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POST-2020 SAP BIO

BOSNIA AND HERZEGOVINA CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

BOSNIA AND HERZEGOVINA CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

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

POST-2020 SAP BIO

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

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List of Acronyms

B&H	Bosnia and Herzegovina
FB&H	Federation of Bosnia and Herzegovina
GEF	Global Environment Facility
HNC	Herzegovina-Neretva Canton
IUCN	International Union for Conservation of Nature
Km	kilometre
M	million
m	meter
MEDPOL	Mediterranean Pollution Monitoring
MPA	Marine Protected Area
NGO	Non-Governmental Organization
SPA/RAC	Regional Activity Centre for Specially Protected Areas
UNEP	United Nations Environment Programme

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Executive Summary

In pre 2020 period B&H made a relatively slow progress in SAP/BIO implementation and did not do much in terms of marine and coastal environment protection. Since the marine and coastal wildlife was (and it's still) greatly unknown, there was nothing much to do, except few basic stuff mostly succeeded by former Yugoslavia and some progress in terms of the basic protection on the initiative of the local community. The Bosnia and Herzegovina did almost nothing to start and favourites the marine wildlife research, including the invasive species. The result of that is a completely unknown of the ecosystem and species quantitative and quality distribution in marine environment in Bosnia and Herzegovina. The final result of this was that no marine species was listed in the Red list of flora, fauna and fungi in Bosnia and Herzegovina (and by that no marine species is legally protected) and no marine invasive species was placed in the Study on invasive species of flora and fauna of Bosnia and Herzegovina with a List of invasive species (Đug *et al.*, 2019).

This document data was based upon data obtained by individual or NGO researchers and by some project results which was directly connected to the creation of first MPA in Bosnia and Herzegovina.

Today, the most important critical marine conservation issue is lack of knowledge on marine ecosystems and wildlife together with huge gap (unknown) on marine invasive species. The serious issue can be the lack of Marine Spatial Plan to but this was (and still is) under the jurisdiction of the local community which placed great effort in preserving the environment and oppose any major project which could seriously harmed the marine and coastal environment.

By observing trends in the field of protection and research of marine ecosystems and species, their exploitation and protection in the past, and past and possible future negative effects on marine and coastal habitats in Bosnia and Herzegovina, the 11 following urgent actions are needed for the successful results in post 2020 period:

- making an official list of marine habitats/ecosystems;
- marine habitat mapping,
- start of research of all marine life;
- compose a list of marine species in Bosnia and Herzegovina;
- conduct a yearly based regular monitoring and researching of marine habitats and species;
- Research and create a list of invasive marine species (flora, fauna and fungi);

- update its Red list of species: Fungi, Flora and Fauna with the existing data for the marine species for Bosnia and Herzegovina as well as with the species from Annex II of the ASP/BD Protocol;
- urgently protect the Litophaga litophaga (Linnaeus, 1758) species and prohibit the collection, trade and consummation of this species in the territory of Bosnia and Herzegovina;
- finish the Marine Spatial Plan for Bosnia and Herzegovina;
- prohibit the expansion of tourist capacities, the construction of new infrastructure facilities, and the conversion of rocky shores into tourist beaches;
- proclamation of the first MPA in Bosnia and Herzegovina;
- strength the human and technical capacities of local utility company to prevent LBS littering.

All of these urgent actions can be realized, but the huge amounts of funding's are necessary in long-term period to realize all the above mentioned actions.

The funding problems in Bosnia and Herzegovina begin with lack of specialized institution/ agency responsible for marine and coastal wildlife research. This lead to the serious lack of human and technical capacities with NGOs in Bosnia and Herzegovina to conduct research and obtain domestic and international funds. The Ministry of Environment and Tourism of Bosnia and Herzegovina should make an initiative towards Environmental Protection Fund of Bosnia and Herzegovina to allocate yearly funds which will promote and support the research of Marine and Coastal ecosystems. This will function as a start (initial capsule) for the researchers to start planning of their research and investing in human capacities much needed for the research. This will finally lead to the more specialized and more complex research which will needed more funds from the international organizations.

International funding is opened for Bosnia and Herzegovina. Since Bosnia and Herzegovina is land which have its economy into transition period and since Bosnia and Herzegovina is not an EU member, the governmental bodies, NGOs and scientific institutions can apply for numerous international grants. However, lack of human capacities within all potential research users was a serious issue for successful applying.

The international cooperation, especially with relevant institutions from the Republic of Croatia and Montenegro is a must in the beginning stage. The funds such as: IPA Adriatic, Adriatic-Ionian Programme, IPA Bosnia and Herzegovina - Montenegro and similar can be a great start up for Bosnia and Herzegovina institutions and NGOs to start learning and researching the marine wildlife.

The proclamation of the first MPA in Bosnia and Herzegovina will certainly open much more fund opportunities for researchers, especially with the neighbouring Croatia, which already have proclaimed MPA bordering Bosnia and Herzegovina. This transboundary perspective can be one of the strongest in the area and it will contribute the protection of the whole Mali Stone Bay and Bosnia and Herzegovina marine environment. This is especially important since Mali Ston Bay, together with the smaller bays showed unique and sensible biodiversity in the whole Adriatic Sea, influenced by inland fresh water.

For this perspective to be a reality, Bosnia and Herzegovina needs to proclaim its first MPA as soon as possible and establish cooperation with the Mali Ston MPA in the republic of Croatia.

The whole perspective of the Post 2020 marine and coastal preservation in Bosnia and Herzegovina is quite good if the urgent actions are realized. The realization of these actions will require great effort, amount of time and funds, but this is very possible to realize given in fact that soon Bosnia and Herzegovina will have its first MPA and that Bosnia and Herzegovina will have more than 10% of protected marine and coastal territory required by the Aichi Biodiversity target 11.

With the expected future strong support from the government and their relevant institutions and precise distribution of funds (for marine and coastal research and protection), together with established cross-border cooperation and obtaining much needed international funds, the Bosnia and Herzegovina can protect and preserve its marine and coastal biodiversity by 2030.

1.

Reference documents and information consulted

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1.1. Documents provided by SPA/RAC and international consultants

- The SPA/RAC provided basic documents such as:
- List of protected species from SPA/BD Protocol (Annex II),
- All data related top Bosnia and Herzegovina reporting and progress send to SPA/RAC, which were available to the author since he is an active representative of Bosnia and Herzegovina in most of SPA/RAC meetings and document preparation,
- SPA/RAC also provide the Format, Contents and Annotated contents and structure of this document.

Bosnia and Herzegovina did not do much in terms of marine protection which can be send to SPA/RAC and which could be useful for this Document preparation. SPA/RAC was opened and communicative to all needs in form of data for the creation of this Document.

1.2. National documents and publications identified and available

Most of national documents were available via online view, and most of them are different Strategies, decisions, Laws. Most important documents available were:

- GEF/UNEP (2016): Strategy and Action Plan for the protection of biodiversity in Bosnia and Herzegovina (2015-2020);
- Red List of: Flora, Fauna and Fungi in Bosnia and Herzegovina;
- Greenway (2015): List of NATURA 2000 sites in Bosnia and Herzegovina. Ministry of Environment and Tourism of Bosnia and Herzegovina;
- Study on invasive species of flora and fauna of Bosnia and Herzegovina with a List of invasive species ((Đug *et al.,* 2019);
- Law on nature protection of Bosnia and Herzegovina (Official Gazette of Bosnia and Herzegovina, no 66/13);
- Law of environment protection (Official Gazette of Bosnia and Herzegovina, 33/03 and 38/09);
- Law on marine Fisheries of HNC. Official Gazette of HNC no. 7/14;
- The Law on Waters of FBiH 70/06,
- Water Management Strategy of FBiH 2010-2022;
- Water Management Plan of VPJM 2016-2021;

- https://avpjm.jadran.ba/kvaliteta-voda-pregled
- The annual reports on the state of waters from the website www.jadran.ba for 2017. and 2018.
- GEF/UNEP (2019): Achieving biodiversity conservation through the establishment and effective management of protected areas and capacity building for nature protection in Bosnia and Herzegovina: Draft of the Expert Explanation for the proclamation of protected area of category V - Protected Landscape Mediteranetum, Neum with part of the marine waters. Federal Ministry of Environment and Tourism.

These documents were enough to create adequate picture about current state of marine environment in Bosnia and Herzegovina. Some documents were quite uninformative because they did not contain data on marine ecosystems and species.

The biggest downgrade of all of these Strategy and baseline documents like the Red list are lack of any information about marine ecosystem and species. This must be correct in next document update.

The only exception regarding these documents were the GEF/UNEP (2019) and HNC (2014) documents which were very informative regarding the marine environment and species.

1.3. Other documents

Regarding other available documents, there were the only valuable literature regarding the data collection of marine invasive species, and all other species and ecosystems. The base of this Document is composed of data collected from these papers. The papers were obtained from the internet mostly and some of them were is given at a concession by the author. All papers are in the Annex section of this Document and data from them are cited in the text.

1.4. Quality and comprehensiveness of available information documents

The quality of available documents was mainly poor, except used scientific paper literature. The Strategies and legal documents (Law and etc.), were only of informative character while other documents, like the Red list of Flora, Fauna and Fungi was not of any use because they did not contain any marine wildlife species.

The document of great help was GEF/UNEP document of first potential MPA in Bosnia and Herzegovina which contain necessary information about marine life and its future preservation.

Needless to say is that Bosnia and Herzegovina do not invest much in marine wildlife research, so the data were hard to obtain but their quality is undisputed.

2.

Marine and coastal ecosystem status in Bosnia and Herzegovina

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2.1. Biological characteristics

2.1.1. Water column habitats

The Neum-Klek gulf including other territorial sea water of Bosnia and Herzegovina have average depth of 22 meters. The Deepest point goes up to 31m so it can be said that Bosnia and Herzegovina has only littoral zone in terms of sea depth so water column habitats are excluded in this matter. However, two major habitat types are present in Bosnia and Herzegovina waters:

- Pelagic and,
- Benthic

Pelagic habitat is mainly constructed out of fito and zooplankton communities and with fish and other pelagic animals. Plankton communities are not researched well to talk about any serious results or to present data.

2.1.2. Invertebrates bottom fauna, macro-algae and angiosperms

There is not enough data about the benthic fauna in Bosnia and Herzegovina territorial waters. Available research is only available through some NGO guided projects and some other projects which purpose was not to research biology but pollution and similar. However, in past 6 years, few authors pay their attention to research the flora and fauna of Bosnia and Herzegovina territorial waters. These research were primarily small-scale, with lack of necessary funds and special equipment for research.

