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The challenges for Croatian fisheries within current regulatory environment

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ABSTRACT

Biodiversity as a planetary boundary and sustainability are strongly related to fish stocks and fisheries that are regulated by a number of sources of law with the aim of achieving their sustainability. The paper analyses current application, impact and effectiveness of the Common Fisheries Policy that sets the rules for fishing fleets management in the European Union and for fish stocks conservation as well as the 2020 Report on its implementation by the European Court of Auditors. It also examines the present and potential implementation and effects of Blue Growth, Marine Strategy Framework Directive, United Nations legal framework and Sustainable Development Goals on fisheries and aquaculture activities in the Adriatic Sea, a semi-enclosed and biodiversity rich sea. Improvements in implementing marine ecosystem approach and marine spatial planning are proposed in policy and regulatory framework, focusing on characteristics of the Adriatic Sea. Resilient solutions require placing more focus on characteristics of regional seas and applying site-specific tailor-made solutions and less complex but efficient governance for the seas which entail integrated approach to exploitation and preservation of the resources and their health.

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Nomenclature

BHD – Birds and Habitats Directives
CFP – Common Fisheries Policy
DG ENV – Directorate-General for Environment
DG MARE – Directorate-General for Maritime Affairs and Fisheries
ECA – European Court of Auditors
EEA – European Environment Agency
EEZ – exclusive economic zone
EFPZ – Ecological and Fisheries Protection Zone
EGD – European Green Deal
EU – European Union
FAO – Food and Agriculture Organization of the United Nations
FRA – fisheries restricted area
GES – good environmental status

GFCM – General Fisheries Commission for the Mediterranean
GSA – geographical subareas
ISSCAAP – International standard statistical classification of aquatic animals and plants
JRC – Joint Research Centre
MSFD – Marine Strategy Framework Directive
MSY – maximum sustainable yield
MPA – marine protected area
NM – nautical mile
OECM – other effective area-based conservation measures
RFMO – regional fisheries management organization
SAC – Scientific Advisory Committee
SDG – Sustainable Development Goal
STECF – Scientific, Technical and Economic Committee for Fisheries
TAC – total allowable catches
UNCLOS – United Nations Convention on the Law of the Sea

1 Introduction

Oceans and seas are highly affected by human activities ranging from exploitation of their live resources, land and sea-use change for infrastructure development, aquaculture, and pollution originating from land and the sea [1]. Key pressure on the Europe's seas comes from fishing which also involves the damage incurred to the sea floor. The Mediterranean Sea remains the most overfished sea in the world, which degrades the food web within it [2]. In spite of actions by the EU to date, GES of its seas has not been restored. Mediterranean fisheries are mainly managed through fishing effort limits and not the limits to catches.

The focus of the paper is on providing a perspective for further interdisciplinary research of a very specific and complex topic of fisheries sustainability given that not many papers have as yet dealt with the impact of recent environmental strategies and policies on Adriatic area, let alone Croatia. Furthermore, the use of numerous abbreviations in regulatory and sectoral terminology as well as the number of entities involved make any holistic effort even more complex, not to mention the premise for involvement of wider public. The paper is therefore predominantly focused on EU and UN policies applicable in the Adriatic Sea. Motivation for writing the paper was precisely the need for further scientific analyses necessary for instituting a permanent collaboration among scientists and professional in different disciplines that the fisheries should integrate and also between the scientists and fishermen, always from environmental perspective. Its results are intended to serve for further research and policy making.

The paper reviews international regulatory framework, common fisheries policy, fisheries management and implementation, the competences for environmental protection and fisheries policy, environmental policies and implementation, and biodiversity protection and marine protected areas, all with the reference to the particular situation in Croatia and the Adriatic.

2 Regulatory framework

The EU and its Member States are parties to international conventions and agreements aimed at protecting marine habitats and species, those being UNCLOS, the Convention on Biological Diversity, Bonn Convention on the Conservation of Migratory Species and Wild Animals, Bern Convention on the Conservation of European Wildlife and Natural Habitats, as well as regional seas conventions. Important role is also played by RFMOs. UN SDG 14 Life below water provides among others achieving the Aichi biodiversity target of having 10% of marine areas effectively conserved by 2020.

