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# FISHERIES IMPACT ASSESSMENT ALBANIA

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# Fisheries Impact Assessment Albania

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Content

# 1. Summary

This report assesses the environmental impact of the Albanian fishing fleet, which is evaluated with regard to biodiversity, status of commercial stocks, bottom impact, pollution and marine litter. The Southern Adriatic Sea and Eastern Ionic Sea are considered in this work, as these are the regions where the Albanian fishery is active.

Physical environmental background of fishing grounds

An overview of the marine environment (focus on sea-bottom) of the Albanian part of the Southern Adriatic Sea and the nature conservation management (e.g. marine protected areas, nursery grounds) is given. The habitats in the South Adriatic Sea are mainly classified as deep sea mud or sand and the shelf part is mainly dominated by coastal terrigenous muds and detritic bottoms. In the near coastal area, sea-grass beds are an important ecological habitat, which need protection. There are two marine parks in the Albanian coastal waters, which ensure some protection of the coastal ecosystem. For the Southern Adriatic Sea, a preliminary assessment of the fisheries' benthic impact, based on the ICES FBIT approach was made, but local fishing activity (VMS data) and habitat sensitivity information is needed to update this to an appropriate seafloor integrity assessment.

Existing fisheries activities

The majority of the fishing vessels are small-scale fishing boats (<12 m) that use passive fishing techniques to catch fish in coastal waters. Although their landings are small compared to those of the industrial fleet, this segment delivers important contributions to food security and employment in local communities. The industrial fleet (>12 m) consists (i) predominantly of bottom trawlers targeting demersal species such as shrimp, hake and mullet; (ii) pelagic trawlers and purse seiners targeting small pelagics such as anchovy and pilchard and (iii) a handful of dredgers targeting clams.

Fisheries recourses

This chapter covers the Albanian landings data and the status of the stocks of the key commercial species. The most landed species (in weight) are deep-water rose shrimp, sardine, hake and anchovy, although the Albanian contribution to the landings in the Mediterranean is relatively low.

An overview of the available stock assessments in the Adriatic Sea shows the fishing pressure of almost all available stock assessments is too high and stocks are fished outside biologically sustainable limits. Despite some positive signals, the levels of fishing mortality for key stocks are still far from the levels expected to provide maximum sustainable yield. Stock assessments serve as a scientific base for the formulation of management advice in the area. Discards represent a major source of uncertainty in the actual fishing mortality rates of several commercial stocks. Incidental catch of endangered, threatened or protected species is part of the unwanted bycatch. Sea turtles and elasmobranchs represent the highest numerical share of reported incidental catch of vulnerable species in the Mediterranean and Black Sea area (FAO, 2020).

One of the management measures to protect stocks is the implementation of minimum conservation reference sizes (MCRS). Species smaller than these sizes cannot be landed or sold. Mesh size and mesh shape of fishing gear should be adapted to mainly catch species larger than the MCRS. The MCRS is not always well aligned with the age at maturity.

Pollution & marine litter

No data was available on pollution by discharge of wastewater or fuel loss. Preliminary data on marine litter in Albania confirms observations made elsewhere in the Adriatic, which indicate that fishery and aquaculture activities are a significant, but not the primary, contributors of marine litter.

Fishery policies

Albania is gradually trying to comply with the common fishery policy (CFP) by implementing legislation and regulatory measures for its fishery based on the GFCM-recommendations for the Adriatic Sea. Regulation in the past mainly focussed on mesh sizes and spatial and/or temporal closures. More recently, the use of fishing licences as well as monitoring and catch registration systems have been introduced. The major challenge to date is extending the required scientific expertise to properly monitor fishing stocks, do research and give advice on one hand and building the administrative capacity to design, implement and enforce policy measures and regulations on the other hand.

Risk analysis related to nature conservation, based on the Marine Strategy Framework Directive (MSFD)

To evaluate the sustainability of Albania's fishery on the marine ecosystem, the Marine Strategy Framework Directive (MSFD) is used as an evaluation framework. The MSFD is based on 11 qualitative descriptors of which the relevant descriptors for fisheries are used as a guideline to evaluate the risk of the Albanian fishery impacting the marine environment:

