola, N. Milone (2018): Monitoring of the Montenegrin Fisheries Sector: BIOLOGICAL SAMPLING (September 2007-August 2011) Studia Marina. Monograph Series No. 1. Institute of Marine Biology, University of Montenegro. Kotor, Montenegro. 106 pp

Joksimović A., Azzurro E., Milone N., Pešić A., Marković O., Joksimović D., Glamuzina B., Tomanić, J.(2016). The spread of non-indigenous species and other warming - related signals: a local ecological knowledge study from Montenegrin waters. 2nd International Congress on Applied Ichthyology & Aquatic Environment 10 - 12 November 2016, Messolonghi, Greece. HydroMediT 2016 - Book of Proceedings, 220-223.

Joksimović A., Pešić A., Đurović M., Ikica Z., Marković O., & Mandić M. (2019): The state of marine fisheries in Montenegro in the last 15 years. Studia Marina 2019, 32 (2): 12-22. DOI: 10.5281/zenodo.3584200

Kašćelan, S., Mandić, S., Radović, I. & Krpo-Ćetković, J. (2009). An annotated checklist of Echinodermata of Montenegro (the south Adriatic Sea). Zootaxa, 2275: 21-40.

Katalog tipova staništa Crne Gore značajnih za Evropsku Uniju verzija 3. 2019.

Macic, Vesna & Antolic, Boris & Thibaut, Thierry & Svircev, Zorica. (2010). Distibution of the most common Cystoseira C. agardh species (Heterokontophyta, Fucales) on the coast of Montenegro (South-East Adriatic Sea). Fresenius Environmental Bulletin. 19.

Mačić et al (2014): Alohtone vrste istočne obale Južnog Jadrana. Monigrafija. Institut za biologiju mora Univerziteta Crne Gore I Institut za more i priobalje Sveučilišta u Dubrovniku. 67 pgs

Macic, Vesna & Krivokapic, Sladjana. (2016). Phytobenthos in the Boka Kotor Bay: State of Knowledge and Threats. 10.1007/698_2016_20.

Mačić, Vesna, Sebastián Hernandis Caballero, Nardo Vicente, José Rafael García March, José Tena Medialdea, Rajko Martinović, Danijela Joksimiović and Slavica Petović (2016): Exceptionally high density of Pinna nobilis Linnaeus, 1758 in the Boka Kotor Bay (Montenegro). III European Conference on Scientific Diving 22-23 March 2017, Funchal, Madeira, Portugal, Abstract book, pp84

Macic, V., Mandic, M., Pestoric, B., Gacic, Z., & Paunovic, M. (2017). First assessment of marine litter in shallow south-east Adriatic sea. Fresenius Environmental Bulletin, 26(7), 4834–4840

Mačić, V., Zordan, C. (2018): Mapping of the Cymodocea nodosa (Ucria) Asch. meadows in the Kotor bay and data comparison over the last four decades. Studia Marina 31 (1): 5-15.

Mačić, V., Panou, A., Bundone, L., Varda, D., & Pavićević, M. (2018). First Inventory of the Semi-Submerged Marine Caves in South Dinarides Karst (Adriatic Coast) and Preliminary List of Species. *Turkish Journal of Fisheries and Aquatic Sciences*, *19*, 765-774. http://doi.org/10.4194/1303-2712-v19_9_05

Macic, Vesna & Trainito, Egidio. (2019). Vesna MAČIĆ, TRAINITO SOME PECULIARITIES OF THE HEXACORALLIA ASSEMBLAGES ALONG THE MONTENEGRIN COAST. 10.13140/RG.2.2.23252.45445.

Ministry of Tourism and Environmental Protection (2008): Biological Diversity in Montenegro – COUNTRY STUDY. Podgorica. 218pp

NETCET - Netwotk for the Conservation of Cetaceans and Sea Turtles in the Adriatic (2015): Strategy on the conservation of sea turtles in the Adriatic Sea for the period 2016–2025.

NETCET - Netwotk for the Conservation of Cetaceans and Sea Turtles in the Adriatic (2015): Strategy on the conservation of Cetaceans in the Adriatic Sea for the period 2016–2025

Opština Tivat (2013): Lokalni akcioni plan za biodiverzitet 2013 – 2018.
Panou A, Varda D, Bundone L (2017) The Mediterranean monk seal, Monachus monachus, in Montenegro. In: Pešić, V. (ed) The Proceedings of 7th International Symposium of Ecologists, 4-7 October 2017, Sutomore, Montenegro.

Peraš I. et al (2017): Composition and abundance of beach litter in Montenegro (South Adriatic Sea). Studia Marina 2017, 30 (1): 17-27. DOI: 10.5281/zenodo.830187

Pesic A. et al (2019): Rare and Endangered Fish Species in the Adriatic Sea and Proposal for Marine Flagship Species. International Conference Adriatic Biodiversity Protection – AdriBioPro2019, 7-10 April 2019, Kotor, Montenegro, Book of Abstracts

PESTORIĆ, B, J. KRPO-ĆETKOVIĆ, B. GANGAI, & D. LUČIĆ. 2012. Pelagic cnidarians in the Boka- Kotorska Bay (Montenegro, South Adriatic). Acta Adriat., 53:291–302

Pestorić, Branka & Drakulović, Dragana & Hure, Marijana & Gangai Zovko, Barbara & Onofri, I. & Lucic, Petra & Lučić, D.. (2016). Zooplankton Community in the Boka Kotor Bay:. 10.1007/698_2016_35.

Pestorić, B., Drakulović D., Hure M., Gangai Zovko B, Onofri I, Lučić P. & Lučić D. (2017) Zooplankton Community in the Boka Kotor Bay. In: A. Joksimović et al. (Editors), The Boka

Kotor Bay Environment. Hdb. Env. Chem., 54: 231-270. Springer International Publishing Switzerland, DOI10.1007/698_2016_35

Petovic, Slavica & Markovic, Olivera. (2016). Characteristics of the Zoobenthos in Boka Kotor Bay. 10.1007/698_2016_23.

Petovic, Slavica & Sladjana, Gvozdenović & Ikica, Zdravko. (2017). An Annotated Checklist of the Marine Molluscs of the South Adriatic Sea (Montenegro) and a Comparison with Those of Neighbouring Areas. Turkish Journal of Fisheries and Aquatic Sciences. 17. 921-934. 10.4194/1303-2712-v17_5_08.

