

The state of marine fisheries in Montenegro in the last 15 years

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ABSTRACT

Marine fisheries in Montenegro are divided into two main categories: commercial fisheries which are divided into large-scale and small-scale fisheries (classification based on the length of the vessel as well as type, size and number of fishing gears) and sport and recreational fisheries. Institute of Marine Biology is the only institution in Montenegro that collects biological data related to marine fisheries. The official data on the catch of marine fish by species in Montenegro is collected, processed and published by MONSTAT (Bureau of Statistics). Montenegro, as a responsible member of the General Fisheries Commission for the Mediterranean, deeply respects the principles and efforts that this body implements in the Mediterranean and the Black Sea. Montenegrin scientists and administration actively participate in all working groups related to fisheries and resource conservation issues. Unfortunately, unlike all the other Adriatic countries which have modernized and renewed their trawling fleet pretty much in the previous period, Montenegro was not been able to do the same. This is why Montenegrin fishing fleet even today consists of very old vessels, with an average age of around 40 years, low capacity, outdated, low-power engines, very limited range of motion due to the insufficient safety at sea, and overall quite limited possibilities for smooth operation.

Keywords: Marine fisheries, sustainable development, Montenegrin coast

INTRODUCTION

Fisheries in Montenegro have a long tradition. In accordance with the Law on marine fisheries and marine aquaculture (Službeni list Crne Gore 56/09, 47/15), marine

fisheries are carried out in the three distinct areas: “inshore” out to 3 nautical miles (NM) from base lines, “off-shore” waters extending from 3 NM to the limit of territorial waters at

12 NM and international waters outside the 12 NM zone. However, almost all the fishing activities take place within the national territorial waters. The major fishing port in Montenegro is Bar, and there are smaller port at Kotor, Herceg Novi, Budva and Tivat (Pešić, *et al.*, 2011).

Marine fisheries are divided into two main categories: commercial fisheries which are divided into large-scale and small-scale fisheries (classification based on the length of the vessel as well as type, size and number of fishing gears) and sport and recreational fisheries. The length of the vessel in small-scale commercial fisheries is limited to 12 m Length Over All (LOA), while the length of the vessel in large-scale commercial fisheries is limited to 34 m LOA. Key activities in Montenegrin fisheries include bottom trawl fishery and coastal-small scale fishery. Most of trawl activity takes place in the area from Budva to Bar where the seabed is sandy and muddy-sandy to a depth of between 50 and 200 m. Overall, the fisheries sector is small and without the industrial fisheries. Majority of the sector is consisted of small fishing vessels. Around 70% of Montenegrin current fleet uses the gears for small coastal fisheries (coastal beach or boat seines, passive gears, hooks and line) with vessels less than 12 m LOA. Fishing fleet of small-scale fisheries is equally distributed along entire Montenegrin coast at open sea, while approximately 50% of bottom trawl fishing vessels are situated in port of Bar and few in Herceg Novi, (Pešić *et al.*, 2011).

STATUS OVERVIEW

According to the current Law on marine fisheries and mariculture (Službeni list Crne Gore 56/09 and 47/15) and the Law on sea (Službeni list Crne Gore 17/07), Montenegrin fishing sea encompasses marine and

submarine area of internal seawaters, territorial sea and epi-continental area of Montenegro as defined by the Law governing the sea. Montenegrin coast is 284 km long, of which 112 km are the coast of Boka Kotorska Bay, and 11.1 km are the coast of islands. The surface of the internal Montenegrin waters is 362 km², the surface of territorial sea is 2 098 km², the surface of coastal sea is 2 460 km², while the surface of epi-continental area is around 3 885 km², Figure 1 (Pešić *et al.*, 2011).