- Biodiversity (D1): Fishing removes a considerable biomass of fish from the ecosystem, both target species as well as unwanted by-catch. Incidental catch of ETP species is part of the unwanted bycatch in Albanian fisheries. Data which would allow assessing the magnitude of these impacts at population level is lacking. D1 is consequently evaluated as at high risk. Since the Albanian contribution to the landings in the Mediterranean is relatively low, the Albanian impact is assessed as medium despite its high bycatches.
- Invasive species (D2): The presence of non-indigenous species is a problem in the area and there is a high risk not to meet D2. Since Albania's fishing fleet does not operate outside of the Adriatic or Ionic Sea, their fishery won't act as a vector for non-indigenous species. Therefore, Albanian impact is low.
- Stock status (D3): almost all available relevant stock assessments show stocks are fished outside biologically sustainable limits. Consequently these criteria are evaluated as at high risk. Albanian fisheries are evaluated to have a medium impact, due to relatively low Albanian contribution to the landings in the Mediterranean, however with high (undersized) bycatch and discards. Discards represent a major source of uncertainty in the actual fishing

mortality rates of several commercial stocks. A better management, control and enforcement is warranted to achieve MSY.

- Food web (D4): Albanian fishery will have an impact on the food web but better monitoring is needed to correctly assess and minimize this.
- Sea floor integrity (D6): Fishery with bottom contacting gear create a relatively high seafloor disturbance, which needs to be followed up. The Albanian fishery is mainly fishing on soft sediments and will not change those habitat types. The major habitat of concern in the region are seagrass fields at the nearby coast, which can decline due to fishery. But as far as reported, the Albanian fishery is not active in those areas and some seagrass areas are included in an MPA. Improving the monitoring of the fishing activities (e.g. VMS data) is needed to evaluate this criterion.
- Pollution (D8): The lack of data and thresholds makes it impossible to assess the relative share of the fishing vessels compared to other fleets and land-based pollution.
- Food safety (D9): Overall, no major significant concerns or extreme high levels were observed so far in the Mediterranean Sea, although the number of research studies on this topic is still limited. Further research is necessary.
- Marine litter & pollution (D10): Information is lacking to fully understand the magnitude of the problem with marine litter. Marine litter is a significant issue in the Adriatic Sea warranting regional solutions. This is definitely not an Albania-specific issue and further research on this topic is a regional and even world-wide challenge.
- Introduction of energy (D11): Albanian fishery contributes to the background noise that may affect marine animals. Albania has no useful dataset on this topic making it impossible to evaluate the impact of their fishery, let alone isolate it from other important contributors such as maritime traffic. This is not a challenge specific to Albania.

These issues are characteristic for the entire Adriatic Sea, and Mediterranean as a whole. However, Albania is running behind when it comes to quantifying these topics. Despite the significant efforts made in recent years, the knowledge of the Albanian marine fishery, its impact and of the targeted stocks is still fairly limited. Therefore, the first step is to develop the scientific, management and enforcement capacity to ensure appropriate management of fish resources and minimize the fishery's impact.

## 2. General introduction

To potentially join the EU, Albania needs to be able to implement the Common Fisheries Policy (CFP), requiring management of their stocks and fleet based on high quality scientific data collection. The EU's environmental legislation is based on the Marine Strategy Framework Directive (MSFD), which aim is to effectively protect the marine environment and achieve good environmental status. This directive is pushing for a better understanding of the pressures and impacts of human activities on the marine environment, as well as their implications for marine biodiversity, habitats and the ecosystems they sustain. Therefore, the MSFD framework is used in this report to evaluate the potential impact of the Albanian fishery on the marine environment. Unfortunately, the knowledge of the Albanian marine fishery and targeted stocks is fairly limited and their policy framework is still inadequate. This report aims to offer (i) an environmental description, (ii) a description of the Albanian marine fishery sector discussing the different types of fishing (gears), (iii) a first estimate of their potential impact on the environment, based on the MSFD evaluation framework and (iv) a discussion of the major knowledge gaps and management priorities to date in this context.

Albania is a member of the General Fisheries Commission for the Mediterranean (GFCM) (gfcm.org), which is responsible for providing advice on established priorities for Mediterranean and Black Sea fisheries and aquaculture. The data reported by Albania to the GFCM show that Albania had a total domestic production of 14800 tonnes of fish and seafood in 2018 of which 42%, 34%, 16% and 8% came from marine fishing, aquaculture, inland waters fisheries and mussel's production respectively. The data (Albanian Institute for Statistics, 2022) shows a 40% increase in total production from 2012 to 2020 although two distinct opposite trends can be noticed (Table 1). On one hand, tremendous growth occurred in aquaculture (250%) and inland water fisheries (90%). On the other hand, landings of marine fisheries decreased 30% over the same period as a result of continued decline in permitted fishing days within the GFCM framework.