Petovic, Slavica & Sladjana, Gvozdenović & Ikica, Zdravko. (2017). An Annotated Checklist of the Marine Molluscs of the South Adriatic Sea (Montenegro) and a Comparison with Those of Neighbouring Areas. Turkish Journal of Fisheries and Aquatic Sciences. 17. 921-934. 10.4194/1303-2712-v17_5_08.

Petovic, Slavica. (2018). Additions to the checklist of the malacofauna of the Boka Kotor Bay (south-east Adriatic Sea). 31. 23-36. 10.5281/zenodo.1321703.

Petovic, Slavica & Markovic, Olivera & Djurovic, Mirko. (2019). Inventory of Non-indigenous and Cryptogenic Marine Benthic Species of the South-East Adriatic Sea, Montenegro. Acta Zoologica Bulgarica. 71. 47-52.

Pucher-Petković, T., Marasović, I. (1980). Développement des populations phytoplanctoniques caractéristiques pour un milieu eutrophisé (Baie de Kaštela). Acta Adriatica 21, 79–93. CROSBI ID: 76278

RAC/SPA - UNEP/MAP, 2013 RAC/SPA - UNEP/MAP, 2013. Ecological quantitative description of Boka Kotor Bay marine area (Montenegro). By Golder Associates. Ed. RAC/SPA - MedMPAnet Project, Tunis: 82 pp + Appendices

Saveljić, D., Jovićević M. (2015): Popis ptica Crne Gore sa bibliografijom. Centar za zaštitu i proučavanje ptica. Podgorica

Saveljić, D (2015): Status of marine and coastal birds of Montenegro: species listed under Annex II of the Barcelona Convention Protocol on specially protected areas and biological diversity in the Mediterannean pg. 88-91 in: Conservation of marine and coastal birds in the Mediterranean. Proceedings of the UNEP-MAP-RAC/SPA Symposium, Hammamet, Tunisia – 20 to 22 February 2015

Sladjana, Gvozdenović & Mandic, Milica & Peraš, Ines & Malovrazić, Nemanja. (2019). Marine litter on Montenegrin beaches (south Adriatic Sea)

Spagnolo A, Auriemma R, Bacci T, Balković I, Bertasi F, Bolognini L, Cabrini M, Cilenti L, Cuicchi C, Cvitković I, Despalatović M, Grati F, Grossi L, Jaklin A, Lipej L, Marković O, Mavrič B, Mikac B, Nasi F, Nerlović V, Pelosi S, Penna M, Petović S, Punzo E, Santucci A, Scirocco T, Strafella P, Trabucco B, Travizi A, Žuljević A. Non-indigenous macrozoobenthic species on hard substrata of selected harbours in the Adriatic Sea. Mar Pollut Bull. 2019 Oct;147:150-158. doi: 10.1016/j.marpolbul.2017.12.031. Epub 2017 Dec 21. PMID: 29274953.

SPA/RAC–UN Environment/MAP, 2019: Updated Classification of Benthic Marine Habitat Types for the Mediterranean Region, followed by Updated Reference List of Marine Habitat Types for the Selection of Sites to be Included in the National Inventories of Natural Sites of Conservation Interest in the Mediterranean

UNEP-MAP-RAC/SPA. (2015). Adriatic Sea: Status and conservation of Seabirds. By Carboneras, C. Edited by Cebrian, D. & Requena, S., RAC/SPA, Tunis ; 17 pp.

UNEP-MAP-RAC/SPA. (2015). Adriatic Sea: Important areas for conservation of cetaceans, sea turtles and giant devil rays. By Holcer, D ; Fortuna, C.M and Mackelworth, P.C. Edited by Cebrian, D.,& Requena, S., RAC/SPA, Tunis ; 69 pp.

UNEP/MAP-RAC/SPA, 2016. Montenegro: Platamuni and Ratac areas. Mapping of marine key habitats and initiation of monitoring network. By Torchia G., Pititto F., Rais C., Trainito E., Badalamenti F., Romano C., Amosso C., Bouafif C., Dragan M., Camisassi S., Tronconi D., Macic V., Sghaier Y.R. & Ouerghi A. Ed. RAC/SPA - MedKeyHabitats Project, Tunis: 77 pp + Annexes. Detailed (PDF) maps of key marine habitats at localities Platamuni and Ratac available at: http://rac-spa.org/sites/default/files/doc_mkh/montenegro/platamuni_ratac_mapping_appendix.zip

UNEP/MAP-RAC/SPA, 2016. Montenegro: Platamuni and Ratac areas. Summary report of the available knowledge and gap analysis. By Torchia G., Pititto F., Rais C., Trainito E., Badalamenti F., Romano C., Amosso C., Bouafif C., Dragan M., Camisassi S., Tronconi D., Macic V., Sghaier Y.R. & Ouerghi A. Ed. RAC/SPA - MedKeyHabitats Project, Tunis: 32 p

UNEP 2020: Towards GES assessment for Montenegro - Biodiversity and Non-indigenous species. Draft prepared by Ana Štrbenac, July 2020, in the frame of UNEP/GEF project "Implementation of Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning" (document is not available at internet, but approved by the Ministry to be used for preparing this National Report)

VIOLIĆ Ivana, Tjaša KOGOVŠEK, Branka PESTORIĆ, Vesna MAČIĆ, Ivona MILIĆ BERAN and Davor LUČIĆ (2019): Recent changes (2013-2017) in scyphomedusan fauna in the Boka Kotor Bay, Montenegro (Southeast Adriatic). ACTA ADRIAT., 60(1): 25 – 40

Vukanic, Vera & Zivic, Nebojsa. (2013). Hydrographic and zooplankton data in the bay of kotor collected during 2007/08. Natura Montenegrina.