Figure 1. Continental shelf area (depths of up to 200 m) within the territorial sea of Montenegro

Institute of Marine Biology is the only institution in Montenegro that collects biological data related to marine fisheries. Fishery-independent data are collected since 2004 within the frame of FAO AdriaMed (Scientific support to development of responsible fisheries in the Adriatic Sea, www.faoadriamed.org). Biological data are also collected through MEDITS (EU Mediterranean Trawl Survey System, www.sibm.it/SITO20%MEDITS/principaleprogramma.htm) and MEDIAS programmes, (www.medias-projects.eu). Resources of small coastal and trawl fishing on Montenegro's coast were studied as a part of national scientific and research projects of the Ministry of Science, from 2008-2015 (Joksimović *et al.*, 2016) The Institute is responsible for the

national monitoring of small-scale fishery resources, demersal resources on the continental shelf and the territorial waters and pelagic resources for Ministry of agriculture and rural development. Data collection on the catch of economically important species (pilchard, *Sardina pilchardus* anchovy, *Engraulis engrasicolus* hake, *Merluccius merluccius*, red mullet, *Mullus barbatus*, deep-water pink shrimp, *Parapenaeus lobgirostris* squids, *Loligo vulgaris* and cuttlefish, *Sepia officinalis*) is collected in the DCRF (Data Collection Reference Framework), started 2017. Biological data are collected for all listed species: length, weight, sex and gonad maturity stages. Age determination is done only for pilchard and anchovy. The data are collected on a monthly basis, each month in a different port. Montenegro is a member country of the General Commission for the Fisheries in the Mediterranean (GFCM). As a member country, it partakes in the policy for responsible fisheries through various working groups for stock assessment. Within that framework, one of the obligations is collection of data in marine fisheries (Joksimović et al., 2019).

Fishing licences specify the type of fishing gear the holders can use. Catches in small-scale fisheries are collected using several types of fishing gear and targeting different groups of species:

- small purse seiners generally target pelagic fish,
- trammel netters, gillnetters and beach seiners target pilchard, anchovy, bogue, horse mackerel and bonito,
- bottom long-lines and various gear with hooks are used to catch hake, red mullet and rays,
- traps and tangle nets are used for catching lobster,

“Chinese” nets are used in Bojana River and its estuary for catching grey mullets and eels. Catches for big demersal and small and large pelagic fish are taken using bottom trawlers, gillnetters, small purse-seiners, beach seiners, and long-liners.

The main fisheries target species are the european hake (*Merluccius merluccius*), red mullet (*Mullus barbatus*), and deep-water pink shrimp (*Parapenaeus longirostris*). Also important, but to a somewhat lesser degree, are the common squid (*Loligo vulgaris*), shortfin squid (*Illex coindetii*), octopus (*Octopus vulgaris* and *Eledone* spp.), and the norway lobster (*Nephrops norvegicus*). bogue (*Boops boops*) is not an economically important species, but is heavily represented in small-scale fisheries (trammel nets). Main target species for beach seine and purse-seine fisheries are the european pilchard (*Sardina pilchardus*) and european anchovy (*Engraulis engrasicolus*) (Ikica et al., 2018).

During the research and monitoring of Montenegro’s fisheries in the recent past, catch analysis by species was carried out for each fishery type separately. Single gillnets are the most frequently used fishing gear in small coastal fishing. The total number of species in the catch was 28, of which 24 fish species (representation of 94% in the catch) and two species of cephalopods (octopus and cuttlefish; 3.1%) and crustaceans (lobster, shrimp; 3%) each. According to weight, the most represented species in catch caught using single gillnets was Atlantic bonito (*Sarda sarda*) by 31.5%. Atlantic bonito belongs to the group of large pelagic fish species and its weight often exceeds 1 kg, which is why the weight of a catch of Atlantic bonito shoals in many cases is several times higher than the weight of all other catches, which explains its great share in the catch. Next comes common pandora (*Pagellus erythrinus*) by 8.5%. Greater amberjack (*Seriola dumerili*) is

represented by 7.1% and all other species by a lower percentage. Among cephalopods, cuttlefish is represented by 2.5% and octopus by 0.5%. Common lobster and Norway lobster are represented by 0.5% each. The average number of fishing days per month is 22.9 and on each of these days fishermen make 1.6 fishing operations of total duration of 3.9 hours (that is, each fishing operation lasts 2.4h on average). The total average daily catch per day per boat was 53.8 kg, or 1400 kg for the total number of single gillnets, with the average annual catch by this fishing gear totalling 352.8 tons. The estimated catch per unit effort (CPUE) is 13.9 kg/h (Ikica *et al.*, 2018).