Floristic compound of Bosnia and Herzegovina is primarily represented by algae from genus: *Fucus*, *Padina* and *Caulerpa*. Bosnia and Herzegovina, even if there is not enough research contain vide range of algae species. This may be due to the fact that Neum-Klek bay has less salinity level (due to the influence of underground fresh water). Most interesting of the possible algae species are: *Cymodocea nodosa* (Ucria) Ascherson, *Posidonia oceanica* (Linnaeus) Delile, *Zostera marina* Linnaeus, *Zostera noltii* Hornemann all which are listed in the Annex II of the SPA/BD Protocol. All of these species are not scientifically proved in Bosnia and Herzegovina waters but, from individual findings it can be said that these species live in this area.

The benthic invertebrate fauna is more/less good researched than flora is. Few papers from 2014 onwards showed that Bosnia and Herzegovina possess significantly high biodiversity of benthic invertebrate fauna. Most of authors (Delić, D. *et al.,* 2019; Čelebičić, M. *et al.,* 2018, Memišević, E. *et al.,* 2018, Memišević, E. *et al.,* 2018b; Lelo, A. *et al.,* 2018; Lelo, S. *et al.,* 2017; Dedić, N. *et al.,* 2016; Fusco, M. *et al.,* 2015; Durgut, S. *et al.,* 2015; Gajić, *et al.,* 2014; Gajić, A. 2013) report on various groups living in Neum-Klek bay. The complete list of invertebrate fauna is in next (table1).

Table 1
List of invertebrate species confirmed in B&H marine environment

Group	Species	SPA/BD Protocol (Annex II)	FB&H red List
	Schizobrachiella sanguinea (Norman, 1868)	No	No
Bryozoa	*Clavelina lepadiformis* (Müller, 1776)	No	No
	Calpensia nobilis (Esper, 1796)	No	No
	Aplysia punctata (Cuvier, 1803)	No	No
	Aplysia fasciata (Poiret, 1789)	No	No
	Bursatella leachi (Blainville, 1817)	No	No
	Hexaplex trunculus (Linnaeus, 1758)	No	No
Mollusca	*Bolinus brandaris* (Linnaeus, 1758)	No	No
	Eledone moschata (Lamarck, 1798)	No	No
	Sepietta oweniana (d'Orbigni, 1843),	No	No
	Pinna nobilis L.	Yes	No
	Lithophaga lithophaga (Linnaeus, 1758)	Yes	No
	Arbacia lixula (Linnaeus, 1758)	No	No
	Sphaerechinus granularis (Lamarck, 1816)	No	No
Echinodermata	*Echinus acutus* (Lamarck, 1816)	No	No
	Paracentrodus lividus (Lamarck, 1816)	No	No
	Psamechinus microtuberculatus (Blainville, 1825)	No	No
	Spantangus purpureus (O. F. Müller, 1776)	No	No
	Ophiothrix fragilis (Abildgaard, in O.F. Muller, 1789)	No	No
	Ophioderma longicauda (Retzius, 1805)	No	No
	Ophiura (Linnaeus, 1758)	No	No
	Astropecten aurantiacus (Linnaeus, 1758)	No	No
Echinodermata	*Asterina gibbosa* (Pennant, 1777)	No	No
	Echinaster sepositus (Retzuis, 1783)	No	No
	Marthasterias glacialis (Linnaeus, 1758)	No	No
	Coscinasterias tenuispina (Lamarck, 1816)	No	No
	Luidia ciliaris (Philippi, 1837)	No	No
	Anseropoda placenta (Pennant, 1777)	No	No
Arthropodes	*Pagurus prideaux* (Leach, 1815)	No	No
Scyphozoa	*Drymonema dalmatinum* (Haeckel, 1880)	No	No
	Stylea plicata (Lesueur, 1823)	No	No
	Botrylloides violaceus (Oka, 1927)	No	No
	Botrylloides diegensis, (Ritter & Forsyth, 1917)	No	No
	Halocynthia papillosa (Linnaeus, 1767)	No	No
	Ciona intestinalis (Linnaeus, 1767)	No	No
Tunicata	*Ascidia mentula (Müller, 1776)*	No	No
	Phallusia mammillata (Cuvier, 1815)	No	No
	Didemnum coriaceum (Drasche, 1883)	No	No
	Didemnum vexillum (Kott, 2002)	No	No
	Clavelina lepadiformis (Müller, 1776)	No	No
	Aplidium conicum (Olivi, 1792)	No	No

So far, only two invertebrate species are listed in Annex Ii of SPA/BD Protocol. None of the invertebrate species listed in Table 1 is protected by law or mention in the Red List of Bosnia and Herzegovina with their conservation status. This was an obligation of Bosnia and Herzegovina as Bosnia and Herzegovina signed a Barcelona Convention.

2.1.3 Vertebrates (exl. fish from commercial interest)

Vertebrate marine fauna is not researched well to have precise scientific data to present. Few researchers, done some small-scale research and publish the data which will be present here (Kahrić, A., Gajić, A. 2016; Kahrić, A. *et al.*, 2015). Data for large vertebrates such as: sea turtles and sea mammals were obtained from the local NGO observers, but they are not published officially. In Bosnia and Herzegovina so far only few species of vertebrates (exc. fish) were discovered and they are listed in the table below.

Table 2
List of vertebrate species confirmed in B&H marine environment

Group	Species	SPA/BD Protocol (Annex II)	FB&H red List
	Hippocampus guttulatus (Cuvier, 1829)	Yes	No
	Raja miraletus (Linnaeus, 1758)	No	No
Pisces	*Raja clavata (Linnaeus, 1758)*	No	No
	Dasyatis pastinaca (Linnaeus, 1758)	No	No
	Torpedo marmorata (Risso, 1810)	No	No

Group	Species	SPA/BD Protocol (Annex II)	FB&H red List
Pisces	*Myliobatis aquila (Linnaeus, 1758)*	No	No
	Squalus acanthias (Linnaeus, 1758)	No	No
	Squatina Linnaeus 1758	Yes	No
	Scyliorhinus canicula (Linnaeus, 1758)	No	No
	Scyliorhinus stellaris (Linnaeus, 1758)	No	No
	Mustelus asterias (Cloquet, 1821)	No	No
	Mustelus (Linnaeus, 1758)	No	No
	Prionace glauca (Linnaeus, 1758)	No	No
Reptiles	*Chelonia mydas (Linnaeus, 1758)*	Yes	No
	Caretta (Linnaeus, 1758)	Yes	No
	Dermochelys coriacea (Vandelli, 1761)	Yes	No
Mammals	*Tursiops truncatus (Montagu, 1821)*	Yes	No

Historically there are evidence of the presence of *Monachus monachus* (Hermann, 1779), but that cannot be confirmed in recent period, mostly due to the lack of research and monitoring. Data from the neighbouring Croatia shows that the species is absent from the area (regionally extinct).

So far, only six vertebrate species living in Bosnia and Herzegovina are listed in SPA/BD Annex II and none of all listed in the Table 2 is in the Red list of Flora, Fauna and Fungi of Bosnia and Herzegovina.

2.1.4 Invasive species

So far, there is no official data of the presence of invasive species in Bosnia and Herzegovina territorial waters. However, there is one paper about the presence of the blue crab *Callinectes sapidus* Rathbun, 1896 (Dizdarević, S. *et al.,* 2016). So far, Bosnia and Herzegovina had done its Study on invasive species for Bosnia and Herzegovina part, this study can be considered as "incomplete" due to the lack of information about marine invasive species.

It is worth to mention that this lack of information is consequence of serious lack of research of marine invasive species in Bosnia and Herzegovina territorial waters which needs to be done as soon as possible to get the exact picture about this potential problem.

2.1.5 Species of commercial interest

So far neither marine species is of commercial interest in Bosnia and Herzegovina. Since Bosnia and Herzegovina has only 25km long coastline, there is no commercial fishery fleet, or commercial exploit of fish or other animals. However, there were some notice about illegal commercial activity regarding collecting the *Lithophaga lithophaga* (Linnaeus, 1758) species in Bosnia and Herzegovina and neighbouring Republic of Croatia. This species is not legally protected in Bosnia and Herzegovina so potential destruction of underwater habitats and species may occur in future. The cantonal government of Herzegovina-Neretva Canton (in which territory is the Neum and coastal water) issue the Law on Sea Fishery (Official gazette of HNC, 7/2014) who regulate all "hunting" activities on sea (surface and bottom). Article 10. of this law prescribe fishery in Bosnia and Herzegovina as:

1) "Fishing is a small coastal, sport, recreational, scientific fishing and scientific research purposes for fishing for public aquariums.

2) In order to protect and preserve fish and others marine organisms the commercial fishing on sea is prohibited, except small-scale coastal fishing."

The Article 10. of this law is first step in protection and preserving marine fauna in Bosnia and Herzegovina, and also preserving traditional small-scale coastal fishing in the area. It is worth to mention that special permission is required for coastal small-scale fishing which is also a step forward for the future marine fauna protection.

2.1.6 Other

The only commercial activity regarding to fishery are aquacultures. Currently there are 2 aquacultures operating in B&H sea waters with cultivating two species: ***Dicentrarchus labrax*** (Linnaeus, 1758). and ***Sparus aurata*** (Linnaeus, 1758).

2.2. Main habitat types

The Bosnia and Herzegovina territorial waters are situated in two bay´s:

- Mali Ston bay and,
- Neum-Klek bay.

The country has one peninsula and two islands in only 25 km of coastline. The habitats in this particular area of Adriatic Sea are unique and determined by the influence of sea currents and fresh waters coming from the inland. Since the area is dominated by karst landscape, which is very permeable for surface water, many underground springs have tending of dropping the sea water salinity. The salinity in Bosnia and Herzegovina territorial waters ranged between 32.0 in April and 38.4 in December. Warm summer months are characterized by lower salinity, while in the cooler months of winter and spring salinity are mostly related to the precipitation regime and the extremely dynamic water flow from the underwater karstic springs that feed the bay (Hafner, *et al.,* 2018). These characteristics are good for the mussel aquaculture development, which are the tradition in the area and it can be a possible nursery from multiple animal species.

According with the available literature data, underwater floristic component of the Bosnia and Herzegovina sea water is researched well and contains around 207 species of algae

from three divisions: *Rhodophyta, Phaeophyta* and *Chlorophyta*.