Annexes

Annex 1

List of Algal species (according to Caković D., Milošević D:, 2013

Acanthoica quattrospina
Acetabularia acetabulum
Achnanthes brevipes
Achnanthes longipes
Acrochaetium daviesii
Acrochaetium virgatulum
Acrodiscus vidovichii
Acrosorium uncinatum
Acrosorium venulosum
Acrosymphyton purpuriferum
Acinetospora vidovichii
Aglaothamnion caudatum
Aglaothamnion furcellariae
Aglaothamnion neglectum
Aglaothamnion tenuissimum
Aglaothamnion tripinnatum
Aglaozonia chillosa
Amphiora cryptarthrodia
Amphiroa rigida
Amphora ostrearia
Amphora grevilleana
Amphidinium acutissimus
Amphidinium lanceolatum
Amphiprora sulcata
Anadyomene stellata
Antithamnion cruciatum
Antithamnion heterocladum
Antithamnion plumula
Antithamnion tennissimum
Apoglossum ruscifolium
Arachnophyllum confervaceum
Arthrocladia villosa
Ascocylus orbicularis
Asperococcus bullosus
Asterionellopsis glacialis
Asterolampra grevillei
Asterolampra marylandica
Asteromphalus flabellatus
Asterocystis ornata
Bacillaria paxillifera
Bacteriastrum hyalinum
Bangia atropurpurea
Botryocladia botryoides
Botryocladia chiajeana
Botryocladia microphysa
Brongniartella byssoides
Bryopsis corymbosa
Bryopsis duplex
Bryopsis hypnoides
Bryopsis plumosa
Bulbocoleon piliferum
Calciosolenia brasiliens
Calciosolenia granii
Calciosolenia murrayi
Callithamnion corymbosum
Callithamnion granulatum
Calyptosphaera oblonga
Calosiphonia dalmatica
Castagnea mediterranea
Catanella repens
Caulerpa racemosa
Caulacanthus ustulatus
Centroceras cinnabarinum
Ceramium tenuissimum
Ceramium bertholdi
Ceramium ciliatum
Ceramium circinatum
Ceramium codii
Ceramium computum
Ceramium diaphanum
Ceramium echinotum
Ceramium gracillimum
Ceramium rubrum
Ceramium tenerrimum
Cerataulina pelagica
Champia parvula
Chaetoceros affinis
Chaetoceros breve
Chaetoceros compressus
Chaetoceros contortus
Chaetoceros costatus
Chaetoceros curvisetus
Chaetoceros danicus
Chaetoceros decipiens
Chaetoceros densus
Chaetoceros diversus
Chaetoceros peruvianus
Chaetoceros protuberans
Chaetoceros simplex
Chaetoceros throndsenii
Chaetoceros tenuissimus
Chaetoceros tortissimus
Chaetoceros vixvisibilis
Chaetoceros wighamii
Chaetomorha linum
Chaetomorpha aerea
Chaetomorpha capillaris
Chaetomorpha gracilis
Chondria dasyphylla
Chondria tenuissima
Chondrymenia lobata
Chroodactylon ornatum
Chrysimenia uvaria
Chrysimenia ventricosa
Chylocladia reflexa
Chylocladia verticillata
Cladophora albida
Cladophora coelothrix
Cladophora dalmatica
Cladophora echinus
Cladophora glomerata
Cladophora lehmaniana
Cladophora pellucida
Cladophora prolifera
Cladophora socialis
Cladophora vagabunda
Cladostephus hirsutus

Cladostephus verticillatus
Coccolithus walichii
Cocconeis scutellum
Codium bursa
Codium dichotomum
Codium effusum
Codium tomentosum
Codium vermilara
Colpomenia sinuosa
Compsothamnion thuyoids
Corallina granifera
Corallina officinalis
Corythodinium constrictum
Corythodinium tesselatum
Coscinodiscus janischii
Coscinodiscus perforatus
Coscinodiscus thorii
Crouania attenuata
Cruoria pellita
Cryptonemia lomation
Cryptonemia tunaeformis
Cutleria multifida
Cyclotella striata
Cylindrotheca closterium
*Cystoseira adriatica**1
*Cystoseira amentacea var. stricta***2
*Cystoseira barbata**
Cystoseira compressa
*Cystoseira corniculata**
*Cystoseira crinita**
*Cystoseira ercegovicii**
*Cystoseira ericamarina**
*Cystoseira schiffneri**
*Cystoseira selaginoides**
*Cystoseira spinosa**
*Cystoseira stricta**
Dactyliosolen blavyanus
Dactyliosolen fragilissimus
Dasycladus vermicularis
Dasya arbuscula
Dasya baillouviana
Dasya corymbifera
Dasya hutchinsiae
Dasya ocellata
Dasya pedicillata
Dasya punicea
Dasyopsis plana
Dasyopsis spinella
Derbesia tenuissima
Dermatholithon cystoseirae
Dermatholithon pustulatum
Dermatolithon confinis
Dermatolithon hapalidioides
Detonula plumila
Dictyopteris membranacea
Dictyocha fibula
Dictyocha polyactis
Dictyocha septenaria
Dictyocha speculum
Dictyota dichotoma
Dictyota linearis
Dilophus fasciola
Dilophus spiralis
Dinophysis acuminata
Dinophysis acuta
Dinophysis caudata
Dinophysis fortii
Dinophysis hastate
Dinophysis sphaerica
Dinophysis sacculus
Diploneis bombus
Diploneis crabro
Diplopsalis lenticula
Dipterosiphonia rigens
Discosphaera tomsonii
Dissodinium elegans
Ditylum brightwelli
Dudresnaia verticillata
Ebria tripartita
Ectocarpus confervoides
Ectocarpus siliculosus
Ectochaete leptochaete
Elachista fucicola
Elachista neglecta
Elachista stellaris
Elashista intermedia
Emiliania huxleyi
Endoderma endolithicum
Endoderma viride
Enteromorpha compressa
Enteromorpha intestinalis
Enteromorpha linza
Enteromorpha multiramosa
Entocladia viridis
Erythrocystis montagnei
Erythrotrichia carneae
Erythrotrichia investiens
Erythrotrichia reflexa
Eucampia cornuta
Eutreptia lanowii
Falkenbergia rufolanosa
Feldmannia caespitula
Feldmannia irregularis
Flabellia petiolata
Fragillaria spp.
Fosliella farinosa
Fosliella lejolisii
*Fucus virsoides**
Galaxaura oblongata
Gastroclonium clavatum
Gelidiella lubrica
Gelidiella pannosa
Gelidiella ramellosa
Gelidiella tenuissima
Gelidium crinale
Gelidium latifolium
Gelidium melanoideum
Gelidium pectinatum
Gelidium pulchellum
Gelidium pussillum
Gelidium spathulatum
Geniodoma polyedricum
Gigartina acicularis
Gigartina tedii
Giffordia dalmatica
Giraudia sphacelarioides
Glenodium spp.
Goniodoma polyedricum
Goniotrychum alsidii
Gonolithon notarisii
Gonyaulax digitale
Gonyaulax hyalina
Gonyaulax polygramma
Gonyaulax spinifera
Gonyaulax verior
Gracilaria armata
Gracilaria bursa-pastoris
Gracilaria compressa
Gracilaria dura
Gracilaria verrucosa
Grammatophora oceanica
Griffithsia barbata
Griffithsia opuntioides