Pursuant to the Treaty on the Functioning of the European Union, the conservation of marine biological resources is fully within the competence of the EU, through CFP. As for environment policies, the competences are shared between Member States and the Commission whereby MSFD and BHDs are those most relevant for the seas. CFP regulates European fisheries, and it aims to ensure the sustainability thereof, whereby MSY was not to be exceeded by 2020.

According to ECA, which examines marine biodiversity and habitat loss and how key European policies and

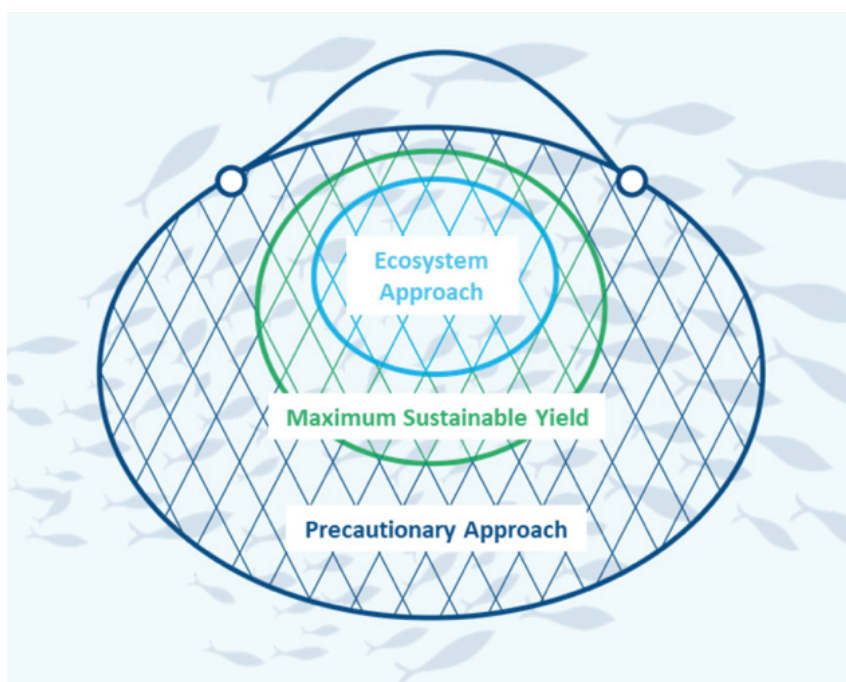


Figure 1 Maximum sustainable yield [3]

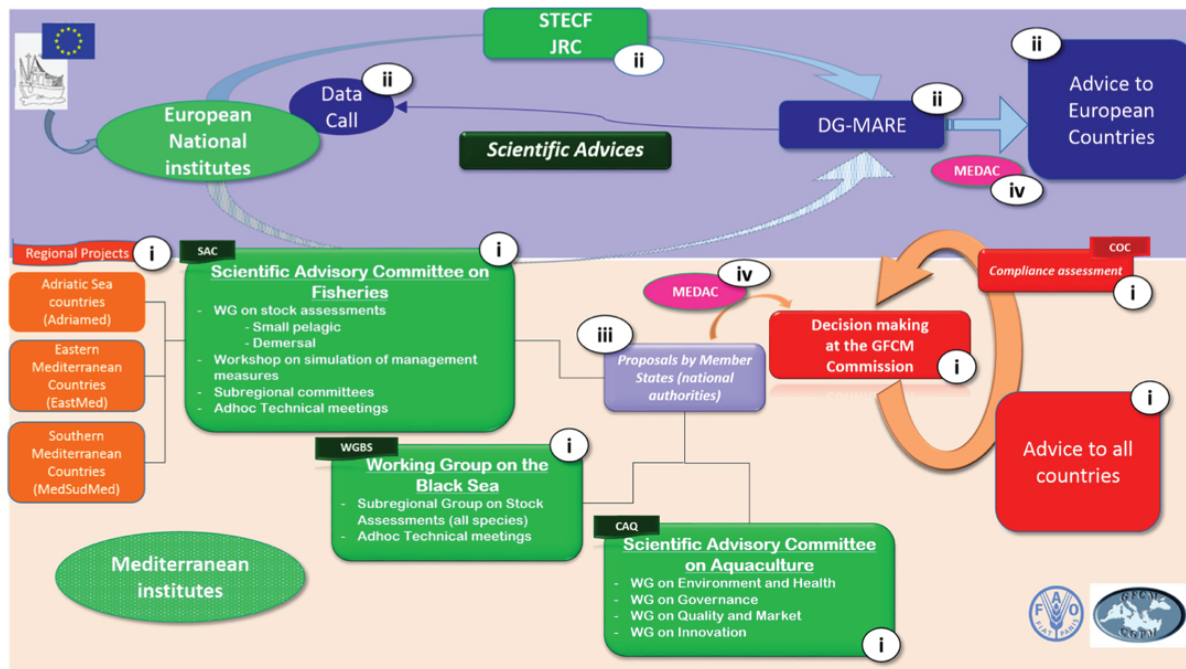


Figure 2 Complexity of management in the Mediterranean Sea [6]