Similar to single gillnets, Atlantic bonito (*S. sarda*) prevailed in catches by triple gillnet, with its share in weight of 30.3%. Much less represented (with less than 10%) are Greater amberjack (*S. dumerili*, 8.6%), Bullet tuna (*Auxis rochei*, 8.2%), Red mullet (*Mullus barbatus*, 7.2%) and Cuttlefish (*Sepia officinalis*, 5.4%). All other species (the total number of species recorded was 29) were represented by less than 5%. Cephalopods were represented by 8.2% (cuttlefish 5.4 and octopus 2.8%), while crustaceans by 2.4% (lobster 1.6% and shrimps 0.8%). Average daily catch ranges around 50.6 kg, or about 759.5 kg for all triple gillnets. Total annual catch is estimated at 31.1 t. The catch per unit effort (CPUE) is 13 kg/h (Ikica *et al.*, 2018).

Beach seines are used only in the region of Boka Kotorska, where they have been used as traditional fishing gear for centuries. Twelve fish species were recorded in the catch and the most represented species is european anchovy (*Engraulis encrasicolus*) with 35.3% followed by european pilchard (*S. Pilchardus*) with 29.2%. Mulletts are represented by 18.3% and all other species by less than 10%. The estimated average daily catch by beach seines is 311.3 kg per boat or 3.4 tons per day for all

beach seines. Estimated annual catch by beach seines is around 304.8 t. The catch per unit effort (CPUE) is 51.9 kg/h, (Ikica *et al.*, 2018).

In catches by bottom longlines the most represented by weight were conger (*Conger conger*, 43%), Common seabream (*Sparus pagrus*, 29.8%), European hake (*Merluccius merluccius*, 8%), and Searobin (fam. Triglidae, 6.2%). Average daily catch by bottom longlines is 57.1 kg (or 456.8 kg for all longlines per day), or around 29.7 t per annum for all longlines. The catch per unit effort is estimated at 9.4 kg/h, (Ikica *et al.*, 2018).

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

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

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

Comparing results from the MEDITS survey with those from the HVAR expedition (1948/49), a sharp decline of elasmobranchs was found. Sharks and rays, which accounted for 36 - 42% of the total fish catch in the early 1970s, declined to 17 - 30% in 2000s. With the exception of *Scyliorhinus canicula* and *Squalus blannvillei*, a decrease or disappearance occurred for all the most common selachians species. Teleostean fish did not show a clear pattern, in particular Hake and Red mullet. Anglerfish (*Lopius budegassa*) and Horse-mackerels (*Trachurus* spp.) seem to be more abundant in more recent surveys than in old expeditions. The opposite was observed for John Dory (*Zeus faber*) (Đurović & Regner, 2009, Pešić, *et al.*, 2011).

Assessment of pelagic resources in Montenegrin territorial waters under AdriaMed and MEDIAS projects, in cooperation with colleagues from Italy and Albania, by research vessel “G. Dallaporta” was carried out by two direct biomass assessment methods - DEP (Daily Egg Production) method, and the European anchovy (*Engraulis encrasicolus*) biomass assessment method based on daily production of early developmental stages (eggs and larvae) used to assess the biomass of the adult

part of the fish population as well as by acoustic method assessing the total biomass of anchovy, pilchard and other pelagic fish species. Analysis of all parameters of early developmental stages of anchovy as well as reproduction parameters of the adult population provides an estimate of the spawning population biomass of about 3500 tons for the South East Adriatic region. The anchovy and pilchard biomass assessment by acoustic method was 1154 tons of anchovy and 16647 tons of pilchard for the South East Adriatic region (Montenegro and Albania) (Joksimović *et al.*, 2016). Based on all the surveys, it is estimated that from 2500 to 3000 tons of small pelagic fish can be caught annually in Montenegrin waters.