Griffithsia phyllamphora
Griffithsia schousboei
Guinardia flaccida
Guinardia striata
Gulsonia nodulosa
Gymnodinium cucumis
Gymnothamnion elegans
Gyrodinium fusiforme
Gyrosigma balticum
Haslea wawrikae
Halimeda tuna
Halopitys incurvus
Halopitys pinastroides
Halopteris filicina
Halopteris scoparia
Halycystis stadio-ovalis
Halycistis parvula
Halydictyon mirabile
Halymenia dichotoma
Halymenia fastigiata
Halymenia floresia
Halymenia pluriloba
Halymenia trigona
Helicosphaera carteri
Hemialus hauckii
Hemiaulus sinensis
Herposiphonia secunda
Herposiphonia tenella
Heterodinium milneri
Heterosiphonia wurdemanni
Hildenbrandia rubra
Hypnea musciformis
Hypoglossum woodwardii
Jania corniculata
Jania rubens
Kallymenia microphylla
Kallymenia reniformis
Lampriscus kittonii
Laurencia obtusa
Laurencia paniculata
Laurencia papillosa
Laurencia pinnatifida
Lejolisia mediterranea
Leptocylindrus danicus
Leptocylindrus mediterraneus
Leptocylindrus minimus
Liagora distenta
Liagora viscid
Licmophora flabellata
Licmophora paradoxa
Licmophora reichardtii
Lioloma pacificum
Lithodesmium undulatum
Lithophyllum expansum
Lithophyllum incrustans
Lithophyllum racemus
Lithophyllum tortuosum
Lithothamnion calcareum
Lithothamnium coralloides
Lithothamnium fruticulosum
Lioloma pacificum
Lithodesmium undulatum
Lomentaria chylocladiella
Lomentaria clavellosa
Lomentaria linearis
Lophocladia lallemandii
Lophosiphonia cristata
Melosira dubia
Melosira lineata
Melosira moniliformis
Melosira nummuloides
Melobesia membranacea
Meringosphaera mediterranea
Mesoporus perforatus
Myriactula elongata
Myriactula microscopica
Myriactula rigida
Myriactula rivulariae
Myriactula stellulata
Myrionema orbiculare
Myriotrichia claveformis
Monosporus pedicellatus
Navicula spp.
Nemalion helminthoides
Nemastoma dichotoma
Nereia filiformis
Neocalyptrella robusta
Neoceratium carriense
Neoceratium contortum
Neoceratium furca
Neoceratium fusus
Neoceratium gravidum
Neoceratium gibberum
Neoceratium horridium
Neoceratium hexacantum
Neoceratium kofoidii
Neoceratium lineatum
Neoceratium macroceros
Neoceratium massiliense
Neoceratium pentagonum
Neoceratium setaceum
Neoceratium trichoceros
Neoceratium tripos
Neogoniolithon notarisii
Neogoniolithon mamillosum
Neomonospora pedicellata
Neurocaulon foliosum
Nitophyllum punctatum
Nitzschia closterium
Nitzschia habirshawii
Nitzschia longissima
Nitzschia incerta
Nitzschia sicula
Nitzschia sigma
Noctiluca scintillans
Octactis octonaria
Odontella aurita
Odontella moiliensis
Ophiaster formosum
Ophiaster hydroideus
Ornithocercus heteroporus
Oxytoxum adriaticum
Oxytoxum aceptrum
Oxytoxum caudatum
Oxytoxum laticeps
Oxytoxum sceptrum
Oxytoxum scolopax
Oxytoxum tesselatum
Oxytoxum variabile
Padina pavonica
Palmophyllum crassum
Paralia sulcata
Peyssonelia squamaria
Peyssonnelia dubyi
Peyssonnelia polymorpha
Peyssonnelia rosa marina
Peyssonnelia rubra
Phaeophila dendroides
Phalacroma rotundatum
Phyllophora nervosa
Phymatolithon calcareum

Phymatolithon lenormandii
Platoma cyclocolpa
Platythamnion plumula
Pleonosporium borreri
Pleurosigma angulatum
Pleurosigma elongatum
Pleurosigma formosum
Plocamium cartilagineum
Podolampas elegans
Polysiphonia elongata
Polysiphonia fruticulosa
Polysiphonia opaca
Polysiphonia sertularioides
Polysiphonia thuyoides
Pontosphaera nigra
Pringsheimiella scutata
Proboscia alata
Proboscia indica
Prorocentrum compressum
Prorocentrum micans
Prorocentrum minimum
Prorocentrum scutellum
Prorocentrum triestinum
Protoperidinium crassipes
Protoperidinium conicum
Protoperidinium depressum
Protoperidinium diabolum
Protoperidinium divergens
Protoperidinium globulum
Protoperidinium leonis
Protoperidinium oceanicum
Protoperidinium pallidum
Protoperidinium paulsenii
Protoperidinium pellucidum
Protoperidinium steinii
Protoperidinium tuba
Psammodictyon panduriforme
Pseliodinum vaubanii
Pseudochlorodesmis furcellata
Pseudolithophyllum expansum
Pseudo-nitzschia pseudodelicatissima
Pseudo-nitzschia seriata
Pseudoscourfieldia marina
Pseudosolenia calcar-avis
Pterocladia capillacea
Pterosiphonia parasitica
Pterosiphonia pennata
Pyrocystis lunula
Pyrophacus horologium
Pyrophacus steinii
Ptilothamnion pluma
Radicilingua reptans
Radicilingua thysanorhizans
Ralfsia verrucosa
Rhabdosphaera stylifera
Rhabdosphaera tignifera
Rhizoclonium kochianum
Rhizosolenia calcar-avis
Rhizosolenia decipiens
Rhizosolenia imbricata
Rhizosolenia imbricata
Rhodochorton haucki
Rhodophyllis divaricata
Rhodymenia ardissonei
Rhodymenia palmetta
Rhytiphloea tinctoria
Ricardia montagnei
Rodriguezella pinnata
Rodriguezella strafforellii
Rodymenia ligulata
Rytiphlaea tinctoria
Sargassum vulgare
Schottera nicaensis
Scinaia furcellata
Scytosiphon adriaticus
Scytosiphon lomentaria
Sebdenia feldmannii
Sebdenia riodrigueziana
Seirospora apiculata
Seirospora giraudyi
Seirospora interrupta
Seirospora sphaerospora
Sermothamnion repens
Siphonocladus pusillus
Skeletonema marinoi
Spermothamnion johanis
Spermothamnion repens
Spermatochnus paradoxus
Sphaerococcus coronopifolius
Sphacelaria cirrosa
Sphacelaria furcigena
Sphacelaria fusca
Sphacelaria plumula
Sphacelaria tribuloides
Sphondylothamnion multifidum
Sporochnus pedunculatus
Spyridia filamentosa
Stelarima stellaris
Stilophora rizoides
Striaria attenuata
Striatella unipunctata
Stypocaulon scoparium
Surirella gemma
Synedra crystalina
Synedra fulgens
Syracosphaera pulchra
Tabellaria spp.
Taenioma macrourum
Taonia atomaria
Thalassionema fraunfeldi
Thalassionema nitzschioides
Thalassionema rotula
Thalassiosira decipiens
Thalassiosira eccentrica
Thuretella schousboei
Torodinium robustum
Trichosolen myura
Udotea desfo ntainei
Udotea petiolata
Ulothrix subflaccida
Ulva lactuca
Ulva rigida
Ulvella lens
Valonia macrophysa
Valonia utricularis
Vidalia volubilis
Wrangelia penicillata
Wurdemannia miniata
Zanardinia prototypus