spending programmes address such a challenge, the application of MSY means maintaining fish stocks at the level that is higher compared to that based on precautionary approach, i.e. keeping the stocks above safe biological limits [3]. Both imply the ecosystem approach to management of fisheries, see fig. 1.

Whereas fisheries management in the Mediterranean is mostly ruled by fishing effort regime, in the Atlantic TACs are set and allocated by Member States and fishing zone. Another two EU Regulations additionally apply for the Mediterranean: MedReg or Mediterranean Regulation [4] and the GFCM Regulation [5]. GFCM is a regional fisheries management organization (RFMO) established under FAO. GFCM geographical subareas (GSA) in the Adriatic Sea are GSA17 North Adriatic Sea and GSA 18 South Adriatic Sea (part). Pursuant to CFP, vessels from EU can fish in all European seas.

3 Fisheries management and implementation

There are four big entities with important roles in the quite complex management of marine stock in the Mediterranean Sea [6]: (a) FAO with its RFMO (GFCM) and SAC (b) European institutions (Commission, Council, Parliament) as well as STECF, a pool of experts that advises the Commission on fisheries management and JRC, the EU science hub, (c) national authorities, and (d) fisheries associations, see fig. 2.

Carpi et al. [6] speak for regionalization of CFP in the Mediterranean, CFP having originally been started as North Sea regional policy. Later on, its area of action broadened, however lacking regionalization. Also, papers on CFP are

much more focused on the Northerly area and less on the Mediterranean. Cardinale et al. [7] argue that alarming situation of Mediterranean Sea stocks can be found in the ineffectiveness of the putative effort reductions to control fishing mortalities, the continuous non-adherence to the scientific advice, and the existence of ineffective national management plans.

In their comparative review of fisheries management experiences in Europe and selected countries having advanced fisheries management practice, Marchal et al. [8] point out that the most obvious difference is that the EU consists of a variety of member states bound together with several supra-national institutions, while others are sovereign countries, which makes the decision-making process less complicated although the same issues are addressed and multiple stakeholders (and sometimes federal states) may be involved. They also conclude that conservation and economic performances of different systems might also be related to the inclusion of coastal communities in fisheries policies.

According to the ECA, available data on landings are not sufficiently reliable and Member State fleet effort monitoring is poor. Furthermore, although fishing pressures in the Mediterranean are more critical than in the Atlantic, new vessels may replace inactive vessels and use techniques that are more damaging (e.g. new bottom trawler replacing a purse seiner causes greater damage to marine habitats) [3].

In order to provide for protection of sensitive deep-sea habitats and essential fish habitats, GFCM established eight FRAs that cover about 1% of the Mediterranean Sea. GFCM points out that the implementation of a FRA in the

	Environment	Fisheries
Territorial waters Sovereignty of coastal state 12 NM from baseline	Coastal Member States	Member States European Union
EEZ Sovereign rights of coastal state 12 – 200 NM	Coastal Member States	European Union
High sea	International and regional sea conventions	RFMOs ^a

^a The GFCM is competent for territorial EEZ and international waters in the Mediterranean and Black seas.

Figure 3 Division of responsibilities for environmental and fisheries policies, adopted from [3] and amended.

Jabuka/Pomo Pit situated in the Adriatic is a good example of transnational collaboration and is important for reproduction of European hake, Norway lobster and deep-water rose shrimp, all being important commercial stocks [9].

4 Competences for environmental protection and fisheries policy

European Commission has a greater role in conservation of marine biological resources than for the marine environment, where responsibilities are shared with the Member States, see figure 3. The Commission proposes regulations which concern allowable catches, fishing methods and controls, as well as funding. It however oversees the implementation in both policy areas, i.e. DG MARE for fisheries DG ENV for the marine environment.