*Table 1: Evolution of Albanians total domestic production of fish and seafood (ton/year).*

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Marine fisheries/landings | 7126 | 7424 | 7067 | 6216 | 6196 | 9282 | 6202 | 5842 | 4965 |
| Inland waters | 1488 | 1563 | 1655 | 1659 | 1688 | 2007 | 2427 | 2865 | 2844 |
| Aquaculture fish | 2500 | 2700 | 2800 | 3000 | 3200 | 4000 | 5138 | 5229 | 8799 |
| Aquaculture mollusk* | 950 | 1000 | 1200 | 495 | 1450 | 430 | 1108 | 1075 | 285 |
| Total | 12064 | 12687 | 12722 | 11370 | 12534 | 15719 | 14875 | 15011 | 16893 |

* *Mytilus galloprovincialis*

As shown in Table 1, aquaculture is the main driver behind the growth of Albanian fish production. In 2018, 77% of the industrial fish production was achieved in seawater cages and 23% in freshwater farms (FAO, 2018), providing direct employment to 620 people. The production consisted mainly of the saltwater species gilthead sea bream (*Sparus Aurata*) and sea bass (*Dicentrarchus labrax*) (Bakiu et al., 2018) and cold freshwater salmonids (*Salmo letnica* and *Oncorhynchus mykiss)* in freshwater (FAO fishery & aquaculture country profile, 2018). There is also a cultivation of mussels (*Mytilus galloprovincialis*) concentrated in the Butrinti lagoon with a yearly

production around 1000 tonnes, although the yield shows strong fluctuations over the years depending on the conditions in the lagoon.

The other growing fish sector is that of commercial inland water fisheries, practiced in natural and artificial lakes, coastal lagoons and irrigation reservoirs by about 800 fishers using gillnets, beach nets and hooks. Traditionally, these fisheries mainly targeted carp species which were restocked annually by fingerlings of carp species cultivated in hatcheries. However, the production of fingerlings, hence restocking, has declined drastically from around 15 million in the 90's to not more than 3 million in recent years (Palluqi, 2019).