Annex 2
List of Invertebrate and fish species

(according to Caković D., Milošević D:, 2013)

AGNATHA
Lampetra fluviatilis
Petromizon marinus

ANELLIDA
Bispira sp.
Hermodice carunculata
Filograna implexa
Myxicola infundibulum
Pomatoceros triqueter
Protula tubelaria
Sabella penicillus
Sabella spallanzani
Serpula vermicularis

ARACHNIDA
Araneus diadematicus
Misumena vatia
Tarentula fasciiventris

ASCIDIACEA
Halocynthia papillosa
Microcosmus vulgaris
Phallusia mamilata
Sydnium sp.

BRYOZOA
Myriapora truncate
Porella cervicornis
Schizobranchella sanguinea

CNIDARIA
Aglaophenia sp.
Anemonia sulcata
Anemonia viridis
Balanophyllia sp.
Corallium rubrum
Caryophyllia sp.
Cerianthus sp.
Cladocora caespitosa
Leptosammia pruvoti
Lophogorgia cfr sarmentosa
Parazoanthus axinellae
Phymanthus pulcher
Polyciathus sp.
Savalia savaglia

CRUSTACEA
Acartia clausi
Aetideus armatus
Balanus eburneus

Calanus helgolandicus
Calanus tenuicornus
Calocalanus pavo
Calocalanus styliremis
Candacia armata
Candacia giesbrecht
Candacia longimana
Cancer pagurus
Carcinus maenas
Centropages typicus
Centropages kröyerii
Clausocalanus arcuicornis
Clausocalanus jobei
Clausocalanus furcatus
Clausocalanus paululus
Clytemnestra rostrata
Corycaeus brehmi
Corycaeus clausi
Corycaeus ovalis
Corycaeus typicus
Corycaeus rostratus
Ctenocalanus vanus
Diaixis pygmaea
Dromia vulgaris
Euchaeta hebes
Euchaeta marina
Euterpina acutifrons
Ischnocalanus plumulosus
Labidocera wollastoni
Lucicutia flavicornis
Macrosetella gracilis
Maia verrucosa
Mecynocera clausi
Microsetella norvegica
Nanocalanus minor
Nephrops norvegicus
Neocalanus gracilis
Oithona helgolandica
Oithona nana
Oithona plumifera
Oncea dentipes
Oncea media
Oncea mediterranea
Oncea subtilis
Pagurus berhnardus
Palemon serratus
Palemon serratus
Palinurus elephas
Paracalanus parvus
Paraeuchaeta hebes

Parapenaeus longirostris
Penilia avirostris
Pontella mediterranea
Sapphirina lactens
Scyllarides latus
Temora stylifera
Upogebia pusilla

ECHINODERMATA
Amphipholis squamata
Amphiura chiajei
Amphiura filiformis
Amphiura mediterranea
Antedon mediterranea
Anseropoda placenta
Arbacia lixula
Astropecten aranciacus
Astropecten irregularis pentacanthus
Asteropecten jonstoni
Astropecten platyacanthus
Astropecten spinulosus
Brissopsis lyrifera
Brissus unicolor
Centrostephanus longispinus
Cidaris cidaris
Coscinasteria tenuispina
Echinaster sepositus
Echinocardium cordatum
Echinocardium fenauxi
Echinocyamus pusillus
Hacelia attenuata
Holothuria forskali
Holothuria impatiens
Holothuria mammata
Holothuria polii
Holothuria sanctori
Holothuria tubulosa
Labidoplax digitata
Leptopenctata elongata
Leptopenctata tegrestina
Luidia ciliaris
Marthasterias glacialis
Mesothuria intestinalis
Ocnus planci
Ocnus syracusanus
Ophidiaster ophidianus
Ophioderma longicauda
Ophiomyxa pentagona
Ophiotrix fragilis
Ophiura albida
Ophiura ophiura
Paracentrotus lividus
Parastichopus regalis
Psammechinus microtuberculatus
Schiazaster canaliferus
Spatangus purpureus
Sphaerechinus granularis
Thyone fusus mediterranea