The official data on the catch of marine fish by species in Montenegro is collected, processed and published by MONSTAT (Bureau of Statistics). Such data also include the production in privately-owned fish and shellfish farms. The estimation of the catch is done using the approximation method, data for which are collected in municipalities. The approximate data refer to landing, do not include species with landings of less than one tonne, and do not include data on fishing gear and fishing effort, Tab.1.

Table 1. Catch of marine fish for period 2007 – 2017 years (t), (Data source: MONSTAT, 2007-2017, www.monstat.org)

YEAR	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Small and large pelagic fish catch	196	241	199	206	174	245	226	222	245	292	659
Demersal fish catch	245	273	291	310	273	298	269	299	313	313	185
Cephalopods catch	67	78	47	61	49	55	44	51	51	50	33
Crustaceans catch	25	41	21	27	22	25	22	31	28	28	35
Total	533	633	558	604	518	623	561	603	637	683	912

According to 2018 data, Montenegro's fishing fleet comprises 190 vessels. Of that number, 19 are trawlers, 18 seiners and 153 are small coastal fishery vessels. The Law on Marine Fisheries and Mariculture (56/09, 47/15), also stipulates the establishment of a satellite monitoring system for fishing vessels. In achieving this goal, VMS devices have been installed on all vessels over 12 m LOA, as well as on several vessels below that length. Currently a total of 20 vessels in the Montenegrin fleet have active VMS devices. Subsequently, through the IPA II 2014 project "Enhancing the control and management in fisheries" the Montenegrin Fisheries Information System from 2009 has been improved, as well as the inspection control, fisheries management, safety in navigation and work on fishing vessels. The project also included the purchase and installation of automatic vessel identification (AIS) devices on registered fishing vessels longer than 10 m LOA, and the satellite tracking system for these vessels (VMS system) was upgraded in terms of replacement and service of existing non-functional devices. Then, an exchange of data was established between the Fisheries Information System of the Ministry of Agriculture and Rural Development and the Vessel Traffic Monitoring Information System (VMS) of the Ministry of Transport and Maritime Affairs, which significantly increased the safety of fishing vessels during navigation.

Unfortunately, unlike all the other Adriatic countries which have modernized and renewed their trawling fleet pretty much in the previous period, Montenegro was not been able to do the same. This is why Montenegrin fishing fleet even today consists of very old vessels, with an average age of around 40 years, low capacity, outdated, low-power engines, very limited range of motion due to the insufficient safety at sea, and overall quite limited

possibilities for smooth operation. For those reasons, they are operational almost exclusively in the territorial waters of Montenegro, which significantly affects their operational efficiency. The amount of catch of demersal species caught by Montenegro in the Adriatic Sea clearly represents the fact that its catch neither was, nor could be a threat to demersal resources in the Adriatic Sea in terms of overexploitation. Given the geomorphologic shape of the rim of South Adriatic basin, greater depths (over 200 m) in front of Montenegrin coast are actually very close to the coast, and this makes the shelf area extremely narrow (7% of the shelf of the entire Adriatic Sea). It is another limiting circumstance for Montenegrin fishers, who mainly focus their activities on areas up to 100 m depth, from Budva to Bar and Ulcinj. Bottom trawling in the Montenegrin fishing sea is carried out at a distance of 1.5 NM to 15 NM from the coast, as shown in Figure 2.