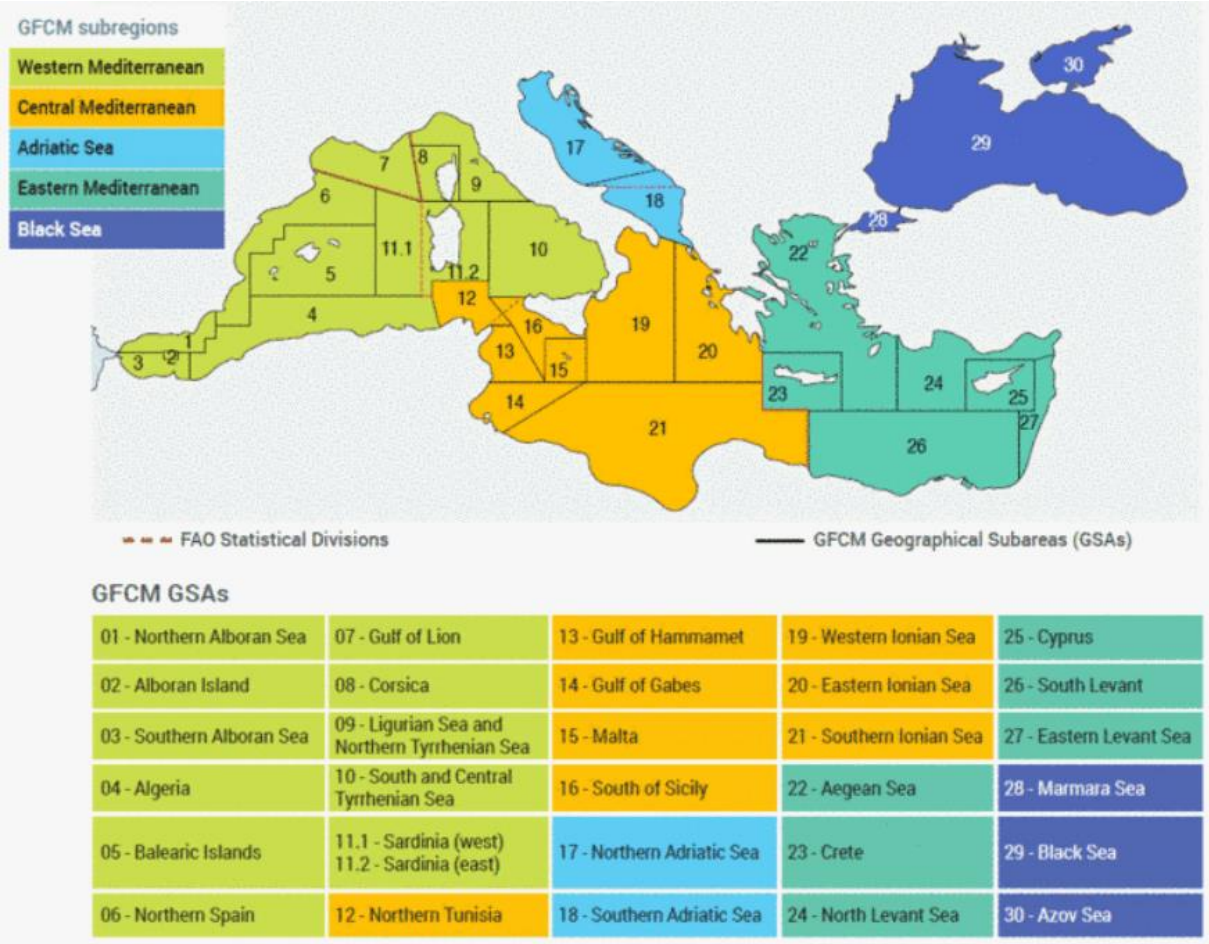



*Figure 1: Map of the GFCM area of application (subregions and geographical subareas, GSA) (FAO.org, Resolution GFCM/33/2009/2).*

From here on, this report will focus on Albania's marine fishing sector. Most licenced vessels sailed from Durres (36.7%) and Vlora (34.1%), the others from Saranda (15.6%) and Shëngin (13.6%) (Figure 2) (Albanian Institute for Statistics, 2022). About two third of these vessels were small scale vessels (<12 m) fishing close to shore mainly using gill nets. The vessels larger than 12 m are mainly bottom trawls (85%) although some dredgers (2%), pelagic trawlers (9%) and purse seiners (4%) were reported as well (Table 2). These vessels mainly operate in the Southern Adriatic Sea and to a minor extent also in the Eastern Ionic Sea. These fishing grounds correspond to FAO-GFCM Geographical

Sub Areas 18 and 20, subdivision of the Adriatic Sea and the Central Mediterranean as illustrated in Figure 1.


*Figure 2: Fishing ports Shëngin, Durres, Vlora and Saranda in Albania.*

According to 2015 OECD/SIGMA report, there are three main challenges for the Albanian fishery sector. First, their organisation lacks adequate legal, institutional and administrative capacities. Second, there is limited research and monitoring capacity preventing policy analysis of the sector. The data collection needs further strengthening. Last, they face a structural drawback caused by missing fishing infrastructure, an aging fishing fleet and inferior professional training and education of the fishermen. The progress is described in EU 2021 progress report for Albania.

## 3. Sensitivity of fishing grounds

In this chapter, we give an overview of the marine environment, with the focus on sea-bottom, of the Southern Adriatic Sea and the nature conservation management (e.g. marine protected areas, nursery grounds). This is the region in the Adriatic where the Albanian fishery is active. This information is needed to estimate the possible impact of the Albanian fishing activities on the seafloor habitats (MSFD descriptor 6) and the biodiversity (MSFD descriptor 1).

## 3.1. Habitat types and their biological characteristics

The Albanian coastline has a length of 427 km, with about 273 km stretching along the semi-enclosed Adriatic Sea and the remaining 154 km facing the Ionian Sea. The two seas have distinct physical and chemical characteristics with the Adriatic showing large seasonal variations in temperature and productivity, with levels of nutrients and salinity controlled by freshwater inputs. The Ionian Sea has a more constant oceanography throughout the year. The habitats in the Southern Adriatic Sea (see Box 1 for details) are mainly classified as deep sea mud or sand (Figure 3) and the shelf part (North coast of Albanian) is mainly dominated by coastal terrigenous muds and detritic bottoms. For the near-shore waters, no habitat categorisation is available, except the indication of Posidonia beds.

**Box 1**: Habitat types bordering Albania:

A5.23: Infralittoral fine sands. These clean sands occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (Bathyporeia) and robust polychaetes including *Nephtys cirrosa* and *Lanice conchilega*.

A5.39: Mediterranean biocoenosis of coastal terrigenous muds. These sediments are always pure mud, more or less clayey, almost always of fluvial origin. Such coarse debris as may be deposited is quickly covered, with the result that no epifauna develops.

A5.46: Mediterranean biocoenosis of coastal detritic bottoms. These communities occur on a substratum whose nature varies widely and depends largely on the typology of the nearby coast and of nearby infralittoral formations. This implies that substrata can sometimes be gravels and sands originating from predominant local rocks, sometimes shell debris from various molluscs, sometimes debris from branched bryozoans or debris of dead and more or less corroded Melobesiae spp. The interstices between these various components are partially filled by a greater or lesser proportion of sand and mud.