Member States are responsible for creating MPAs. Since fishing is within EU competence, Member States may seek to limit the impacts from fishing vessels from other Member States under Article 11 of CFP. However, Member States find the process too complicated and potentially leading to weaker final restrictions. Also, with regard to MPAs, ECA points out to the lack of an effective, well-managed and well-connected network of MPAs and thus limited protection of marine biodiversity [3]. Extending the definition of fisheries restricted areas to any protected area established by Member States as proposed by the Commission in 2018 would empower them to control fishing activities in those areas and simplify the Article 11 process.

5 Environmental policies and their implementation

BHDs (1979 Birds Directive and the 1992 Habitats Directive) aim to protect threatened species and habitats across the EU and together create the Natura 2000 network of protected areas. Member States designate and manage Natura 2000 sites.

Environmental pillar of integrated maritime policy in EU aimed at strengthening the coordination between

various policy areas is MSFD in force since 2008. Member States are to set up national marine strategies to achieve or to maintain GES by 2020. Its implementation takes place six-year cycles. The second cycle was initiated in October 2018 and is being characterised by long reporting delays due to scarcity of data and knowledge about marine environment for certain topics and regions. One of the objectives of CFP is the coherence with the MSFD and its target of achieving GES.

The ecosystem-based approach has by virtue of the MSFD, become a binding principle for managing Europe's marine environment. Namely, ecosystem-based management departs from the approaches that focus on a single species or sector or activity as it implies cumulative impacts of various sectors.

The main activities reported to cause physical loss of benthic habitats include unsustainable aquaculture. Key pressures perceived by Member States in the Mediterranean Sea include overfishing, non-indigenous species, litter, cumulative impacts, and also eutrophication as locally relevant pressure in the Adriatic Sea [10]. Blue Growth strategy on the other hand does share sustainability principle with MSFD, but it by its nature contradicts with MSFD measures for achieving GES, particularly with regard to possible expanding of energy and aquaculture.

One of the foci of the 2019 European Green Deal is conserving healthy and resilient seas. With regard to European environmental objectives that were according to ECA not likely to be met by 2020 [11], the Institute for European Environmental Policy, in its analysis of the EGD [12] pointed out that the issue of state of marine ecosystems and biodiversity needs more ambitious action to reduce harmful impacts of fisheries on biodiversity, while the theme pressures and impacts on marine ecosystems depend on integration with key policies/sectors and “carrots/sticks” to implement. The theme sustainable use of the sea is claimed to be insufficient and other measures need to be proposed following the analysis of the International Panel for Climate Change special report on oceans.

New Biodiversity Strategy [13] of May 2020 envisages to protect at least 30% of Europe's seas area by 2030, with at least 10% being strictly protected.

6 Biodiversity protection and marine protected areas

The planetary boundaries are intimately linked to the oceans and seas and the ongoing changes staying within their limits may be the biggest challenge the present generation is facing [2]. Just looking at the climate change effects, with ocean temperature increasing, so is the salinity and the acidification, with oxygen levels lowered.

The blue economy as a major user of Europe’s seas can be sustainable only if Europe’s seas are clean, healthy and productive [2]. Figure 4 shows an integrated classification of biodiversity condition in the Adriatic Sea. Pursuant to the Convention on Biological Diversity, Aichi Target 11 representing one of the key commitments, states that 10% of coastal and marine areas, especially the areas of particular importance for biodiversity, be conserved by 2020. Mediterranean Sea had a coverage of 11.7%, with the Adriatic Sea having only 5.8% of the area covered by MPAs while Greater North Sea reached 27.1% by 2016, the highest proportion of any European regional sea [14].

MPAs and networks of MPAs are one of the measures for protecting Europe’s marine biodiversity. Fully protected European MPAs (e.g. no-take reserves) have been documented to deliver significant improvements in densities of species, species richness, body size and biomass. MPAs

proved to be successful in biodiversity conservation and local quality of life improvement, if managed effectively. They can be enlarged, made more interconnected, and established in underrepresented regions that are important biodiversity areas [1]. Aichi target 11 itself states that the conservation of coastal and marine areas requires management that is effective and equitable, as well as ecologically representative, with connected systems of protected areas incorporated into wider seascape [14].