The most valuable sea vegetation is preserved on the south-western part of Bosnia and Herzegovina after Klek peninsula, between cape Rep and the island of Mali Školj where was found most of the valuable phytocenosis. This area contains ten following communities:

1 _ *Catenelletum repentis* (Lor.);
2 _ *Nemallo-Laurencietum papillosae* (Zal. 1942),
3 _ *Fucetum virsoidis* (Zal. 1942),
4 _ *Ceramio-Corallinetum officinalis* (Zal. 1942),
5 _ *Cystseiretum barbatae* (Zal. 1942),
6 _ *Cystoseiretum adriatiae-corniculatae* (Lov. 1975),
7 _ *Sargasso-Cystoseiretm latiramosae* (Lor. Zal. 1942).,
8 _ *Botryocladietum botryoidis* (Boud. et Cin. 1982).,
9 _ *Udoteo-Peyssonnellietum squamariae* (Zal. 1942),
10 _ *Pseudolithopyllo-Halimedetum* (Feld. 1937).

Within the Neum Bay and in the inner part of the Mali Ston Bay, due to weaker hydrodynamics of the sea, increased natural eutrophication and a sharp increase in anthropogenic pollution, a smaller number of communities (7 in total) was identified. This vegetation is poorer and more uniform ruderal vegetation of more or less nitrophilous and other resistant algae:

1 _ *Zosterelletum noltii* (Herm. Giac.1972),
2 _ *Cymodoceetum nodosae* (Giac.et Pign. 1978),
3 _ *Enteromorphetum proliferae-intertinalis* (Zal. 1942),
4 _ *Pterocladio-Ulvetum rigidae* (Feld. 1937),
5 _ *Rhodymenietum ardissonei* (Feld. 1937),
6 _ *Zanardinio-Codietum bursae* (Lor. Zal.1942), and
7 _ *Rhytiphloeo-Vidalietum volubillis* (Lor. Zal. 1942).

According to the: „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" in Bosnia and Herzegovina has only littoral and infralittoral area. Even if Bosnia and Herzegovina did not classify their habitats according to this list it can be said that Bosnia and Herzegovina contains several habitats described in table below.

Table 3

Classification of habitats in B&H according to the SPA/RAC updated Reference List of Marine Habitat Types

MA1.5 Littoral rock	MA1.51 Supralittoral rock	MA1.51b Wracks of dead leaves of macrophytes
	MA1.54 Lower mediolittoral rock	MA1.542 Association with Fucales
MA3.5 Littoral coarse sediments	MA3.51 Supralittoral coarse sediment	MA3.511 Association with macrophytes
MA4.5 Littoral mixed sediment	MA4.51 Supralittoral mixed sediment	MA4.511 Association with macrophytes
MA6.5 Littoral mud	MA6.51 Supralittoral mud	MA6.511 Association with macrophytes
MA6.52 Mediolittoral mud	MA6.52a Habitats of transitional waters (e.g. estuaries and lagoons)	MA6.521a Association with marine angiosperms (e.g. Zostera noltei, Ruppia maritima)
MB1.5 Infralittoral rock	MB1.51 Algal-dominated infralittoral rock	MB1.511a Association with Fucales
	MB1.51c Well illuminated infralittoral rock, sheltered	MB1.511c Association with Fucales
	MB1.53 Infralittoral rock affected by sediments	MB1.537 Facies with endolitic species (e.g. ***Lithophaga***, ***Cliona spp.***)
	MB2.54 ***Posidonia oceanica*** meadows	MB2.543 ***Posidonia oceanica*** meadow on sand, coarse or mixed sediment

According to the NATURA 2000 proposal sites in Bosnia and Herzegovina, the area of Neum-Klek Bay, with whole Klek peninsula and part of Mali Ston Bay in Bosnia and Herzegovina should be proclaimed as NATURA 2000 site coded BA8200061 size of 1,942 ha. There is no much data about why the site has been proposed to NATURA 2000 Network.

Figure 1.

NATURA 2000 proposed site BA8200061

2.3. Singular habitats in the country

In Bosnia and Herzegovina so far, there is no singular habitats for the country or Mediterranean. Unique habitats are the one contain species from Annex II of SPA/BD Protocol like: *Cymodocea nodosa* ((Ucria) Ascherdon, 1869), *Posidonia oceanica* ((L.) Delile, 1813), *Zostera marina* (Linneus, 1753), *Zostera noltii* (Hornem., 1832). Important habitats lately may be the habitats with *Pinna nobilis* (Linnaeus, 1758), regarding their declining in the Mediterranean Sea and Adriatic. The populations of *Pinna nobilis* (Linnaeus, 1758) according to the latest research are stable and healthy.

2.4. Transboundary issues

Currently, Bosnia and Herzegovina has some transboundary issues with the Republic of Croatia regarding sea borders. Dispute is about some territory near top of Klek peninsula and 2 islands of Mali and Veliki Školj. Bosnia and Herzegovina is bordering Special Marine Reserve "Mali Ston" in Croatia which is a MPA. This could lead to potential disputes regarding potential sea pollution and tourist facilities in Bosnia and Herzegovina, but so far, there were good mutual cooperation between Bosnia and Herzegovina and Republic of Croatia in all issues regarding borders and nature protection. Bosnia and Herzegovina build up its first sewage water purifier and together with Croatia there is a plan that all nearby settlements sewage systems in Croatia should be connected to this system.

The possible transboundary problem that may have huge negative impact is the "upper horizon" project in which is planned that huge amounts of freshwater is contained for irrigation and in dams for the electricity production and diverted from one to another watershed area. This project, even if the planning stopped during the war in Bosnia and Herzegovina, can have huge negative impact on underground freshwater flow from land into the Mali Ston Bay and influence on salinity regime in both Bosnia and Herzegovina and Croatia.

The future of part of Bosnia and Herzegovina coastline is to be protected. In 2018 a project of designation of new protected areas in Bosnia and Herzegovina started and part of Bosnia and Herzegovina coastline will be protected as MPA in the future. The future MPA in Bosnia and Herzegovina and existing MPA in Croatia (Mali Ston) should be one transboundary MPA with same levels of protection and protection measures, and to closely collaborate in the future all for the better and efficient protection of Mali Ston Bay.

2.5. Country GAPs

The most important country GAP is lack of scientific knowledge and capacities to conduct regular research of the marine biodiversity. Even if country wants to proclaim its first MPA, the serious lack of knowledge in management of these areas can be potential problem in the future in terms of good and quality management.

Lack of knowledge and experts are accompanied by the lack of funds necessary to maintain and develop of the future MPA and to measure and monitor potential negative impacts on marine environment.

Historical data for the marine flora and fauna are present and available, but the lack of expertise and newer data are serious problem. Lack of the Marine spatial plan is other serious GAP that needs to be resolve as soon as possible.

One of the biggest GAPs in Bosnia and Herzegovina are non-existed data about the invasive species in the marine environment and that Bosnia and Herzegovina did not put any of the marine species in its Red list of flora and fauna, meaning that the marine species currently are not under any protection regime even if Bosnia and Herzegovina signed a Barcelona convention.

3.

Pressures and impacts

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3.1. Biological disturbance

It is unknown whether there is or no biological disturbances in Bosnia and Herzegovina territorial waters.

The presence of invasion species in Bosnia and Herzegovina are not researched well to make adequate conclusions. There is a presence of some species (like the blue crab), that are confirmed by relevant papers, but there are some indices that the following species are present in Bosnia and Herzegovina marine area:

- *Aplysia dactylomela* (Rang, 1828)
- *Percnon gibbesi* (H. Milne-Edwards, 1853) and
- *Asparagopsis taxiformis* ((Delile) Trevis, 1845).

However, there is no scientific record about presence of these invasive species.

Bosnia and Herzegovina had done its Study on invasive species for Bosnia and Herzegovina part, this study can be considered as "incomplete" due to the lack of information about marine invasive species. This is a serious GAP for the future protection of the marine habitats in Bosnia and Herzegovina (Đug *et al.,* 2019).

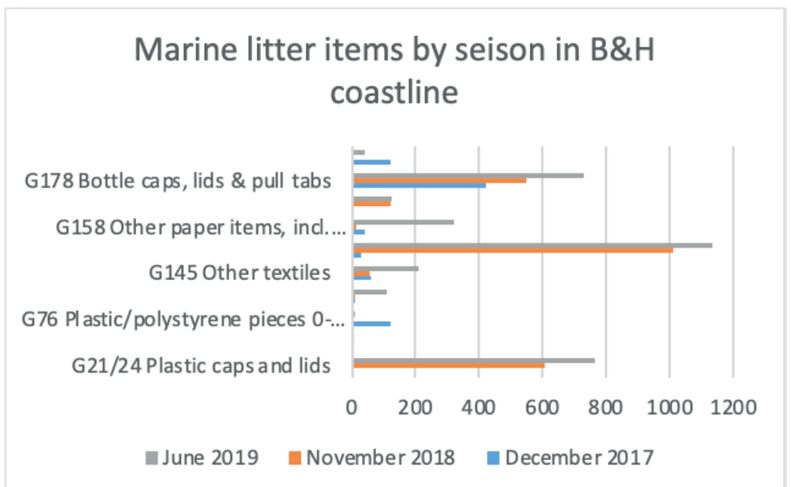
As it is with invasive species, there is no data about presence of the microbial pathogens. Some periodical controls of sea water exist, but they are mainly connected with the inspection of the water quality for swimmers like *E. coli* and similar human pathogens. Bosnia and Herzegovina should establish regular monitoring of potential Marine species pathogens in order to maintain marine populations stabile and healthy. So far, Bosnia and Herzegovina designated a surveilance monitoring station in Neum Bay for surface water monitoring, where, depending on the year and monitoring plan, monitoring is performed 4-12 times, including microbiological parameters (total coliform bacteria, E. coli, intestinal enterococci). In addition, monitoring of bathing water is carried out at 3 bathing areas in the summer months. Since 2020, two new operational monitoring stations have been introduced - one at the entrance to Neum Bay, the other on the side of Mali Ston Bay.

Since Bosnia and Herzegovina has only two aquacultures (fisheries) in marine waters, regular inspections and water quality analyses showed that these facilities do not influence on the sea water quality. The sea water analyses showed that the sea water is almost always oligotrophic. The monitoring of the aquaculture negative impacts on marine ecosystems was discussed, in the Study of Aquaculture from 2016., where it is concluded that aquacultures produced mainly organic waste, as results from feeding of fish. The second main impact came from the derelict fish gear. The inspection of the derelict fishing gear which showed that Bosnia and Herzegovina waters are not under serious pressure from this type of pressure.