ECHIUROIDEA

Bonellia viridis

MOLLUSCA

Aloidis gibba
Allotheuthis media
Anomia ephippium
Aplysia depilans
Apporhais pes-pelecani
Arca barbata
Arca diluvia
Arca lacteal
Arca noe
Arca tetragona
Astraea rugosa
Avicula tarentina
Bittium latreilli
Brachyodontes minimus
Buccinulum corneum
Calliostoma conulus
Calliostoma laugieri
Calliostoma zizyphinum
Calyptraea chinensis
Cantharidus striatus
Capulus hungaricus
Cardium edule
Cardium echinatum
Cardium exiguum
Cardium paucicostatum
Cardium tuberculatum
Cassidaria echinophora
Cerithium rupestre
Cerithium vulgatum
Chama gryphina
Chama lamellose
Chiton olivaceus
Chlamys glabra
Chlamys opercularis
Chlamys varia
Clanculus corallines
Chromodoris krohni
Columbella rustica
Conus mediterraneus
Crepidula moulinsii
Cuspidaria cuspidate
Cyprea lurida
Cyprea pyrum
Cyprea spurca
Dentalium dentale
Dentalium vulgare
Discodoris atromaculata
Diodora gibberula
Diodora graeca
Divaricella divaricata
Dolium galea
Donacilla cornea
Dosinia lupine
Eledone cirros
Eledone moschata
Emarginula fissure
Fasciolaria lignaria
Flabellina affinis
Flabellina cfr bab
Fusinus rostratus
Fusinus syracusanus
Fusus pulchellus
Gastrochaena dubbia
Gibbula divaricata
Gibbula magus
Gibbula obliquata
Gibbula umbilicaris
Glycymeris glycymers
Glycymeris pilosa
Glycymeris violacescens
Haliotis lamellose
Hexaplex trunculus
Hiatella arctica
Hiatella rugosa
Hypserodoris picta
Illex coindetti
Irus irus
Isocardia cor
Janolus sp.
Laevicardium oblongum
Leda fragilis
Leda pella
Leptothyra sanguine
Lima lima
Lima hians
Lithophaga lithophaga
Littorina neritoides
Loligo vulgaris
Loripes lacteus
Luria lurida
Mactra corralina
Mitra ebenina
Mitra zonata
Modiolus barbatus
Monodonta turbinate
Murex trunculus
Murex brandaris
Mytilus galloprovincialis
Nassa costulata
Nassa neritea
Nassarius mutabilis
Nassarius pygmaeus
Nassarius reticulates
Natica hebraea
Natica josephinia
Natica millepunctata
Nucula nucleus
Ostrea edulis
Octopus vulgaris
Octopus salutti
Patella coeruela
Patella lusitanica
Patella vulgate
Pecten jacobeaus
Pharus legumen
Philine aperta
Phyllidia flava
Pinna nobilis
Pinna pectinata
Pisania maculosa
Pitar rudis
Polynices alderi
Primovula adriatica
Psammobia depressa
Pteria hirundo
Pteroctopus tetracirrhus
Rossia macrosoma
Ruditapes decusssatus
Scala communis
Scaeurgus uncirrhus
Scrobicularia plana
Sepia elegans
Sepia officinalis
Sepia orbignyana
Sepiola oweniana
Sepiola petersii
Sepiola rondeletti
Solen vagina
Solenocurtus pellucidus
Spondylus gaederopus
Stramonita haemastoma
Strombiformis subulata
Tellina distorta
Tellina pulchela
Teredo navalis
Thracia combulordea
Todarodes sagitatus
Tonna galea
Tritonalia erinacea
Trivia adriatica
Venus gallina
Venus fasciata
Venus verrucosa
Venerupis aureus
Venerupis decussate
Vermetus arenarius
Vermetus subcancellatus

PORIFERA

Agelas oroides
Anchinoe sp.
Aplysina aerophoba
Axinella cannabina
Axinella damicornis
Axinella polypoides
Axinella verrucosa
Cacospongia scalaris
Chondrila nucula
Chondrosia sp.
Clatrina clathrus
Clathrina coriacea
Crambre crambre
Haliclona cratera
Geodia cydonium
Discodoris astromaculata
Dysidea avara
Ircinia variabilis
Mycale massa
Oscarella lobularis
Raspailia viminalis
Petrosia ficiformis
Spirastrella cunctatix
Spongia officinalis ssp. adriatica
Suberites carnosus
Suberites domuncula
Terpios cerulea
Tethya sp. plur
Verongia aerophoba

PISCES

Alopias vulpinus
Anthias anthias
Apogon imberius
Aphanius fasciatus
Argentina sphyraena
Argyrosomus regius
Arnoglossus laterna
Atherina mocho
Atherina hepsetus
Auxis rochei
Balistes carolinensis
Belone belone
Blennius ocellaris
Boops boops
Bothus podas
Cepola rubescens
Chimaera monstrosa
Chromis chromis
Citharus linguatula
Conger conger
Coris julis
Coryphaena hippurus
Dasyatis pastinaca
Deltentosteus quadrimaculatus
Dentex dentex
Dentex gibbosus
Dicentrarhus labrax
Dicentrarhus labrax
Diplodus puntazzo
Diplodus sargus
Diplodus vulgaris
Engraulis encrasicolus
Epinephelus alexandrinus
Epinephelus costae
Epinephelus marginatus
Fistularia commersonii
Gobius auratus
Gobius bucchichi
Gobius cobitis
Gobius cruentatus
Gobius geniporus
Gobius niger
Gobius vittatus
Gobius xanthocephalus
Hippocampus hippocampus
Hippocampus ramulosus
Labrus bimaculatus
Labrus merula
Labrus mixtus
Lepidopus caudatus
Lepidotrigla cavillone
Lichia amia
Lipophys canevae
Lipophys nigiceps
Lithognathus mormyrus
Liza aurata
Liza ramada
Lophius budegassa
Lophius piscatorius
Macroramphosus scolopax
Merluccius merluccius
Microchirus variegatus
Mobula mobular
Mugil cephalus
Mullus barbatus
Mullus surmuletus
Muraena helena
Mustelus asterias
Mustelus mustelus
Myliobatis aquila
Naucrates ductor
Oblada melanura
Oxynotus centrina
Pagellus erythrinus
Pagellus acarne
Pagrus pagrus
Pomatoschistus tortonesi
Parablennius gattorugine
Parablennius incognitus
Parablennius rouxi
Parablennius sanguinoilentus
Parablennius zvonimiri
Phycis phycis
Pomatomus saltatrix
Prionace glauca
Psseta maxima
Raja asterias
Raja clavata
Raja miraletus
Sardina pilchardus
Sarda sarda
Sardinella aurita
Sarpa salpa
Sciaena umbra
Scomber japonicus
Scomber scombrus
Scophtalmus rhombus
Scorapaena madereinsis
Scorpaena notata
Scorpaena scrofa
Scorpaena porcus
Scyliorhinus canicula
Seriola dumerili
Serranus cabrilla
Serranus hepatus
Serranus scriba
Smaris alcedo
Smaris smaris
Solea impar
Solea kleini
Solea solea
Solea vulgaris
Sparus aurata
Sparisoma cretense
Spicara flexuosa
Spicara maena
Spicara smaris
Spheroides cutaneus
Sphyraena sphyraena
Spondylosoma cantharus
Stromateus fiatola
Squalus acantias
Squalus blainvillei
Syngnathus acus
Symphodus cinereus
Symphodus melops
Symphodus ocellatus
Symphodus roissali
Symphodus rostratus
Symphodus tinca
Thalassoma pavo
Thorogobius macrolepis
Thunus albacares
Thunnus thynnus
Trachinus draco
Trachinus radiatus
Trachinotus ovatus
Trachurus mediterraneus
Trachurus trachurus
Trigla cuculus
Trigla lucerna