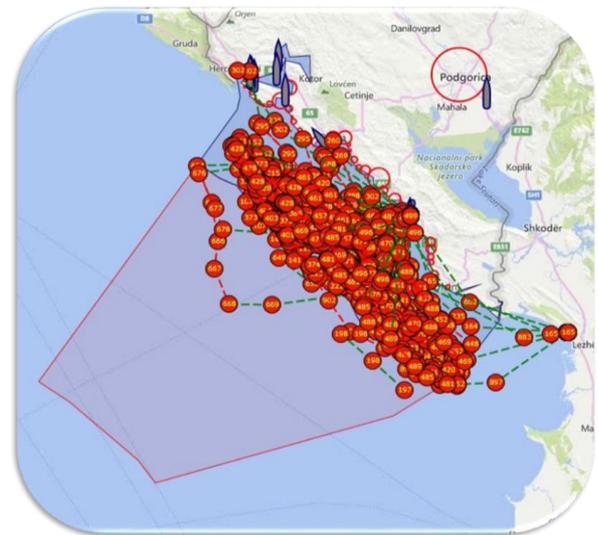


Figure 2. Map of area of Montenegrin trawlers, (Data source: Fisheries Information System – FIS, VMS – Vessel Monitoring System, Ministry of agriculture and rural development of Montenegro, 2018).

In August 2018, Montenegro launched a pilot project "Discard monitoring program" in

cooperation with the GFCM. The work of observers on the vessels, the self-sampling of fishers, as well as the interviews with the fishers are all used to get an assessment of the quantity and composition of the species which are present in the discard. Based on the collected data, the aim of this project is to find a solution to the problem of large quantities of discarded catch in the Mediterranean, reduction of discard and, consequently, the protection of resources.

Montenegrin fishermen encountered certain problems during the period of fisheries development, but some of the problems are present also today. First of all, our fishermen face the problem of obsolete fishing fleet illustrated by vessels that are more than 40 years old. Furthermore, there is a problem of low power engines, so these vessels cannot trawl at deeper depths in the continental slope area. Lack of fishing tools and intermediate products, too, poses a great difficulty, since for each supply fishermen have to travel to countries of the region (Italy, Croatia). On the coast, particularly during summer season, mooring slots in ports pose a problem, because there are no designated fishermen ports in Montenegro. Also, there are no sites on the coasts where fishermen could take their vessel ashore for overhaul. Connections and organisation of fishermen through associations are rather poor. This also creates difficulties in communication with the Ministry, as fishermen are taking care of individual problems rather than finding ways to resolve larger problems. There is also an obvious lack of understanding of the European fisheries policy and non-acceptance of measures for the protection of fishery resources (increase of mesh size in fishing nets, introduction of closed season - either temporal or spatial) and non-acceptance of recommendations of scientific and expert opinions. Some of the issues mentioned would benefit from a better

enforcement of law in the field and an increase in the number of fisheries inspectors, while constant work on awareness raising, further fishermen training opportunities and organised public forums would help improve the situation in general.

FUTURE PLANS

Montenegro submitted the application for EU membership on 15 December 2008. The European Union granted Montenegro the status of a candidate country on 17 December 2010. In December 2011, the Council launched the accession process in June 2012, with a view to opening of the negotiations. Accession negotiations with Montenegro were opened on 29 June 2012. The screening report on alignment of legislation for Chapter 13 – Fisheries was published in November 2013, after two screening meetings, in March and in June 2013. To that end, the Ministry of Agriculture and Rural Development adopted the Fisheries Strategy of Montenegro for 2015-2020, with the Action Plan for transposition, implementation and enforcement of the EU acquis, adopted by the Government of Montenegro at the sitting held on 25 June 2015. The Strategy provides a general strategic framework, identifies the key steps that Montenegro intends to undertake in order to prepare for fulfilling all of its commitments arising from the EU Common Fisheries Policy (CFP). The document includes the vision of the sector's development, its administrative and institutional capacities needed to fulfil all the CFP requirements and to identify some of its key potential.

Montenegro, as a responsible member of the General Fisheries Commission for the Mediterranean, deeply respects the principles and efforts that this body implements in the

Mediterranean and the Black Sea. Montenegrin scientists and administration actively participate in all working groups related to fisheries and resource conservation issues. Through AdriaMed scientific cooperation project and its working platform, which undoubtedly connects Adriatic institutes and ministries in the best possible way, many issues and dilemmas are addressed and will be addressed in order to achieve sustainable fisheries in the Adriatic Sea.