Marine litter problem can be characterized as moderate. Most of the litter in Bosnia and Herzegovina came from the tourism activities and most of it can be found on the beaches or in littoral area where there are oscillations caused by Moon tides.

Mainly, the litter composition is made out of smaller particles but yet, in long-term this litter can represent the threat to the marine ecosystems.

Figure 2.
Marine litter classification for B&H (From: HEIS; 2019)



3.2. Vulnerable marine ecosystems

Currently, there is not enough data to conclude is there a vulnerable marine ecosystem in Bosnia and Herzegovina. Based on old field research and some new conformations, it can be said that in Bosnia and Herzegovina there are few particularly vulnerable marine ecosystems, but status of that ecosystems on national level are not researched enough.

Based upon some international status, recent devastations and possible future negative trends, few ecosystems can be considered as vulnerable like:

Ecosystems with *Pinna nobilis* (Linnaeus, 1758) located on the top of the Klek peninsula.

Ecosystems with: *Cymodocea nodosa* (Ucria) (Ascherson, 1869) *Posidonia oceanica* (Linnaeus, 1813) Delile, *Zostera marina* (Linnaeus, 1813) *Zostera noltii* (Hornem., 1832) – sporadically located in the whole Marine area of Bosnia and Herzegovina.

Ecosystems of supralittoral and Infralittoral rocks which contains the populations of *Litophaga litophaga* (Linnaeus, 1758) species which are distributed on the whole Mali Ston Bay part in Bosnia and Herzegovina, including two islands of Mali Školj and Veliki Školj.

Almost all littoral area with all ecosystems can be considered as endangered due to the possible litter pollution. The litter mainly comes from the sea and LBS sources. Sea source can be considered as transboundary pollution and litter mainly comes from the Croatian waters but the origin of the litter itself are mainly other countries.

The LBS litter mainly comes from the local beaches and they are produced by tourist.

The eutrophication as one of the major threats for the bays and shallow seas are not a case in Bosnia and Herzegovina. The eutrophication was the problem until 1980-is when the first wastewater treatment facility was built. Since then, sea water in Bosnia and Herzegovina are oligotrophic and did not contain any of the pathogen bacteria in large quantities.

The scientific assessment is necessary to get the most recent picture about state of all ecosystems in Bosnia and Herzegovina. The Bosnia and Herzegovina also need to know the spatial arrangement of its marine ecosystems, to determine their current condition (health), and to propose measures to improve the condition, if necessary. The first step to protect and save these above mentioned ecosystems is a proclamation of the first MPA in Bosnia and Herzegovina. However, the long-term conservation, together with the effort of neighbouring Croatia will surely save all the vulnerable ecosystems of Mali Ston Bay and Neum-Klek Bay.

3.3. Emerging issues (climate change)

The possible emerging issues can be can be classified into several basic categories:

- Climate changes
- Litter pollution
- Overexploitation of natural resources
- Transmission of the invasive species via ships ballast waters.

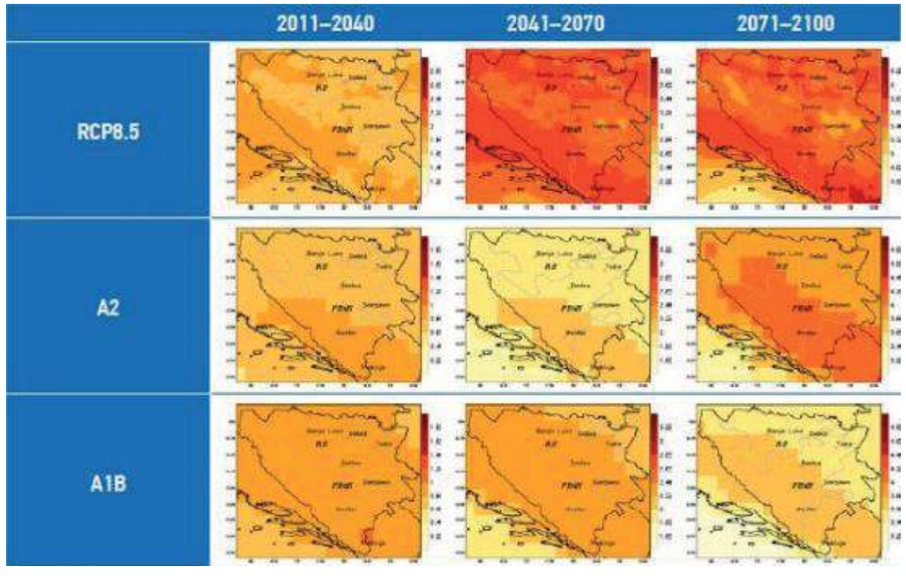
Climate changes

The climate changes represent a serious threat to all seas and oceans, including the marine ecosystems in Bosnia and Herzegovina. Since all the marine environment in Bosnia and Herzegovina are located in so called "nearly closed seas (bays)" with strong influence of nearby Neretva river and other inland freshwaters, the whole marine ecosystems of this area can be considered under climate change influence.

The most powerful prove of direct climate change influence are the changes of the air temperature. These changes are particularly seen in the Mediterranean part (warmer) of Bosnia and Herzegovina where it can be seen that, if the measured trends of average yearly air temperature rise in this progress, by 2040 the average yearly air temperature will rise up to +2,4 °C, and until 2100 up to +4,2 °C (Figure 3).

Figure 3.

Climate change modelling for B&H[1]



1 http://www.fhmzbih.gov.ba/latinica/KLIMA/PromjeneKlime.php

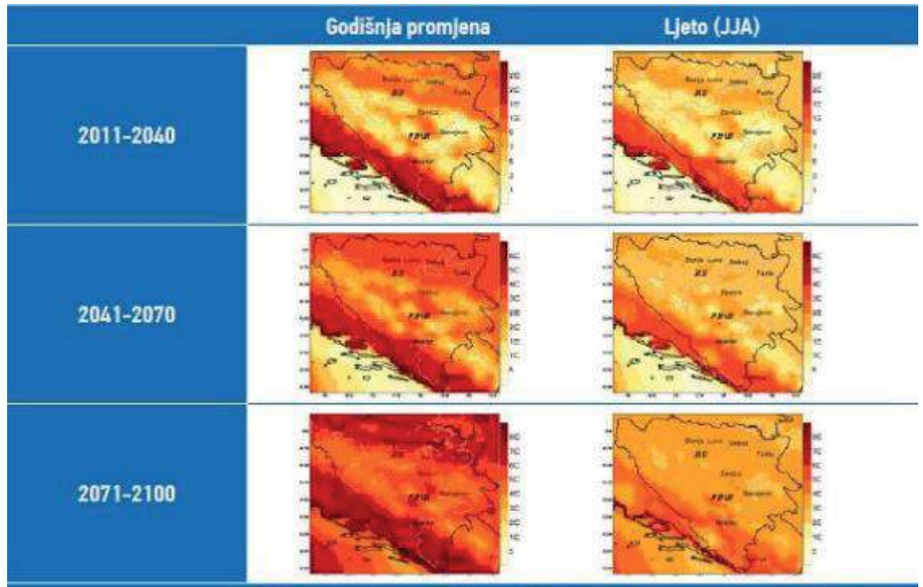
The same situation is with the due to the duration of the warmer days (25°C or higher) of the year. By 2040 it is expected that warmer days last longer up to 15 days per year, and by 2100 up to 40 days per year (Figure 4).

Regarding the expected change in precipitation, it is expected that by 2040 Bosnia and Herzegovina will have a positive anomaly up to +5% per year, while up to 2100 the southern parts of Bosnia and Herzegovina (including marine environment) will have negative anomaly up to -40% (Figure 5).

The expectation of climate changes in the marine environment are not calculated or modelled, but if they are carefully connected with the air temperature, summer days and precipitations models, it can be concluded that the climate changes will have devastating effect on the marine environment in Bosnia and Herzegovina by 2100. Longer and warmer day, together with precipitation reduction will eventually cause the changes in sea salinity which will eventually cause changes among marine ecosystems in terms of reduction (or even disappearing) of shellfish habitat and many algae habitats that are currently inhabit the area of Mali Ston and Neum-Klek Bays.

Figure 4.

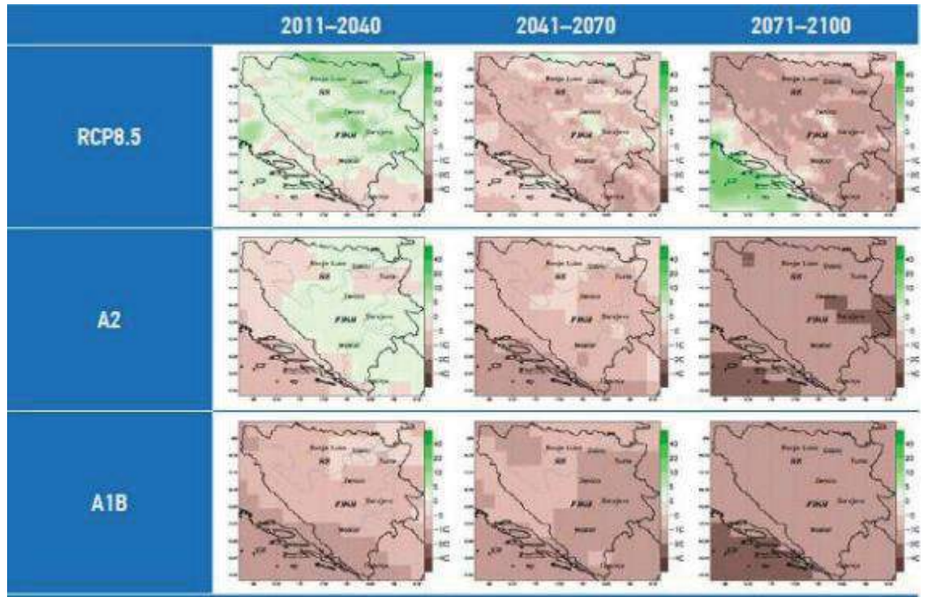
Prediction of warmer days' duration by 2100[2]



Slika 3: Promjena indeksa TX25 na godišnjem nivou i za ljetnu sezonu (JJA), u dana/godini, za periode 2011-2040, 2041-2070. i 2071-2100. u odnosu na period 1971-2000, prema scenariju buduće klime RCP8.5

Figure 5.