Trigla lyra
Trigloporus lastoviza
Tripterygion delaisi
Tripterygion melanurus
Tripterygion triptreronotus
Trisopterus minutus capelanus
Torpedo marmorata
Torpedo torpedo
Tylosurus acus imperialis
Umbrina cirrosa
Uranoscopus scaber
Xiphias gladius
Xyrichthys novacula
Zeus faber

Annex 3

Outline of the measures / sub-measures and targeted outcomes by 2030 for NSICZM Strategic goals 1.1. Protect Nature, Landscape and Cultural assets efficiently and Strategic goal 1.2. Manage Protected Natural assets, ecologically valuable habitats and ecosystems of the Coastal Zone sustainably

a) Strategic goal 1.1. Protect Nature, Landscape and Cultural assets efficiently

THEMATIC AREA	Preservation of nature, landscape and cultural assets	
STRATEGIC GOAL	PROTECT NATURE, LANDSCAPE AND CULTURAL ASSETS EFFICIENTLY	
RESPONS-SIBLE ENTI-TIES	Lead entities: Ministry of Sustainable Development and Tourism, Environmental Protection Agency, Administration for the Protection of Cultural Heritage, local governments in the coastal zone Entities involved in implementation: Ministry of Agriculture and Rural Development, Ministry of Culture with Administration for the Protection of Cultural Heritage, Ministry of Transport and Maritime Affairs, Public Enterprise (future Agency) for Coastal Zone Management, scientific institutions (University of Montenegro: Faculty of Natural Sciences and Mathematics, Institute of Marine Biology), civil sector organisations and NGO.	
MEASURES	SUB-MEASURES	TARGET OUT-COMES TO BE ACHIEVED BY 2030
Apply instruments for conservation of natural resources, ecologically valuable habitats and eco-systems	— Amend the Law on nature protection, Law on forests and regulations governing economic activities in the coastal zone with regard to requirements for biodiversity conservation and application of ecosystem approach set out by the Protocol on ICZM and relevant EU legislation (primarily Habitats Directive 93/626/EEC, Birds Directive 2009/147/EC), UN Convention on Biological Diversity, while ensuring their mutual harmonisation. — Integrate environmental protection principles, goals, measures and instruments into sectoral policies and plans. — Build capacity for the application of ecosystem approach by: – preparing technical guidelines; – implementing pilot projects; – capacity building of public administration through information exchange, transfer of knowledge and best practices available in the framework of regional cooperation (primarily with UNEP/MAP) and with the EU member states; – encouraging cooperation between science and public administration through active participation in the development of technical baselines for the application of ecosystem approach, monitoring of and reporting on the state of marine ecosystem, preparation of programmes, projects and technical manuals; – encouraging cooperation between business sector and public administration in financing programmes and projects related to the application of ecosystem approach through social responsibility mechanisms.	Based on indicators of good environ-mental status of the sea and ecosystem approach indica-tors, status of the marine ecosystem has been assessed as good

Apply instruments for conservation of natural resources, ecologically valuable habitats and eco-systems	— Improve the application of: – strategic assessments of the impacts of spatial and development plans on the environment of protected natural assets, ecologically valuable habitats and ecosystems of the coastal zone, – Environmental impact assessment for projects in protected natural as-sets and potential areas of the National Ecological Network (EMERALD, IBA, IPA), particularly those which include natural habitats and ecosystems of the coastal zone. — Facilitate the use of appropriate/ acceptability assessment by: – supporting transfer of knowledge and best practice experiences through development of guides and technical manuals for its implementation; – testing its use at the sites of future Ecological Network in the coastal zone. 1.1.1.6 Improve availability and update of data on the state of terrestrial and marine biodiversity by: – improving monitoring of the state of biodiversity in the terrestrial part of the coastal zone; – establishing inventory of the state of biodiversity of the coastal zone; – development of technical baselines (in GIS format) for spatial planning with regard to presence, state and values of habitats and species; – exchanging data in the framework of cooperation in the Adriatic and Mediterranean and with the European Environmental Protection Agency.	Use of strategic impact assessment and environmental impact assessment is improved, as is the use of appropriate/ acceptability assessment Key habitats in the marine and land parts of the coastal zone are not lost

Protect and manage cultural assets	__ Harmonise legislation in the area of spatial planning, nature, environment and cultural heritage protection with the European Landscape Convention determining, amongst other things, protection of exceptionally valuable landscapes. __ Adopt landscape policy and ensure the following as a part of its implementation: – develop landscape typology for Montenegro, singling out landscape of the coastal region in the framework of landscape regionalisation; – in the course of development of landscape typology, prepare technical baselines for the protection of outstanding landscapes; – in the course of development of spatial planning documents at all levels, it is mandatory to prepare the landscape plan which is harmonised with the overall planning solution and which should contain the following: clear concept of development and protection of (locally) important/ recognisable landscapes, certain conditions for the development of activities/ interventions, as well as the guidelines on development and protection of landscapes for which there is a need for special (local) landscape protection; – guidelines on development and protection of landscapes are operational and go beyond traditional protection concept, where that is deemed necessary, and take into account the need to create new landscape; – close attention should be devoted to the landscape in the narrow coastal zone (±1000 m from the coast, depending on the characteristics), remediation of degraded areas, planning of green systems and landscape-architectural development of the open space in settlements; – particularly address issues of landscape (landscape-architectural) development of the coastline and hinterlands of beaches, establishment of green protective zones between beaches and urbanised areas, architectural design of the structures on beaches and landscape rehabilitation in degraded areas; – coastal setback should be applied as one of the basic instruments for preservation of the coastal landscape which, in terms of development of tourism capacities, is not a limitation but a potential for establishment of the quality landscape-architectural development; – raise awareness about the importance of landscapes through various forms of promotion and educational curricula.	Landscape is integrated into spatial plans