Less than 1% of MPAs in Europe are marine reserves [2]. Out of the 1,231 MPAs in the Mediterranean in 2016, solely 76 MPAs include fully protected area(s), whereby 50% of those cover the area that is less than 1 km², meaning that only 0.04% is covered by fully protected MPAs [15].

Actions should also include the removal of the key pressures from the sites to allow recovery of species and habitats that they contain and to ensure that the MPAs can act as a sanctuary zone for biodiversity from which the broader marine ecosystem can benefit as progression is made towards GES. It has been demonstrated that European MPA networks are being more affected than non-protected areas by commercial fisheries. That questions the true benefit of the EU MPA network for marine biodiversity and shows that management efforts need to be strengthened, to prove, for example, that they do benefit biodiversity in comparison with outer network [2]. Obviously, the success

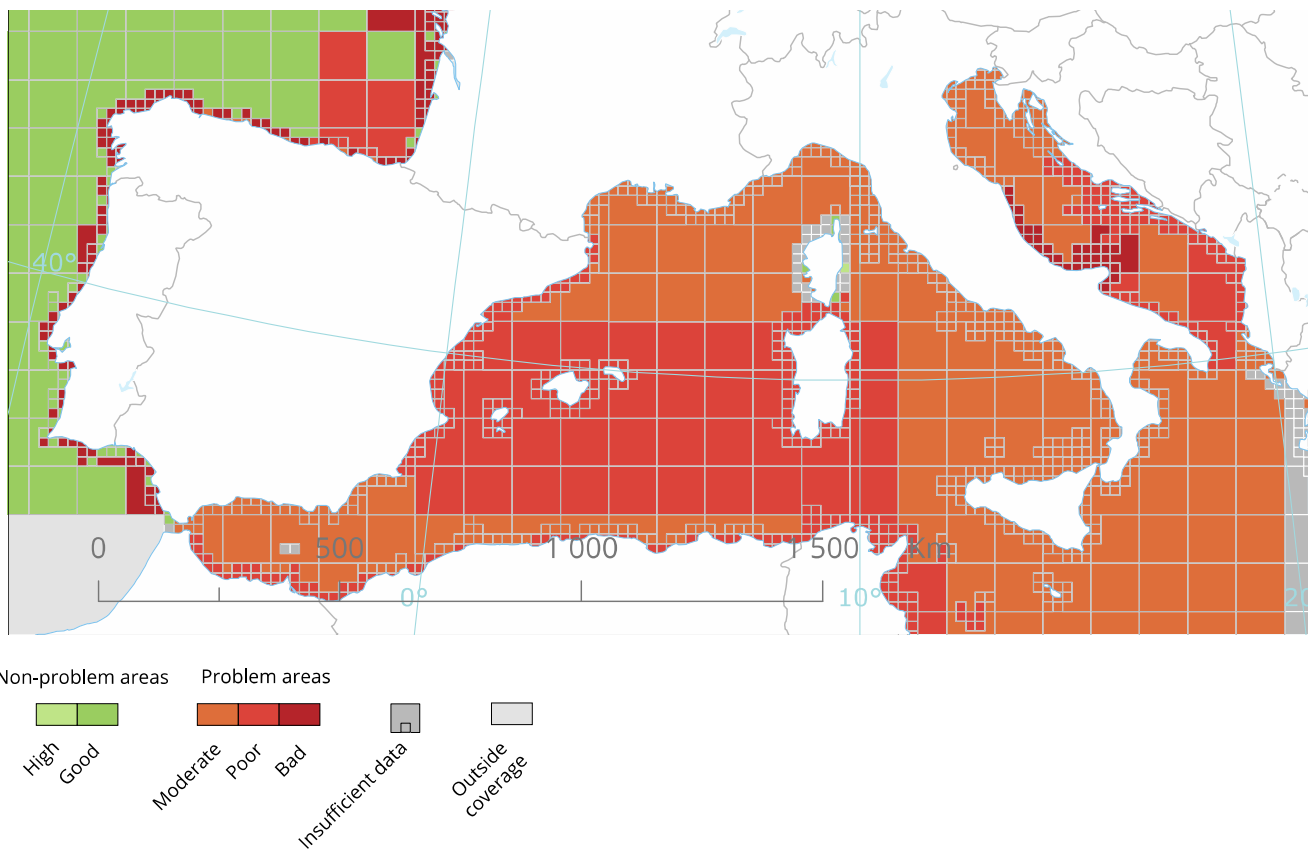


Figure 4 Integrated classification of biodiversity condition in the Mediterranean Sea [2]

and longevity depend on local population support. Study [15] demonstrates that there is a correlation between the support of local small-scale fishermen for protected areas and their perception of good governance, environmental effectiveness and social impacts.