Estimated percentage of average yearly precipitation[3]



Slika 4: Promjena godišnjih količina padavina za scenarije RCP8.5, A2 i A1B, za buduće periode 2011-2040, 2041-2070. i 2071-2100 u odnosu na referentni period 1971-2000.

2 http://www.fhmzbih.gov.ba/latinica/KLIMA/PromjeneKlime.php

Litter pollution

Bosnia and Herzegovina did not establish its permanent marine and LBS litter monitoring. So far, in Bosnia and Herzegovina three marine and LBS litter monitoring campaigns were made:

1 _ DeFishGear project (2014-2016),

2 _ MEDPOL financed beach litter project (2017-2018),

3 _ MEDPOL financed marine litter monitoring project (2018-2019).

The DeFishGear project was the pioneer project which deal the derelict fishing gear and all type of the marine litter in the Adriatic Sea region.

MEDPOL financed projects were related only for Bosnia and Herzegovina marine environment.

Last implemented project focus was on:

1 _ Beach Marine Litter (> 2.5 cm);

2 _ Seafloor marine litter;

3 _ Floating marine litter.

The data presented in this Report were taken from HEIS, 2019.

The Beach Marine Litter was monitored on 2 selected beaches: Zenit and Mala Strana (Figure 6) and it showed that the most abundant litter type were cigarette buds and all types of lids which are directly connected with the tourist season peaks.

Figure 6.

Beach Litter monitoring sites – Left: Zenit Beach, Right: Mala Strana Beach

3 http://www.fhmzbih.gov.ba/latinica/KLIMA/PromjeneKlime.php

Table 4.

Beach Marine Litter monitoring results

No	Type	Druga Strana	Zenit	Druga Strana	Zenit	Total
1	G21/24	41	180	34	114	369
2	G27	174	297	112	216	799
3	G71	9	0	1	0	10
4	G76	14	0	2	0	16
5	G127	0	1	0	2	3
6	G128	8	0	2	0	10
7	G134	12	3	8	1	24
8	G137	0	1	0	2	3
9	G145	7	6	3	3	19
10	G158	22	0	5	0	27
11	G165	11	17	2	12	42
12	G172	5	0	0	0	5
13	G178	26	103	13	53	195
14	G200	0	6	0	5	11
15	G208	0	11	0	3	14
16	G210a	4	0	0	0	4
17	G210b	0	4	0	1	5
Total		**333**	**629**	**182**	**412**	**1556**

Seafloor litter was collected from two locations: Hotel Sunce and Hotel Zenit. The results showed that plastic and glass bottles dominated the among the sea bottom litter. This issue can be connected with environmentally unawareness of locals and tourist's population (Table 5; Figure 7).

Table 5.

Sea bottom litter monitoring results

No	Item type	Sunce	Zenit	Sunce	Zenit	Total
1	Plastic bottles	40	30	50	28	148
2	Hard plastic objects	10	0	31	0	41
3	Other plastic	5	5	1	2	13
4	Other Rubber (gloves, floats, etc.)	0	5	7	1	13
5	Beverage cans (metal)	11	10	7	7	35
6	Large metallic objects	3	0	0	0	3
7	Glass/ceramic bottles	31	100	1	1	133
8	Piece of glass	0	0	0	17	17
9	Ceramic jars	2	0	0	0	2
10	Natural fishing ropes	0	0	1	0	1
11	Total	102	150	98	56	406

Figure 7.

Sea floor litter monitoring – collected litter in Hotel Zenit location

Sea surface litter monitoring showed surprisingly good results comparing with sea bottom and beach litter monitoring results. Small amounts of collected granules showed that Bosnia and Herzegovina sea surface is not very polluted with litter (Table 6, Figure 8)

Table 6.

Sea surface litter monitoring results

No	Parameters			I monitoring	II monitoring	Total
	Micro plastic Type	Colour	Transparency	No of Objects	No of Objects	
1	Foam	Red	Opaque	2	1	3
2	Filament	Red	Opaque	34	12	46
3	Fragment	Blue/Green	Opaque	5	6	11
4	Granule	Blue	Opaque	12	21	33
5	Granule	Other colour	Opaque	2	1	3
6	Granule	Green	Opaque	1	3	4
7	Sheet	White	Opaque	1	3	4
Total				57	47	104

Figure 8.

Sea surface monitoring circular transect line in Neum-Klek Bay.

The above showed and collected results from 2014 to 2019 showed that marine litter in Bosnia and Herzegovina can cause a serious threat, especially for the sea floor marine species and ecosystems of littoral zone. The urgent actions are needed to prevent this type of the marine pollution in order to preserve the marine environment in Bosnia and Herzegovina.

Overexploitation of natural resources

The overexploitation of natural resources from the sea was serious problem in Bosnia and Herzegovina. Until 2014. there was no legal regulation of fisheries and natural resources (species) exploitation. Since 2014. and adaptation of Law on Marine Fisheries (HNC, 2014), the overexploitation of any marine species was prohibited and only traditional and legally controlled fishery activities was allowed. The serious problem (even after 2014) is that marine flora and fauna species were not protected by Law and they are not mentioned in the Red List of flora, fauna and fungi of Bosnia and Herzegovina which is a serious problem regarding the fact that Bosnia and Herzegovina is a legal party of the Barcelona Convention.

So far, only *Litophaga litophaga* (Linnaeus, 1758) species has record of overexploitation, not only in Bosnia and Herzegovina but in the neighbouring Croatia as well, despite its legal protection. The inexistence of legal protection in Bosnia and Herzegovina supports the illegal activities of smugglers of this species, so it is necessary to urgently put all marine species under legal protection in Bosnia and Herzegovina to abolish these activities.

Transmission of the invasive species via ships ballast waters

So far there were no official scientific research dealing with an invasive species in Bosnia and Herzegovina. It is only known the presence of the blue crab *Callinectes sapidus* Rathbun, 1896 (Dizdarević, S. et al., 2016), but there is evidence of more invasive species present in Bosnia and Herzegovina Marine environment. Regarding the ballast water problems, currently Bosnia and Herzegovina does not have a port, but the bigger ships were visited Bosnia and Herzegovina before (some USA battleships etc.). Bosnia and Herzegovina are among few countries which do not have legislative for ballast water disposal prevention and treatment. In 2014. a draft Law on maritime domain and maritime navigation has been defined but as known it still not yet officially adopted.

The local community (Municipality of Neum), together with the Council of Ministries in Bosnia and Herzegovina issued a decree which temporary ban the entry of large cargo and military ships into Bosnia and Herzegovina waters. This will prevent the potential fast spreading of invasive species into Bosnia and Herzegovina Marine environment.

Regarding the invasive species, Bosnia and Herzegovina needs to research the marine invasive species in its territorial waters and to assess the risk of spread and develop a plan to suppress their spread if they are registered in Bosnia and Herzegovina. The ballast water problem however, will be dealt with adoption of prepared legislation in this area, and as well in mutual cooperation with the Croatia on this issue.

4.

Current Response measures

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4.1. MPAs and other conservation measures

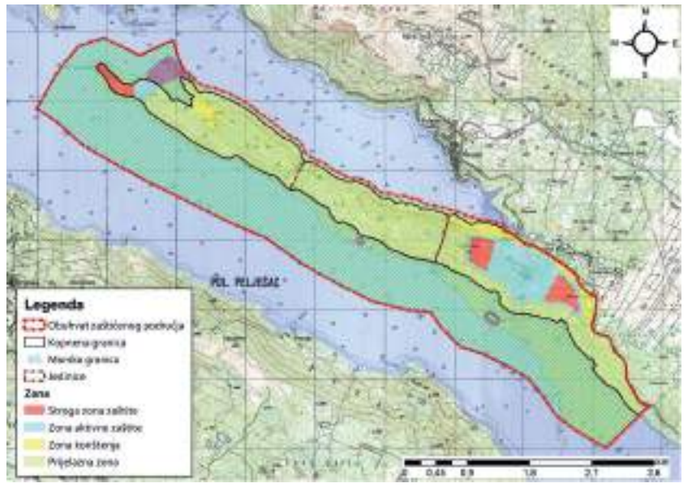
Currently, Bosnia and Herzegovina does not have proclaimed MPA. However, before the war in Bosnia and Herzegovina, the part of Klek Peninsula was under the certain regime of protection. That area was a Mediterranean botanical garden called "Mediteranetum". After the war, the part of the former Mediteranetum was neglected and since then, the whole area is not under protection. Together with the Mediteranetum (which was the land base protection area), the whole Mali Ston Bay (in former Socialistic Federative Republic of Yugoslavia) was under protection as a Marine protection place because of its unique habitats, with abundance of *Litophaga litophaga* (Linnaeus, 1758) species.

The first attempt to protect the Bosnia and Herzegovina marine ecosystems is the adoption of new Law on Marine Fisheries (HNC, 2014) which main subject is: *"to regulate measures for proper management and protection of renewable marine resources; methods and activity of catching, breeding, processing and trade in fish and other marine organisms; administrative and inspections, punitive measures as well as others issues relevant to marine fisheries in Herzegovina-Canton County and Canton"*.

In 2019. the Federal Ministry of Environment and Tourism, together with the UNDP in Bosnia and Herzegovina started a project: "*Achieving biodiversity conservation through the establishment and efficient management of protected areas and capacity building for nature protection in Bosnia and Herzegovina*" which main goal is the establishment of the new protected areas: The Protected landscape Mediteranetum, Neum with part of the marine area. This is a Category V of the protection according to the IUCN.

According to the latest information, the proposed MPA will cover 1,470.46 ha of land and sea area (Figure 9), with few designated zones of protection, mostly based according to the land use and level of habitat and species uniqueness.

Figure 9.
Schematics of the proposed MPA in B&H (Explanation is in the folowing table)[1].



4 Picture from GEF/UNEP 2019

Table 7.
Explanation of Figure 9 (from GEF/UNEP, 2019).

Zone	English translation	B/H/S Original
	Strict protection zone	Stroga zona zaštite
	Active protection zone	Zona aktivne zaštite
	User free zone	Zona korištenja
	Buffer zone	Prijelazna zona

So far, the official designation of the first MPA in Bosnia and Herzegovina is not legal due to the facts that there are a few problems with the local community regarding the land use, there is a problem regarding the future MPA financing and few other legal issues that needs to be solved to avoid possible future conflicts inside the MPA.