A5.47: Mediterranean communities of shelf-edge detritic bottoms: These communities are present in detritic bottoms with abundance of dead shells, bryozoans and coral skeletons.

A5.535: Posidonia beds. Posidonia oceanica is protected by EU legislation (Habitat Directive), the Bern and Barcelona Conventions and some national legislations.

A6.51: Mediterranean communities of bathyal muds (no fishing). This biocenosis is characterised by a constant homothermy of around 13° C and an almost total absence of light. The granulometry and thickness of the sediment is not homogeneous. It is present, generally, at depths of 150 - 250 metres. The faunal composition is characterised by foraminifera, sponges, polychaetes, echinoderms and crustaceans.

A6.511: Facies of sandy muds with *Thenea muricata*. This facies is characterised by sandy muds populated by the mollusc *Thenea muricata*.

A6.3: Deep-sea sands. These are deep-sea benthic habitats with substrates predominantly of sand.

A6.4: Deep-sea muddy sands. These are deep-sea benthic habitats with substrates predominantly of muddy sand.

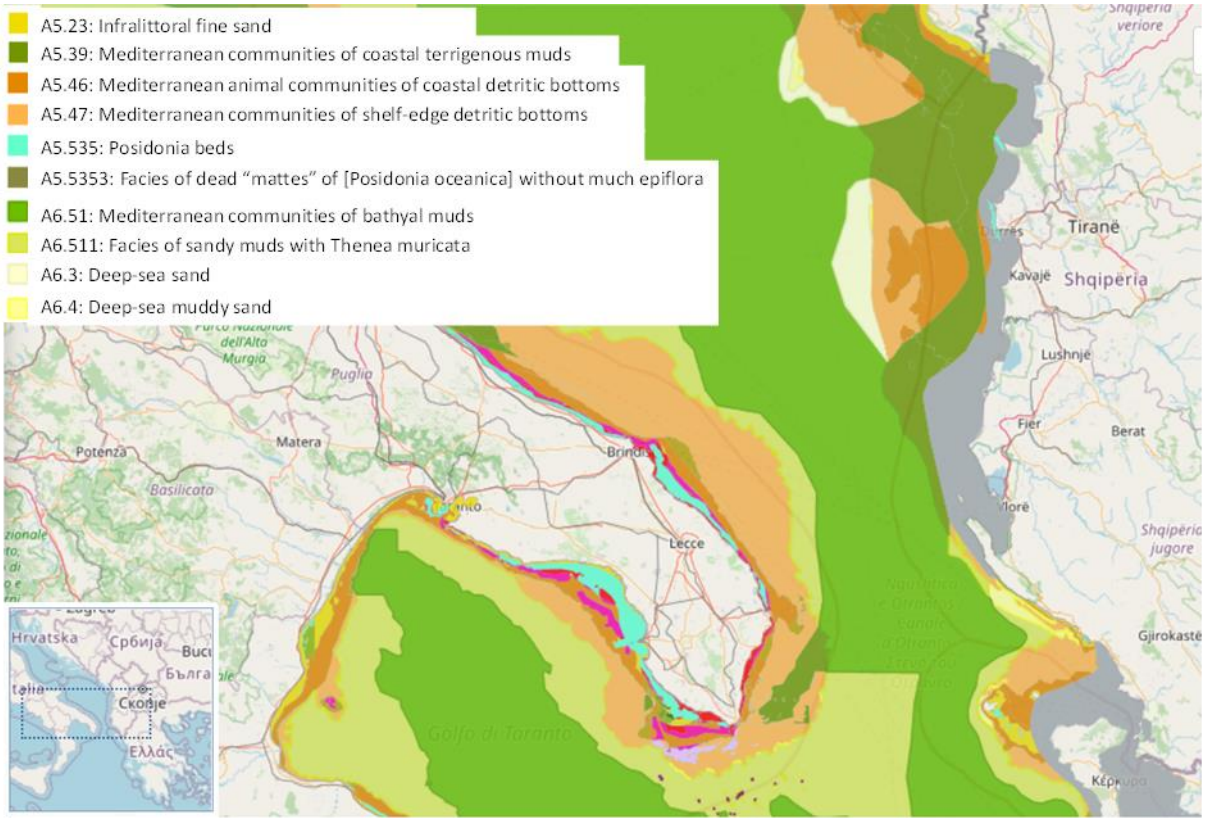



*Figure 3: Overview of the habitats in the Southern Adriatic Sea, region Albania, with indication of the EEZ of the countries. The habitats are defined according to the EUNIS scale, at the lowest possible resolution.*

## 3.2. Marine Protected areas

A way to manage the marine ecosystem and protect certain habitats and species is to install marine protected areas (MPAs). There are two marine parks in the Albanian coastal waters.