The network of MPAs is unfortunately not representative with regard to diversity of European seas, providing generally little protection. The BHDs annexes that were agreed years ago neither incorporate recent scientific knowledge nor do they cover marine habitats sufficiently. In 2015, the European Environment Agency (EEA) reported that significant aspects of marine ecosystem are excluded from formal protection schemes. Reviewing BHDs annexes would therefore facilitate the protection under CFP rules. MedReg does prohibit the catch of species listed in the Habitats Directive, but catching threatened species not listed in the Annex thereof remains legal [3].

7 Croatian Adriatic fisheries

The Adriatic Sea is a semi-enclosed basin within the larger semi-enclosed sea. It is characterised by the largest shelf area on the Mediterranean, which extends over the Northern and Central parts where the bottom depth is no more than 75 and 100 m respectively, with the exception of the Pomo/Jabuka Pit (200-260m) in the Central Adriatic, largely situated within the Croatian territorial waters. There, cold nutrient-rich waters from North Adriatic flow near the bottom and get trapped by the bottom shape. Pomo pit is the main nursery area for many demersal species. Southern Adriatic has a marked steep slope reaching the maximum depth of 1223 m [16]. Its northern part that lies at the continental shelf of 30 m average depth collects 1/3 of the total continental freshwater of the Mediterranean and 80% of all pollution in the Adriatic [17]. As shallow seas host rich seabed habitats, the combined effects of sea-based pressures on their marine ecosystem are relatively high. In the Adriatic Sea the land-based pressures and pollution are particularly visible in its northern shallower part [2].

The shelf dense water formation in the area affects circulation and thus oxygen supply in the Eastern Mediterranean [18]. Western part is characterized by sandy coasts interrupted by lagunas, while eastern coast is karstic with numerous channels, small islands, submerged cliffs and abrupt depth variations. Dinaric karst encompasses north and eastern parts of the Adriatic, and half of Adriatic Sea bed, with pronounced biodiversity of habitats and benthic fauna located over a small area [17]. The Adriatic Sea is one of the largest areas of occurrence of demersal and small pelagic shared stocks in the Mediterranean [16].

According to Colloca et al. [19] the increased exploitation has altered and simplified the food web structure over time, especially by reducing the proportions of top predators and large-sized fish and increasing the abundance of non-commercial species at lower trophic levels

and species with higher turnover rates, as observed in the Adriatic Sea where there is a long-term decline in large-sized and late-maturing fish species. Thus, the preservation of healthy size-structure of communities should be one of the objectives of the ecosystem approach, while precautionary single species management can contribute to its achievement.

Two EU countries mainly contribute to total catches in the Adriatic Sea. Table 1 shows the landings by groups of species for Croatia and Italy, as well as the share rankings for various species in 2018, those being the latest available data from GFCM. It is evident that Croatian fisheries are more concentrated on small pelagics, with less distribution over other species than is the case of Italy. CFP statistics issued in 2020 [20] provide the data for year 2017 that is further broken down and from which it follows that in Croatia European pilchard (sardines) constituted 69.2% of total catch and European anchovy 15.6%. Thus, anchovy is predominantly targeted by Italy and sardine by Croatia.

Eurostat [22] currently provides newer data (year 2019) for total fishery products. Croatian catches in the Mediterranean are 64,819.92, and Italian 174,688.7 (covering areas outside Adriatic as well) tonnes live weight.

Total aquaculture production for Croatia is 17,114 tonnes live weight worth around 100 million EUR. Main species in marine aquaculture in Croatia are European seabass, gilthead seabream, and Atlantic bluefin tuna [20]. The landings of small pelagics represent the feed for tuna.

During and after recorded events of landings decline in 1987 for anchovy and 2005 for sardine, the authorities failed to react with measures that would contribute to stock recovery. Also, it is to be seen how long the sardine stock will sustain its harvest rate as feed fish for tuna growing and fattening for export from Croatian waters [6]. On the other hand, SWOT analysis for tuna farming in the World Bank report on the vision and plan for implementing the strategy for transformation of aquaculture sector does not consider mentioned problem, stating just that small pelagics as a feed pollutes the sea, particularly the fat matter that degrades surrounding tourist areas [23].