4.2. Legal and institutional framework

Regarding nature protection, Bosnia and Herzegovina signed multiple international conventions. Signed and ratified conventions and protocols are:

- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) - ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/09)
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal - ("Official Gazette of Bosnia and Herzegovina" - MU No. 31/00)
- Aarhus Convention / Convention on Access to Information, Public Participation and Access to Justice - ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/08)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) - ("Official Gazette of Bosnia and Herzegovina" - MU No. 11/08)
- Convention on the Transboundary Effects of Industrial Accidents (TEIA) - ("Official Gazette of Bosnia and Herzegovina" - MU No. 13/12)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS) - ("Official Gazette of BiH" - MU, No. 8/2017)
- Convention on Long-Term Transboundary Air Pollution (LRTAP) - (Official Gazette of the SFRY - MU 01/90 and RBiH, No. 13/94)
- Protocol on Strategic Environmental Assistance - SEA - ("Official Gazette of Bosnia and Herzegovina" - MU, No. 3/2017)
- UN Convention on Biological Diversity (UNCBD) - ("Official Gazette of Bosnia and Herzegovina - MU No. 12/02")
- UN Framework Convention on Climate Change (UNFCCC) - ("Official Gazette of Bosnia and Herzegovina - MU No. 19/00")
- Convention on Wetlands of International Importance, especially as a Waterfall Habitat (Ramsar Convention) - Taken over by Succession 2001 2001 Succession Notice
- Convention for the Protection of the Marine Ecosystem and Coastal Areas of the Mediterranean (Barcelona Convention) - ("Official Gazette of Bosnia and Herzegovina" - MU No. 26/98)
- Protocol on joint connection of pollution with ships and, in case of danger, in combating pollution of the Mediterranean Sea ("Official Gazette of Bosnia and Herzegovina" - MU No. 26/98)
- Protocol on the Protection of the Mediterranean Morality of Pollution from Sources and Activities on Land ("Official Gazette of Bosnia and Herzegovina" - MU No. 26/98)
- Protocol on Specially Protected Areas and Biodiversity in the Mediterranean ("Official Gazette of Bosnia and Herzegovina" - MU No. 26/98)
- Cartagena Protocol on Biosafety of the Convention on Biosafety (January 29, 2000), Taken over by Succession ("Official Gazette of Bosnia and Herzegovina" - MU No. 12/08)
- Kyoto Protocol ("Official Gazette of Bosnia and Herzegovina" - MU No. 03/08)
- Stockholm Convention on Persistent Organic Pollutants ("Official Gazette of Bosnia and Herzegovina" - MU No. 01/10)
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) - ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/08)
- Vienna Convention for the Protection of the Ozone Layer - Taken over by succession (Official Gazette of the SFRY - MU 01/90 and Official Gazette of the Republic of Bosnia and Herzegovina, No. 13/94)
- Montreal Protocol on Substances that Deplete the Ozone Layer - Taken by Succession (Official Gazette of the SFRY-MU, No. 16/90)
- London Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer - ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/03)
- Copenhagen Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer - ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/03)
- Vienna Amendments to the Montreal Protocol on Substances that Require the Ozone Layer ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/03)
- Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer Montreal - ("Official Gazette of Bosnia and Herzegovina" - MU No. 08/03)
- Beijing Amendments to the Montreal Protocol on Substances that Require the Ozone Layer - ("Official Gazette of Bosnia and Herzegovina" MU No. 01/17).

In terms of nature protection, Bosnia and Herzegovina also determined the importance of cooperation with the Republic of Croatia and Republic of Serbia since those countries share lots of natural values that needs mutual protection. For the Marine protection, the most important is the cooperation with the Republic of Croatia and Bosnia and Herzegovina and Croatia signed an "*Agreement between the Council of Ministers of Bosnia and Herzegovina and the Government of the Republic of Croatia on cooperation in the field of environmental protection and sustainable development ("Official Gazette of BiH - MU", No. 2/17)*".

In terms of in-country jurisdiction over nature protection, Bosnia and Herzegovina has complicated system. On country level the Ministry of Foreign trade and Economics, together with the Council of Ministries is the one amenable for the country representative on international level, signing of convention and protocols and resolving possible cross-border problems related to the environment.

In terms of internal political structure, Bosnia and Herzegovina has two Entities and one District. The Entity of Federation of Bosnia and Herzegovina has 10 Cantons which are made out of Municipalities. The Republic of Srpska Entity does not have Cantons.

The competent Ministries for nature protection are on the Entity levels and regarding to the Marine protection the amenable Ministry is Federal Ministry of Environment and Tourism which regulates protection from the IUCN Category I to Category II. This Ministry is also amenable for rest of the categories if the protection is on the territory of two or more Cantons. The Cantonal level is amenable for nature protection from IUCN category III to VI as well as protection on local level such as: fisheries, nature and cultural-historical values etc.

In terms of Marine protection (areas and species), the Nature Protection Law of Bosnia and Herzegovina is amendable which regulates the protection on lower levels (Cantonal). Regarding to the species protection, the Nature Protection Law of Bosnia and Herzegovina obligates the making of Red list of Flora, Fauna and Fungi which are the base for the species protection. However, the first Red list of Flora, Fauna and Fungi of Bosnia and Herzegovina did not contain the Marine species. This major mistake is expected to be corrected in the first Red list of Bosnia and Herzegovina updated expected in 2020/2021.

The Ministry of Environment and Tourism are also amendable for the tourism management. In this term, the ministry is closely working with the local (municipality) tourist departments (organizations).

The marine fisheries were the big issue together with the exploitation of the marine resources (mussels, fish etc.). Since the Law on Bosnia and Herzegovina level did not cover the Marine areas (only freshwaters), the Herzegovina – Neretva Canton adopted the Law on Marine Fisheries (HNC, 2014), which not only regulate the fisheries in the way that commercial fishery is prohibited, but also in terms of preserving traditional, coastal fishery and protection of mussel exploitation as well as exploitation of other marine species. This Law, is mostly in terms of Marine protection rather than fishery regulation.

Bosnia and Herzegovina currently does not have the list of Marine habitats and Marine species are not researched well. The lack of professional institutions and capacities is the main reason for this issue. So far, the Bosnia and Herzegovina (part of Bosnia and Herzegovina) is doing their best to proclaim its first MPA, from which it is expected to be initial trigger for the future marine habitats and species research.

4.3. Transboundary issues

Excluding the cross-border problems listed in section 2.4), it can be said that so far, Bosnia and Herzegovina does not have issues with the Republic of Croatia in terms of Nature protection. The Mali Ston Bay is the one of the MPAs bordering Bosnia and Herzegovina, but so far there were no reported environmental issues in this area. However, the existence of the MPA in Croatia bordering Bosnia and Herzegovina can potentially cause few issues, especially in terms of building tourism facilities and possibly a harbour for Bosnia and Herzegovina.

This is why it is necessary to have the MPA in Bosnia and Herzegovina bordering the Republic of Croatia, especially in sensible habitats such as Mali Ston Bay. The planned first MPA in BIH cover more than minimal 10% designated by the Aichi Biodiversity Target 11. Linking these two areas will certainly strengthen international cooperation between Bosnia and Herzegovina and Croatia in terms of nature protection in the future.

5.

Asessment of the marine and coastal status and pressures on marine and coastal areas

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

Bosnia and Herzegovina is the country which still does not have a proclaimed MPA. The Neum municipality is the only municipality with the with access to the sea in Bosnia and Herzegovina. The 25km of coastline for 3,8M people in Bosnia and Herzegovina is potential risk for the marine habitats and species in the future.

The tourist facilities in Neum Municipality are limited only in town area so far. The individual houses are built in the top of the Klek peninsula and that's are 2 major settlements in the Bosnia and Herzegovina coastline. Much of the Klek peninsula and two islands are not inhabited or contain any tourist facilities. The wastewater treatment plant is situated in this peninsula on Mali Ston Bay side. The whole waste water collection system is part of the regional drainage system with discharge to the open sea.

The Klek Peninsula, together with the associated Marine territory and two islands are preserved with the help of the local community (municipality) which strongly supports the proclamation of the first MPA in Bosnia and Herzegovina.

Tourism is the one of the major possible threats for the marine environment in Bosnia and Herzegovina. Neum as Municipality has only 4,543 inhabitants and town itself has 3.013 inhabitants1. In 2019. Neum had around 700.000 night stays in one season. Hotel capacities are 2.500 beds and in private accommodation Neum has around 13.000 beds. These are great numbers for 25 km coastline. Taking into account that Neum has only few small beaches (smaller than 100m in diagonal) this makes that this town is almost overcrowded during June, July, August and partly September. The town is open for new investors and it is expected that they build up to two more big hotels so they can accommodate more tourists.

Even if these are great numbers, the tourist facilities (including beaches) are mainly situated on Neum-Klek Bay while the coastline on Klek peninsula are mainly intact. This makes it perfect for protection.

In the future it is possible that some of the natural rock coastline will be turn over into the pebble beach. The bigger tourist demands for vacation arrangements from Western Europe and Middle East (and also domestic tourist) will caused the creation of more suitable beaches for tourists. This will lead to the destruction of rock habitats and natural rock beaches which are home for multiple marine species.

Neum has built up his sewage system facilities, together with waste water treatment plant. This reduced the potential pressures from waste waters on the marine environment to zero. However, the Municipality of Neum is struggling with the litter problem and infrastructure. The municipality has its communal enterprise, but system of waste collection and disposal is not up to the task. It is projected for 5000 people and, during the season, it cannot collect waste on beaches created by the negligence of tourists. The

beach cleaning is left to the responsibility of beach concessionaires who often, due to too much work, do not manage to completely clean their beaches.

5 Source: http://www.statistika.ba/?show=12&id=10685

The UNEP financed several projects which main task is to analyse the marine litter and land-based sources litter in Bosnia and Herzegovina and conclusion was that Municipality needs support to build-up facilities and capacities to collect the beach litter during the season. The project results are given in chapter 3.1).

Figure 10.
Rocky (natural) coastline in B&H. Part of the future MPA – top of the Klek peninsula (Author)

Fisheries was the common problem, together with the illegal exploitation of marine species. One of the most important impacts on marine fauna was illegal fishing and legal collection of *Litophaga litophaga* Linnaeus, 1758., followed by destruction of rocky habitats. These lasted until 2014, when the Law on fisheries of Herzegovina-Neretva Canton (HNC, 2014), prohibited the exploitation of the species and destruction of habitats. This Law also regulate the other type of fisheries and protection of marine fauna.