- The Karaburun-Sazan maritime park (https://www.karaburunsazanmpa.com/index.php/en/) (Figure 4): This Maritime Park represents a very rich and attractive place in terms of natural and cultural heritage attractions, both at sea and on land. It reveals a rich traditional culture of lifestyle, folklore, music, crafts, gastronomy, etc. The area is a shelter for at least 36 marine species of international importance belonging to the list of endangered species and / or protected by several international conventions. For example, this area is also of special importance for the common dolphin and other cetaceans (ACCOBAMS regulation). At the national level, about 75% of endangered species of marine animals are recorded in the area. Although the main sectors of the economy that rely on this ecosystem are traditional farming, livestock farming and fishing, tourism remains one of the most important activities of the Park, creating economic opportunities and enabling a wide range of natural tourism activities.

- The marine park of "Porto Palermo-Llamani Bay": The Marine and Coastal Protected Area (MCPA) was established to preserve biodiversity, integrated marine and coastal ecosystems, species, terrestrial, marine, coastal and underwater landscape, as well as administration of functions and services they provide. The protected area will provide resources for sustainable living conditions of the population, stakeholders and for future generations. Marine subsurface biodiversity is known for the diversity of threatened species, such as *Posidonia oceanica*, *Cymodocea nodosa* and *Halophila stipulacea*. Likewise, it is known for the diversity of fish, dolphins, seals, sea turtles, shellfish, sea urchin, corals etc. Within the area, different zones with different levels of management and nature protection rules are defined (Al info in it management plan: http://www.rac-spa.org/sites/default/files/doc_medmpanet/final_docs_albania/73_albania_management_plan_eng.pdf)