The analysis of another species landed in the Adriatic Sea, Norway lobster, that is harvested on muddy seafloors prevalently by bottom trawls and also by means of baited traps, and whose important concentrations are in Croatian waters, demonstrates that the reference to spatial origin of the catches is often withdrawn. Its landings attributed to Croatia are 25% by weight [6].

By signing the Stability and Association agreement with the EU in 2001, Croatia was bound to accept the CFP. Since 2004 Croatia also renewed its fleet and increased its capacity. Its original attempt to establish the EFPZ, being in conflict with CFP, was enforced only in 2008, with derogation for vessels from the EU. In February 2021 Croatia proclaimed its exclusive economic zone in the Adriatic [15] in order to protect its stocks from trawlers from non-EU countries themselves having deeper territorial waters.

Table 1 Capture production in 2018 in the Adriatic Sea for Croatia and Italy [21].

Croatia 69,141.5		Total catches	Italy 81,994.8	
ranking				ranking
1	86.27%	ISSCAAP groups of species		
2	4.86%	Herrings, sardines, anchovies	44.15%	1
3	2.29%	Miscellaneous pelagic fishes	2.09%	10
4	1.68%	Miscellaneous coastal fishes	6.66%	3
5	1.32%	Cods, hakes, haddocks	4.43%	5
6	1.07%	Shrimps, prawns	2.39%	9
7	0.48%	Squids, cuttlefishes, octopuses	5.89%	4
8	0.42%	Miscellaneous demersal fishes	1.68%	11
9	0.35%	Flounders, halibuts, soles	2.64%	8
10	0.29%	Lobsters, spiny-rock lobsters	0.48%	15
11	0.22%	Sharks, rays, chimaeras	0.97%	12
12	0.20%	Clams, cockles, arkshells	18.51%	2
13	0.14%	Sea-urchins and other echinoderms		
14	0.14%	Oysters		
15	0.14%	Scallops, pectens	0.46%	16
16	0.08%	Marine fishes not identified	0.43%	18
17	0.07%	Mussels	0.64%	14
18	0.04%	Sponges		
19	0.03%	Abalones, winkles, conchs	3.13%	7
20	0.02%	Miscellaneous marine crustaceans	4.09%	6
		Crabs, sea-spiders	0.86%	13
		Miscellaneous marine molluscs	0.46%	17
		River eels	0.04%	19