Pressures from the existing aquacultures are registered in terms of organic pollution caused by fish feeding. The Aquaculture study did not registered higher level of pollutants caused by aquaculture facilities in Neum-Klek Bay. The analyses of water in and around the existing two aquacultures showed that there is slight organic pollution nearby the aquacultures which do not affect rest of the marine environment. The marine water analyses in Neum-Klek Bay showed that there are no traces of slow or rapid organic trophy and that water is mainly oligotrophic.

Even if there are no bigger threats for the environment so far, the demands for more tourist space will definitely lead to the coastal habitat changes. This will also lead to the rapid increase of litter quantities as well. Urgent actions are needed in terms of stringent the infrastructure and human capacities in local Public Utility Company to develop the Litter management plan as part of their Waste management plan.

It is also urgent to finish the Marine Spatial Plan for Bosnia and Herzegovina and to establish, proclaim and effectively protect first MPA in Bosnia and Herzegovina in its proposed borders (see Chapter 4.1).

5.2. Critical impacts and effects on marine coastal biodiversity

The most critical impact in Bosnia and Herzegovina so far are:

1 _ Development of tourist capacities (new hotels, houses, expansion of artificial pebble beaches);

2 _ Possible negative impacts by large construction projects (Pelješac bridge, Proposal for the construction of the Neum port and Marina);

3 _ Beach and LBS littering, littoral zone sea bottom littering;

4 _ Exploitation and trade of *Litophaga litophaga* (Linnaeus, 1758) species and other marine species.

Developing of tourist facilities is rapid in past 5 years. Currently in Neum there is app. 15,500 beads and registered app. 70,0000 nights which is high number for a small coastline. The two more hotels are currently building and more guests will require more beach places for swimming. Currently Neum has app. six pebble small beaches (app up to 100m in length) and many smaller concreate beaches. The expected artificial pebble beach expansion is expected on northern side of Klek peninsula in the future. This will lead to irreversible destruction of natural rock coastline in that area.

It is not yet clear how the ongoing Pelješac bridge project in neighbouring Croatia will affect marine environment in Bosnia and Herzegovina and in Croatia as well. This is especially in relation to the movements of sea currents in the Neum-Klek and Mali Ston bay. The future scientific research will show has the bridge had a negative impact on marine ecosystems, flora and fauna in Bosnia and Herzegovina marine environment.

The other proposed project is the Neum port and Marina project. This was an idea developed as one of the strategic interest of B6H in the near past. However, after the argumentation of few scientist and environmentalist and after strong opposition of local community in Neum, this idea was left aside for now. The future of Neum as municipality is currently related to tourist based economy and nature preservation. On the other hand, building of the Marina port was a progressive idea in 2017, but yet again the Municipality of Neum had a strong opposition against it and committed to the development of tourism and environmental protection.

Beach littering is one of the biggest environmental problems in Bosnia and Herzegovina Marine environment. Almost all of the litter came from the facilities on shore and environmentally unaware tourists that occupies the town during summer season. Lack of necessary facilities on beaches and human and financial capacities as well environmentally unawareness cause a problem in littering. This problem can do a great harm, especially to the sea floor flora and fauna if continue to last over the decades.

Regarding to the overexploitation of some species, preferably *Litophaga litophaga* (Linnaeus, 1758), it can be said that species itself is not protected by any Law in Bosnia and Herzegovina. However, since 2014 and new Law on fishery (HNC, 2014), it is prohibited to do any collection or hunting of commercial species in Bosnia and Herzegovina. The *Litophaga litophaga* (Linnaeus, 1758) selling problem is also a problem of poaching in the neighbouring Croatia where people collect these animals, smuggle them in Bosnia and Herzegovina where they can be sell easily. The species collection in Bosnia and Herzegovina marine habitats done tremendous damage to the underground

rocky habitats. The damage itself cannot be estimated due to the lack of data before the exploitation was in place. Similar situation is in Croatia to. Legal protection of the species in Bosnia and Herzegovina is a must in order to protect species and their habitats in Bosnia and Herzegovina and Croatia too.

6.

Asessment of Bosnia and Herzegovina priority needs and response actions

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6.1. Needs

Since Bosnia and Herzegovina did not do much in terms of research and preservation of the marine ecosystems and species, the state should first make an official list of marine habitats/ecosystems. After that, the country should make a list of priority habitats, which needs constant monitoring and protection. These habitats should be mapped for the easier future protection planning.

The country is in urgent need of research of all marine life. This include researching all forms of organisms: from single -cellular to the marine mammals, including the research of the invasive species. This preliminary research will result in making the full list of marine species in Bosnia and Herzegovina. This is a long-term process but it needs to start immediately and be regularly supported by the country and other relevant international organizations.

The most basic need for the country is to update its Red list of species: Fungi, Flora and Fauna with the existing data for the marine species for Bosnia and Herzegovina as well with the marine species from the Annex II of the ASP/BD Protocol for which are proven to live in the Adriatic Sea (by using literature data). With this update the species from the annex II, will be officially under some type of protection in Bosnia and Herzegovina.

The country needs to urgently protect the *Litophaga litophaga* (Linnaeus, 1758) species and prohibit the collection, trade and consummation of this species in the territory of Bosnia and Herzegovina. The legal trade and consumption of this species are causing the degradation of habitats in the neighbouring countries (Croatia) and the emergence of illegal trade and import of this species.

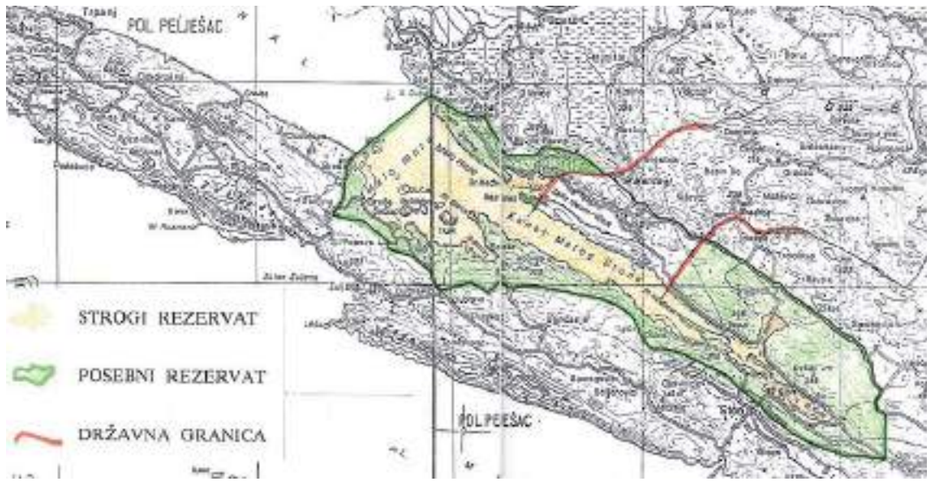
The country should also make a marine spatial plan – urgently, in order to know the future use of the marine and coastal space in accordance with the requirements of the local community and biodiversity protection.

Related to the Marine Spatial Planning, before the one is finished and adopted, the country should prohibit the expansion of tourist capacities, a ban on the construction of new infrastructure facilities, and a ban on the conversion of rocky shores into tourist beaches. This all refers to the part of the Klek peninsula with two islands where there are still mostly untouched nature areas.

Bosnia and Herzegovina is one of few countries which still does not have a designated MPA. Even if the part of Klek peninsula was protected before 1991, after the war in Bosnia and Herzegovina this designation was cancelled. The whole Bosnia and Herzegovina marine area is surrounded by the existing Croatian MPA – the Special Nature Reserve – Mali Ston Bay (Figure 11).

Figure 11.

Mali Ston MPA in Croatia – marked with green with strict protection area -marked with pink before 1999. Today, based upon Agreement on the state border between the Republic of Croatia and Bosnia and Herzegovina signed in 1999, top of the Klek Peninsula and half of the Mali Ston Bay (than part of Croatia) is now part of Bosnia and Herzegovina.[1]



The complexity and uniqueness of the whole Mali Ston Bay requires its full protection in both Croatia and Bosnia and Herzegovina. Therefore, the Bosnia and Herzegovina should legally proclaim its first MPA as soon as possible.

Today, part of this MPA is not protected legally in Bosnia and Herzegovina (Figure 11) and that includes half of the marine area of Mali Ston bay between Bosnia and Herzegovina and the Croatia together with the two islands of Mali Školj and Veliki Školj. The Federation of Bosnia and Herzegovina start the project of creating new protected areas to achieve Aichi biodiversity targets and SDG goal 14. One of few possible new protected areas is the first MPA in Bosnia and Herzegovina – the Protected Landscape "Mediterranetum" Klek which will encompass all the Mali Ston Bay area in Bosnia and Herzegovina and it will continue on the existed MPA in Croatia.

6 https://hr.wikipedia.org/wiki/Datoteka:Podjela_rezervata_Malostonskog_zaljeva_i_Malog_mora_na_strogi_i_posebni_rezervat.jpg

Figure 12.

The map of former (black line) and the existence border (red line) between Croatia and Bosnia and Herzegovina. Source: Klemenčić, M. (2000): The Border Agreement between Croatia and Bosnia-Herzegovina: The first but not the last, Boundary and Security Bulletin, 7/4, IBRU Durham, 96-101.

One of the biggest issues and needs in terms of Marine protection in Bosnia and Herzegovina is the efficient management of the marine litter, especially the land based source litter. The Neum Municipality has some serious issues regarding waste management infrastructure and human capacities to adequately respond to this problem. The tourist source littering is directly connected with lack of the litter dumping facilities on beaches, regular beach cleaning is absent and there is no sanitary landfill in the vicinity of Neum. The road connection with inland Bosnia and Herzegovina is not adequate for the dumping transport and the Neum is combating this issue for several years on. Urgent need is to invest in building dumping facilities and to straight local utility company with human and technical capacities.