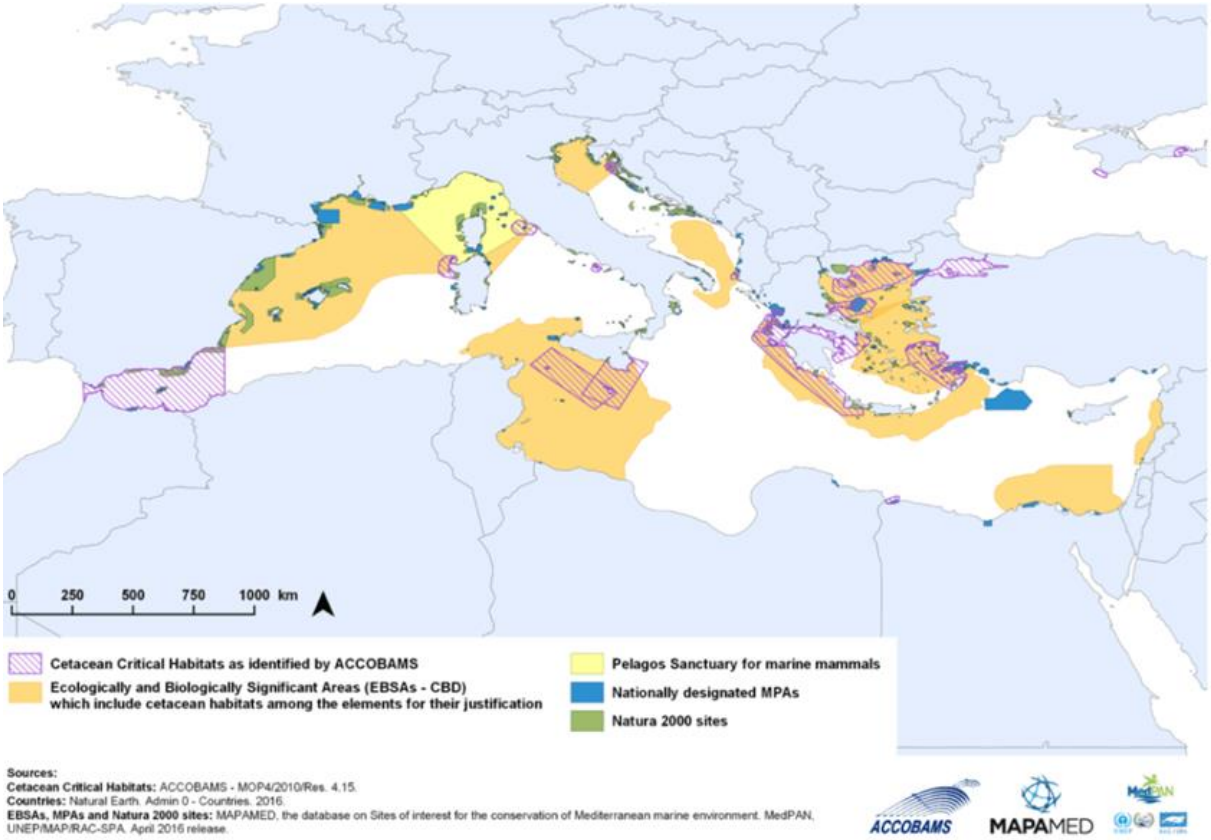



*Figure 4: Overview of the areas identified as ecologically and biologically significant, including cetacean habitats. The critical cetacean habitats by ACCOBAMS are identified as well, whereas The Sazani Island – Karaburuni Peninsula (Adriatic and Ionian Sea, Albania) is one of.*

Despite the fact that there are two marine parks where the marine environment is managed, it is important for the Albanian fishery to avoid bycatch of Cetacean species, as the Southern Adriatic Sea is an important ecological and biological area for those species. Catch of cetacean species is prohibited by Albanian law (Law on Fisheries No. 64/2012.).

Another aspect important in striving for a sustainable fishery is to take into account the spawning and nursery grounds of the fish and avoid intensive fisheries in those areas on certain moments.

No real data or information is available, except the review study of Zorica et al. (2020). This study includes the examination of spawning and nursery areas for four economically and ecologically important fish species (Sardine, anchovy, European hake, Common pandora) over the time period of last two decades. It pointed out that the area of the open middle Adriatic is a spawning and nursery ground for small pelagic fish species and the area of European hake-successful recruitment. The area of shallow northern Adriatic was highlighted as an area significant for early life stages of anchovy and common pandora, while the southern part of the Adriatic Gulf of Manfredonia distinguished itself as by far the most important nursery area for both small pelagic fish species and European hake (Zorica et al., 2020).

## 3.3. Benthic impact estimates of fishing

The fleet operates almost entirely within the GSA 18 (Southern Adriatic). Fishing activity takes place along the entire coastline. However, for the most part it is concentrated along the continental shelf zone, which on the Adriatic side in the north extends 25 miles, but only 2-4 miles on the side of the Ionian Sea. The sea bottom varies from north to south. In the north, the shelf is larger and the slope less steep to the 200 m isobath and consequently easier to trawl (Figure 3). In the south, where the water depth rapidly reaches 200 m, it is uneven and covered with rocks.

The possible benthic impact is estimated based on the fishery benthic impact approach (FBIT) (ICES, 2017, 2022; Hiddink et al., 2018). This approach combines the estimate of the fishery pressure and the sensitivity of the habitat to determine the impact. The sensitivity of the habitat is based on the longevity composition of the benthic fauna, where habitats with more long living species are assumed to be more sensitive to fishing. For the Southern Adriatic Sea, a preliminary assessment of the fishery benthic impact, based on the FBIT approach was made based on data of the Global fish watch (SAR 2015-2019), benthic data of the MEDITS survey and the EMODnet EUSeaMAp (2021) for the broad scale MSFD habitat information. The results were visualised in a reference grid of 0.1° x 0.1° c-squares. Those analyses were performed by COISPA in the context of the ICES FBIT working group (ICES, 2022).

1) Step 1: Pressure layer information

Fishing intensity was estimated using the swept area ratio (SAR). The swept area is the cumulative area contacted by a fishing gear within a grid cell over one year. The source of pressure data for GSA 18 is AIS data from Global Fishing Watch. Vessels' fishing activity, reported as fishing hours, were analysed in a predefined grid (e.g. 0.1° × 0.1°). For the estimation of the SAR the total gear width (door spread) was derived using Eigaard et al. (2016) equations. Estimates of the total SAR within each grid cell were calculated for demersal otter trawls of the fishing fleet in the Southern Adriatic. In Figure 5, an average of the SAR for the years 2015-2019 is presented, related to the trawling frequency of demersal otter trawls.