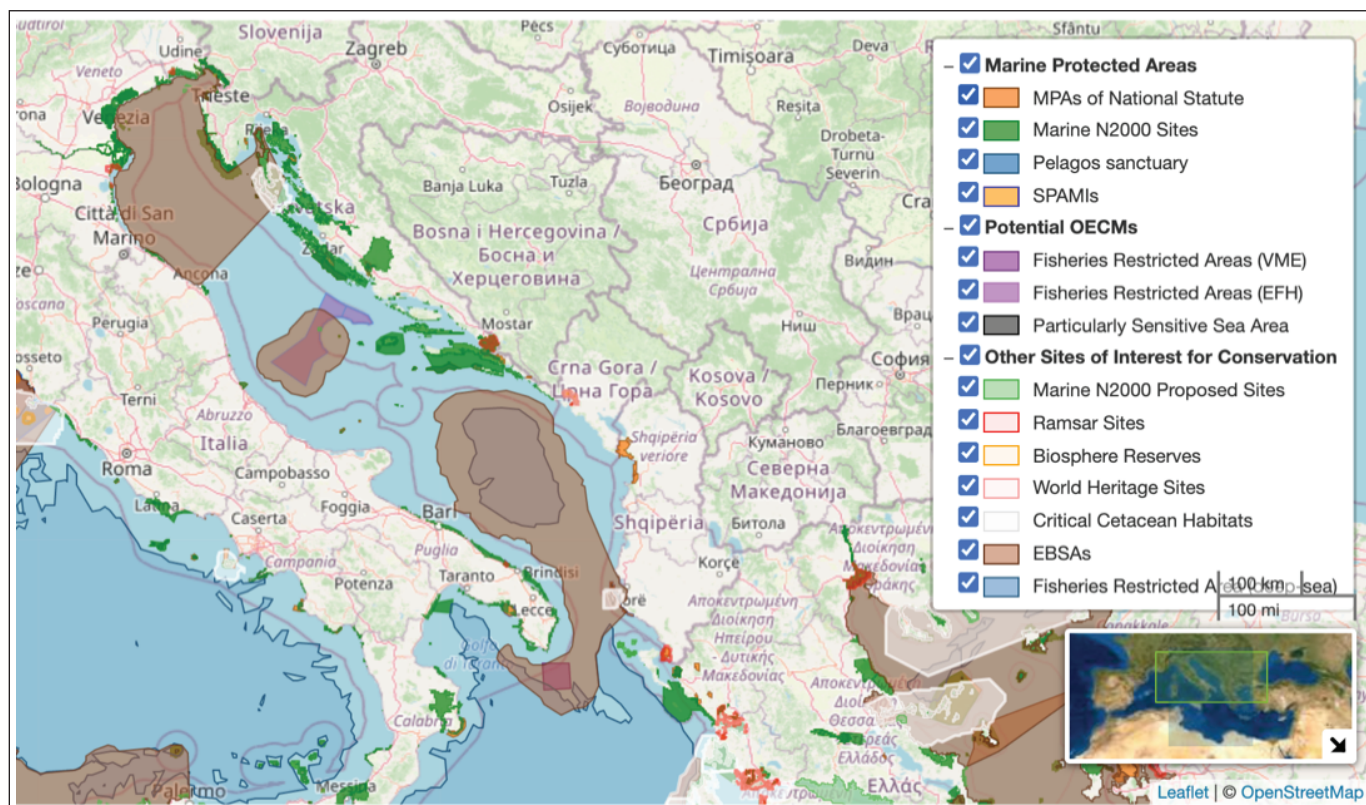


Figure 5 Marine protected areas and sites of interest for conservation in the Adriatic Sea [29]

With regard to Croatian obligations under the MSFD, as a new Member State of the EU, Croatia submitted its initial assessment (Article 8 MSFD), GES (Article 9 MSFD) and environmental targets (Article 10 MSFD) reports in 2014, along with its monitoring programmes (Article 11 MSFD) report. All descriptors were reported to be adequately covered by 2018, except D1,4,6 – Biodiversity which the Croatia reported would be covered by 2020. Justification for the GES not yet adequately covered by the monitoring programmes and plans of how to address these gaps are not consistently provided across all descriptors, which represents a gap in the Croatian reporting [25]. The issues with timeliness and efficiency of MSFD implementation in Croatia are further analysed in [26].

In Croatia there are 10 recognized marine protected areas. The system of protected areas covers 1.97% of the territorial sea. Croatian draft proposal of EU Natura 2000 ecological network involves 16.60% of the area of the sea [27]. Natural capital preservation and maps of areas of ecological network are dealt with in more detail in [28]. The very fact that Croatian administrative body responsible for environmental protection has lately been merged with energy and then with the economy ministry coupled with recent integration of former Croatian Agency for Environment and Nature into such a mega-ministry significantly contributes to less attention being paid to reaching reasonable targets in natural capital and marine ecosystems.

The map in fig. 5 shows marine protected areas, OECMs (according to CBD) and sites of interest for conservation in the Adriatic Sea.

8 Conclusion

Sector of fisheries clearly shows the dependence of economy on a healthy and rich ecosystem that represents its base. It is therefore very difficult to balance the pressures on marine ecosystems resulting from land use, use of the seas, ever less sustainable tourism, aquaculture and blue economy in general with the need to preserve food chains and biodiversity leading to productive seas.

The use of Europe's seas has not been decoupled from marine ecosystem degradation. The key priority is thus restoring the marine ecosystem resilience, while ensuring a sustainable use of the sea. That implies the application of the ecosystem approach, marine spatial planning which entails spatial conservation action of expanding and properly implementing marine protected areas as well as addressing the causes of climate change and pollution.

The Adriatic Sea, as a semi-enclosed sea making the part of the Mediterranean has numerous specific features and importance for the rest of the Mediterranean, also with regard to freshwater and oxygen feed and karstic bottom in its eastern part. It therefore deserves regional approach to sustainable fisheries policy implemented therein and possibly the review of control by fishing effort. Resilient solutions re-

quire placing more focus on characteristics of regional seas and applying site-specific tailor-made solutions and less complex but efficient governance for the seas which entail integrated approach to exploitation and preservation of the resources and their health.

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