Protect and manage cultural assets	__ Amend the Law on protection of cultural assets by prescribing in situ conservation of cultural assets on land and at sea and by improving the existing norms related to the protection of underwater heritage. __ Perform re-assessment of movable and immovable cultural assets and establish guidelines on cultural assets in spatial planning documents including: – analysis of the state of cultural heritage in the coastal zone; – definition of functions (way of using, purpose) of individual cultural assets and their relation with the surrounding space; – where necessary, re-definition of the status and of protection measures for cultural assets; – rehabilitation of prioritised cultural assets, with prior preparation of technical baselines for conservation; – preparation of technical baseline for protection of underwater cultural heritage; – Incentives for cultural activities rooted in the cultural heritage of Monte-negro. 1.1.3.3 Develop information system for the registry of cultural assets taking into account needs of spatial planning in data formatting by: – mapping the state, values, conditions and measures for preservation of cultural assets in GIS format; – setting priorities in development of the registry of cultural assets in accordance with the spatial planning needs and spatial planning programme. 1.1.3.4 In implementing development and spatial planning directions, ensure compliance with recommendations of significance for the protection of natural and cultural-historic area of the Bay of Kotor-Risan, as UNESCO world heritage site, in accordance with the 2011 Management Plan. 1.1.3.5 Incentivise cultural activities based on cultural heritage and preservation of intangible cultural heritage with the aim of preserving specificities and recognisability of the coastal zone of Montenegro	Conditions for the protection of cultural assets are integrated into spatial and development plans All important cultural monuments are functional and in good condition
Provide for efficient supervision and control of the use of coastal zone resources	__ Priorities include: – improvement of coordination in actions of inspection services responsible for supervision and control of fisheries, maritime activities, sea pollution caused by vessels, environmental protection, water protection, protection of space and construction, as well as coordination of their actions with communal inspection services; – strengthening of technical and administrative capacities of inspection services, particularly from the perspective of preventing the use of prohibited means in fishing, prohibited introduction of invasive species, illegal construction, commercial-tourist utilisation of natural and cultural heritage on land and at sea.	Technical and administrative capacities of inspection services are improved, as is efficiency of their coordinated operation

b) Strategic goal 1.2. Manage Protected Natural assets, ecologically valuable habitats and ecosystems of the Coastal Zone sustainably

THEMATIC AREA	Preservation of nature, landscape and cultural assets
STRATEGIC GOAL	MANAGE PROTECTED NATURAL ASSETS, ECOLOGICALLY VALUABLE HABITATS AND ECOSYS-TEMS OF THE COASTAL ZONE SUSTAINABLY
RESPONS-SIBLE ENTI-TIES	ead entities: Ministry of Sustainable Development and Tourism, Environmental Protection Agency, Public Enterprise (future Agency) for Coastal Zone Management, local governments in the coastal zone Entities involved in implementation: PE National Parks of Montenegro, scientific institutions (University of Montenegro: Faculty of Natural Sciences and Mathematics, Institute of Marine Biology etc.), civil society organisations and NGO
MEASURES	SUB-MEASURES
Identify and evaluate ecologically valuable habitats and eco-systems of the coastal zone and review status of the existing protected natural assets	__ Map and evaluate i.e. establish the state of (by using GIS): – the protected natural areas on land and ecologically valuable habitats and ecosystems of the coastal zone which are proposed for protection, first of all monuments of nature, landscapes with outstanding natural characteristics and Bay of Kotor-Risan which is a UNESCO world heritage site; – Marine habitats in the territorial sea of Montenegro, as well as in inter-national waters, primarily at seven priority locations: 1. Luštica (from Mamula to the Mačak cape), 2. Zone from the cape Trašte to Platamuni (with narrow zone of strict protection from the cape Žukovac to the cape Kostovica), 3. Broader zone of the Katič island, 4. Zone from the cape Volujica to Dobre Vode, 5. Zone from the cape Komina to the cape next to the Old Ulcinj island, 6. Zone of the cove Valdanos to Velika cove and 7. Seka Đerane with southern part of the zone in front of Velika beach to the Bojana river estuary. __ On the basis of the established state: – review status of the existing protected natural assets as well as of potentially protected natural assets; – determine the extent and boundaries of natural assets and of priority marine habitat locations which are proposed for protection; – identify new protected natural assets that should be designated on priority basis by 2020, in accordance with the valid spatial planning guidelines and requirements for establishment of the Ecological Network and other relevant international standards through an open participatory process, with participation of relevant stakeholders (administration at national and local levels, state authorities, scientific and expert institutions, non-governmental and civil society organisations).
Build capacities for integrated management of natural resources, ecologically valuable habitats and eco-systems of the coastal zone	__ Establish efficient management structure for the management of protect-ed natural assets including: – preparation of protection studies and management plans and provision of optimal funding for the management of protected natural resources in accordance with results of evaluation and inventory of terrestrial and marine biodiversity; – application of optimal management practices; – halting the loss of biodiversity value and ecosystem degradation; – implementation of rehabilitation and restoration measures at the sites with endangered habitats; – harmonisation of development-investment plans with the management plans for protected natural assets; – increased benefits from ecosystem services by implementing measures for green and blue growth, primarily through sustainable utilisation of ecosystem services for tourism; – enhancement of the Law on nature protection and Law on public maritime domain through inclusion of norms that enable integrated management of protected natural areas, ecologically valuable habitats and ecosystems of the coastal zone as parts of the future National Ecological Network, including collection of information and reporting on the state of biodiversity of the coastal zone. __ Improve the existing capacities for the management of protected natural assets through: – implementation of training programmes and training activities (in the context of obligations arising from transposition of the Habitats Directive 93/626/EEC, Birds Directive 2009/147/EC, Marine Strategy Framework Directive 2008/56/EC, establishment of the National Ecological Network, integrated coastal zone management and maritime spatial planning in accordance with the European Union Directive establishing a framework for maritime spatial planning 2014/89/EU, cooperation with UNEP/MAP and GFCM); – Transfer of knowledge with the aim to apply the best available practice in the management of natural assets, particularly in the management of protected marine natural assets (by using experience gained in the framework of MEDPAN).

SPA/RAC WORKING AREAS

*SPA/ RAC, the UNEP/ MAP **Specially Protected Areas Regional Activity Centre**, was created in 1985 to assist the Contracting Parties to the Barcelona Convention (21 Mediterranean contries and the European Union) in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).*

POST-2020 SAPBIO

Strategic Action Programme for the **Conservation** of **Biodiversity** and **Sustainable Management** of **Natural Resources** in the **Mediterranean Region**

SPAMI

Specially Protected Areas of **Mediterranean Importance**

Marine turtles

Cetaceans

Specially Protected Areas

Monitoring

Mediterranean Monk Seal

Cartilaginous fishes
(Chondrichtyans)

Coralligenous and other calcareous bio-concretions

Marine vegetation

Marine and coastal bird species

Listed in Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean

Dark Habitats

Habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena

Species introduction and invasive species

POST-2020

SAP BIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC
The Mediterranean Biodiversity Centre

Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafet
B.P. 337 - 1080 - Tunis Cedex - Tunisia
+216 71 206 649 / +216 71 206 485
car-asp@spa-rac.org
www.spa-rac.org

MAVA FONDATION POUR LA NATURE

This publication has been prepared
with the financial support of the MAVA foundation