Montenegro, as the youngest partner in the GFCM and Adriatic family, wants to be a firm and responsible partner in all activities carried out by the GFCM and the EU in the Mediterranean. We also respect all the efforts of non-governmental organizations, which we certainly consider as our indispensable partners in this crucial process.

Taking into account the age and current condition of the fishing fleet, as well as the lack of adequate infrastructure on the shore for mooring of fishing vessels and landing of the catch, the Government of Montenegro took a loan from the World Bank in June 2018 and started the project "Montenegro Institutional Development and Agriculture Strengthening " - MIDAS II in order to modernize the fisheries sector.

Through this project, the fisheries sector will be supported in the following manner:

- Direct support for professional fishers for the modernisation of fishing fleet will be implemented in the form of grants for the procurement of new vessels, reconstruction of existing ones, procurement of navigation equipment and improvement of safety on vessels, etc. This component of the project was created after the needs of 90 professional fishers were studied. Regarding this support for modernization of the fishing fleet, increase of the capacity or effort, or responsible attitude towards

sustainable resource management at no point will be questionable.

- The modernisation of the fisheries sector through the MIDAS II project will also cover the investment in the construction, reconstruction and equipment of ports for fishing vessels, construction of first landing places, reconstruction of existing fish markets, as well as the improvement of catch statistics by equipping first landing places with appropriate systems for entering the quantity of caught fish.
- For the purpose of strengthening the institutional capacities or the administrative capacities of the Directorate for Fisheries, as well as the inspection and control, this project provides funds for the organisation of trainings, study visits, procurement of inspection equipment, as well as the improvement of work and professionalization of fishers' associations.

The total amount of allocated funds for the modernisation of the fisheries sector amounts to 10 million €. One of the important goals of investing in the fisheries sector is to strengthen the national institutional framework, administrative capacities and to prepare the sector for the establishment of the system of structural measures in fisheries and the future use of the resources of the European Maritime and Fisheries Fund (EMFF).

Surely, that the fishermen's profession is a difficult one and should not be forgotten, so support from the state authorities is needed to resolve these problems. Dialogue, mutual understanding and some subsidies by the state, fisheries development on sustainable principles can all result in further development of this sector. Fishery sector developed in such a way can bring nothing but benefit to all the stakeholders.

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Stanje morskog ribarstva Crne Gore u poslednjih 15 godina

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SAŽETAK

Morsko ribarstvo u Crnoj Gori podijeljeno je u dvije glavne kategorije: komercijalni ribolov koji je podijeljen na veliki i mali ribolov (podjela je na osnovu dužine plovila, kao i vrste, veličine i broja ribolovnih alata) i sportsko rekreativni ribolov. Institut za biologiju mora jedina je ustanova u Crnoj Gori koja prikuplja biološke podatke koji se odnose na morsko ribarstvo. Službene podatke o ulovu morske ribe po vrstama u Crnoj Gori prikuplja, obrađuje i objavljuje MONSTAT (državni Zavod za statistiku). Crna Gora, kao odgovorna članica Generalne komisije za ribarstvo Mediterana, duboko poštuje načela i napore koje ovo tijelo sprovodi u Mediteranu i Crnom moru. Crnogorski naučnici i Direktor za ribarstvo aktivno učestvuju u svim radnim grupama vezanim za ribarstvo i zaštitu resursa. Nažalost, za razliku od svih ostalih jadranskih zemalja koje su u prethodnom razdoblju prilično modernizovale i obnovile svoju ribarsku flotu, Crna Gora to nije bila u stanju uraditi. To je razlog zašto crnogorsku ribarsku flotu i danas čine vrlo stara plovila, prosječne starosti od preko 40 godina, malog kapaciteta, zastarjelih motora male snage, vrlo ograničenog dometa plovidbe zbog nedovoljne sigurnosti na moru i uopšte prilično ograničenih mogućnosti za nesmetan rad.

Ključne riječi: Morsko ribarstvo, održivi razvoj, crnogorsko primorje