6.2. Proposed urgent actions

Urgent actions are related to the urgent needs mentioned in previous chapter. in short, those are:

- making an official list of marine habitats/ecosystems; marine habitat mapping,
- start of research of all marine life;
- compose a list of marine species in Bosnia and Herzegovina;
- conduct a yearly based regular monitoring and researching of marine habitats and species;
- Research and create a list of invasive marine species (flora, fauna and fungi);
- update its Red list of species: Fungi, Flora and Fauna with the existing data for the marine species for Bosnia and Herzegovina as well as with the species from Annex II of the ASP/BD Protocol;
- urgently protect the *Litophaga litophaga* (Linnaeus, 1758) species and prohibit the collection, trade and consummation of this species in the territory of Bosnia and Herzegovina;

- finish the Marine Spatial Plan for Bosnia and Herzegovina;
- prohibit the expansion of tourist capacities, the construction of new infrastructure facilities, and the conversion of rocky shores into tourist beaches;
- proclamation of the first MPA in Bosnia and Herzegovina;
- strength the human and technical capacities of local utility company to prevent LBS littering.

These 11 needs are urgent to solve in order to fully conserve and protect the marine environment in Bosnia and Herzegovina. Even if the local community, together with all higher level of governance in Bosnia and Herzegovina is investing great effort in preserving the environment, a complex governance system in Bosnia and Herzegovina makes the realization of these efforts very slow.

Intensive talks between local community and all other level of governance needs to be intensified and above mentioned problems need to be finished as soon as possible by combing finance efforts of Bosnia and Herzegovina and other related regional and international organizations.

7.

Funding problems and opportunities

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

Bosnia and Herzegovina does not invest much in the nature protection. Since most of the country is inland, the small portion of the marine area is quite neglected and there are few reasons for that:

1 _ lack of human capacities (scientists etc.),

2 _ lack of big funding opportunities for research and infrastructure upgrade (marine research are quite expensive, huge finance abilities are currently not possible to expect from Bosnia and Herzegovina),

3 _ lack of specialized research institute/agency (which deals only with marine research and protection).

The regular national sources are mainly based on budget-based finance and finance obtained from the Environment protection fund of Federation of Bosnia and Herzegovina are mainly based on co-funding. Regarding that budget funding for science includes all 1% of the total budget, and that yearly invest for co-funding for nature protection by the Environment protection fund of Federation of Bosnia and Herzegovina is app. 3 Million EUR, it can be easily concluded that national sources are not enough to deal with all existing problems in terms of Marine protection.

Regarding the fact that there are not enough domestic funds for the quality work on marine protection, the co-financing option is one of the possible opportunity for the future financing of these activities. Number of international organizations, offer this model to the countries in order to speed up the work and to finance more project from same budget. For this to be working, Bosnia and Herzegovina needs to allocate more funds that will focus on this type of financing (projects) and give full support to fundraisers (NGOs, Institutes, individual researches) to easily obtain these funds.

Since some co-financing model already exists, in terms of funds from Environment protection fund of Federation of Bosnia and Herzegovina, the problem of international funding is leaved to the local interested parties which would conduct the projects. However, the lack of proclaimed MPA in Bosnia and Herzegovina makes this effort much harder, especially in terms of realizations of the “big budget projects”.

Much more realistic option, is the small-scale to medium scale projects, which can be funded by numerous organizations (like: National Geographic, the Rufford foundation, Save our Seas, MAVA etc.).

7.2. Other sources (private, public, partnership)

The private funding for the marine research and protection in Bosnia and Herzegovina are not an option in this moment due to the fact that the economy of Bosnia and Herzegovina is in transition. The public-private partnership is more realistic option but in case of nature protection it is still not taken root in Bosnia and Herzegovina.

This can be prescribed with the lack of communication between public and private sector. One of the possible opportunity for this type of funding can be joint effort of local community (Municipality) and private companies to reduce marine litter.

This financing model will not come into realization soon. The levies that are put on private sector are too high to achieve their full participation in this type of partnership. Reforms in tax policy, and in levies that will significantly reduce private sector payment in state budget will certainly contribute to the strengthening of public-private partnership in the implementation of environmental protection projects

7.3. International funds, projects, programmes, national eligibility for international programmes/funds

International funding was up to date the most reliable source of funding for the marine protection in Bosnia and Herzegovina. The latest project which main goal was proclaiming new protected areas in Bosnia and Herzegovina was funded by GEF/UNEP (2019).

The marine litter monitoring project in Bosnia and Herzegovina together with the proposed methodology for Bosnia and Herzegovina was funded by the UNEP/MAP in 2019.

The perspective of international funding in terms of marine protection in Bosnia and Herzegovina is good, but the basic prerequisites for the obtaining ones are:

1 _ proclamation of first MPA (possible funds from SPA/RAC),

2 _ strong cooperation between different NGOs and individual experts (domestic and international) for the funds obtained from the EU and other international organizations that funds research projects,

3 _ strong cooperation between Bosnia and Herzegovina, Croatia and Montenegro to obtain IPA, IPA ADRIATIC and Adriatic -Ionian programme funds for the purpose of marine protection.

Bosnia and Herzegovina, as country in transition and non EU member state is eligible for numerous international funding calls, including the large scale funding projects, but it is excluded from the EU funding for the environment. However, these funds are not used enough in the marine environment protection projects. This can be the result of lacking the technical and scientific capacities in some areas of biodiversity and lack of these capacities makes local NGOs and Institutions incompatible to apply for this type of funding.

Possible future cooperation between Institutions in Bosnia and Herzegovina (NGO, private companies etc.) with relevant institutions from Croatia, Montenegro or Slovenia can increase the chances of getting much needed international funds. Much of first funds must be related to the strengthening human capacities in Bosnia and Herzegovina in order to become much more independent and more educated so they can find and use these funds on their own.

The best example of this kind of cooperation is the IPA Adriatic DeFishGear project where the mutual cooperation of the institutions from seven countries in the Adriatic Sea strength the capacities of local companies to monitor, prevent and deal with the marine litter in Bosnia and Herzegovina. This led to future independent project implementation in this area.

So far, the only NGO that conducted some scientific research in marine biota is the Sharklab Adria NGO which conduct the research on sharks and rays and contribute scientifically to the draft of the first MPA in Bosnia and Herzegovina. However, this is not enough due to the fact that large amount of other marine organisms is still not listed or researched in Bosnia and Herzegovina.

8.

Conclusions and recommendations

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Bosnia and Herzegovina done little so far in terms of Marine wildlife conservation and protection. The lack of funds and responsible state agency (which will deal with ecosystem and species research and monitoring) caused serious lack in progress in this matter comparing with the all Adriatic Sea countries.

The marine protection has become a theme to talk in past few years, much thanks to individual researchers and efforts of national focal points, but slow administration and country specific issues (different level of government) slow all the progress even in terms of environment protection.

Regarding the needs, it can be said that Bosnia and Herzegovina need to star research its marine wildlife, establish biological monitoring of all (even invasive) species and include marine wildlife into its national law and strategic documents.

Country efforts toward marine protection was noticed from 2018 onwards when country designated one area in Neum municipality to be proclaimed as the first MPA in Bosnia and Herzegovina and which will cover more than 10% of the marine territory under protection required by the Aichi biodiversity target 11.

In terms of other recorded problems related to the marine and coastline protection, they are more/less implementable on national level but they will require secure and long-term financing.

Biodiversity of marine and coastline in Bosnia and Herzegovina will not be possible without the help of the neighbouring countries in the Adriatic Region. The mutual cooperation, especially with the Republic of Croatia and Montenegro (which both have specialized Institutions and required human and technical capacities for the marine wildlife research) is required to strengthen the human and technical capacities of Bosnia and Herzegovina which can be considered as a contribution to the education of staff for independent activity in this field.

The proclamation of the first MPA in Bosnia and Herzegovina could be a decisive step for the future of marine and coastal wildlife and protection in Bosnia and Herzegovina because it can obtain the funds from the state budget and be involved as a key partner in numerous regionally and internationally funded projects which main call is marine ecosystem and species research and protection.

The proclamation of Bosnia and Herzegovina first MPA will also have impact on trans-boundary issues regarding the protection of Mali Ston Bay. As mentioned, the Republic of Croatia already proclaimed Mali Ston as the MPA but part of the Bay in Bosnia and Herzegovina is not legally protected. This sensitive and unique ecosystem, deserve the protection in both countries and mutual cooperation between the countries to preserve and maintain the natural order in it.

The Marine Spatial Plan is also a much needed document in order to successfully plan the future use and purpose of the marine environment that belongs to Bosnia and Herzegovina. It is recommended, from scientific and historical point of view, that part of this area that was legally protected in Bosnia and Herzegovina (Mediterranetum) with its marine environment in Mali Ston Bay should be legally protected in the future. Other territory main purpose should be in sustainable tourism, which will be supported by better utility company organization regarding the littering.

The litter pollution is present, but the biggest polluter of the marine environment is the LBS litter, which comes mostly from the tourist activities on beaches. Lack of infrastructure of local utility company and human capacities will make this problem even bigger in the future as tourist capacities will spread.

The municipality is determined to preserve their environment as they can. They strongly support the establishment of the first MPA in Bosnia and Herzegovina. They also have main role in the creation and adoption on Law on fisheries (HNC, 2014) which preserve the marine wildlife from illegal exploitation and the ban on entry and docking of large ships into Neum-Klek Bay which could potentially harm the marine wildlife.

The local community is also strongly opposed to any construction of a port and marina for the same reason.

The Bosnia and Herzegovina, especially its Bosnia and Herzegovina entity and relevant Ministry of Environment and Tourism which are in charge of preserving and researching should make a separate fund in the Environmental protection fund of Bosnia and Herzegovina or in some percentage support the marine and coastal wildlife research. The environmental NGOs in Bosnia and Herzegovina should build up their capacities and, with the help of the relevant Ministry, conduct a yearly based research and monitoring.

The basic conclusions and recommendations for Bosnia and Herzegovina are the basics of what a country needs to do in terms of marine and coastal zone protection and preservation. The marine wildlife research, with the invasive species, the protection of sensitive habitats and species, prevention of littering, proclamation and successful management of the future MPA, regular allocation of funds from the budget or Environmental Protection Fund of Bosnia and Herzegovina for protection and research of marine wildlife and ecosystems should be enough for the post 2020 period.

Realization of these basics should be just the beginning towards a goal called Sustainable use of the sea and its protection in Bosnia and Herzegovina.

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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

Mediterranean Monk Seal

Cartilaginous fishes
(Chondrichtyans)

Marine and coastal bird species
Listed in Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean

Specially Protected Areas

Monitoring

Coralligenous and other calcareous bio-concretions

Marine vegetation

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**
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of **Natural Resources**
in the **Mediterranean Region**

UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC
The Mediterranean Biodiversity Centre

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