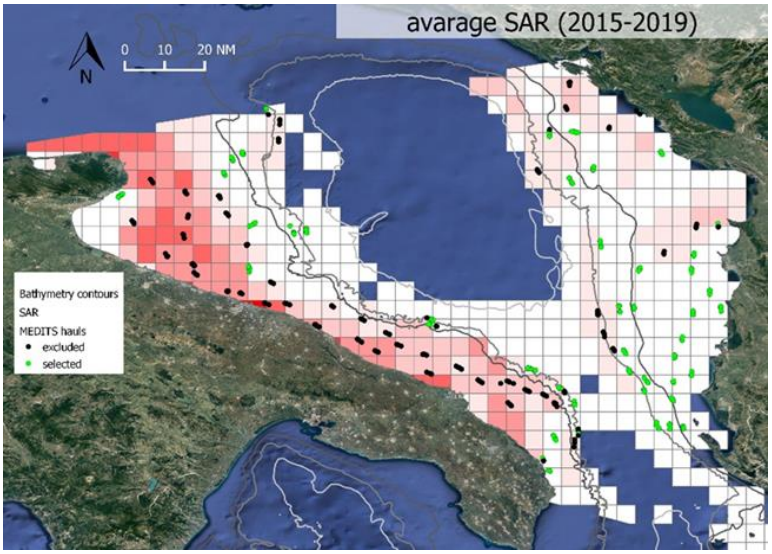
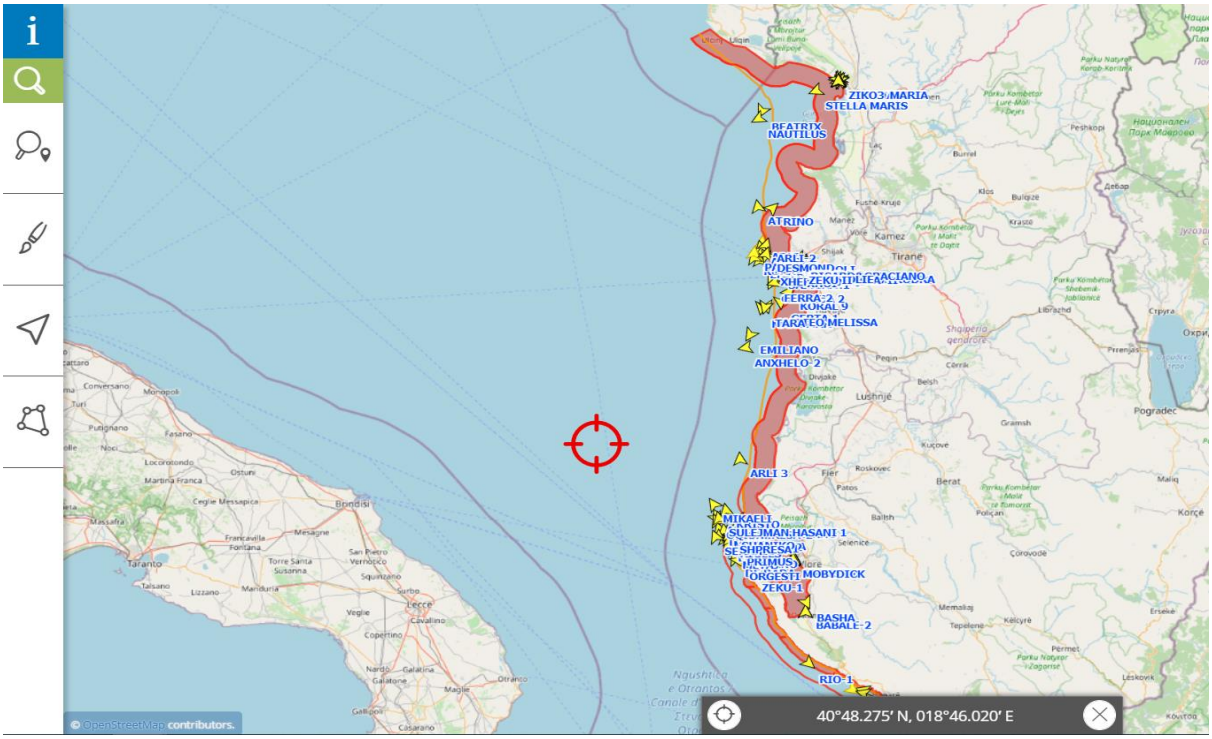



*Figure 5: Extent of the average swept area ratio (SAR) in the Southern Adriatic Sea from 2015-2019 plotted on a 0.1° x 0.1° grid (Red areas are areas with highest SAR). Green dots represent MEDITS survey selected hauls with SAR < 0.5; black dots show MEDITS survey removed hauls with SAR >= 0.5.*

No specific Vessel Monitoring System (VMS) data of the Albanian fishery was available to estimate the extent of their fishing distribution. Nevertheless, VMS data of the Albanian fishery is recorded since 2021 and can be used in the future to estimate the Albanian fishing distribution. Snap shots at two dates (14 and 17 January 2022) are given to illustrate the Albanian fishery is mainly active in the coastal area and a bit offshore in the Northern area (Figure 6). The VMS data is needed to estimate the extent of the impact of the Albanian fishery on the sea-bottom ecosystem.



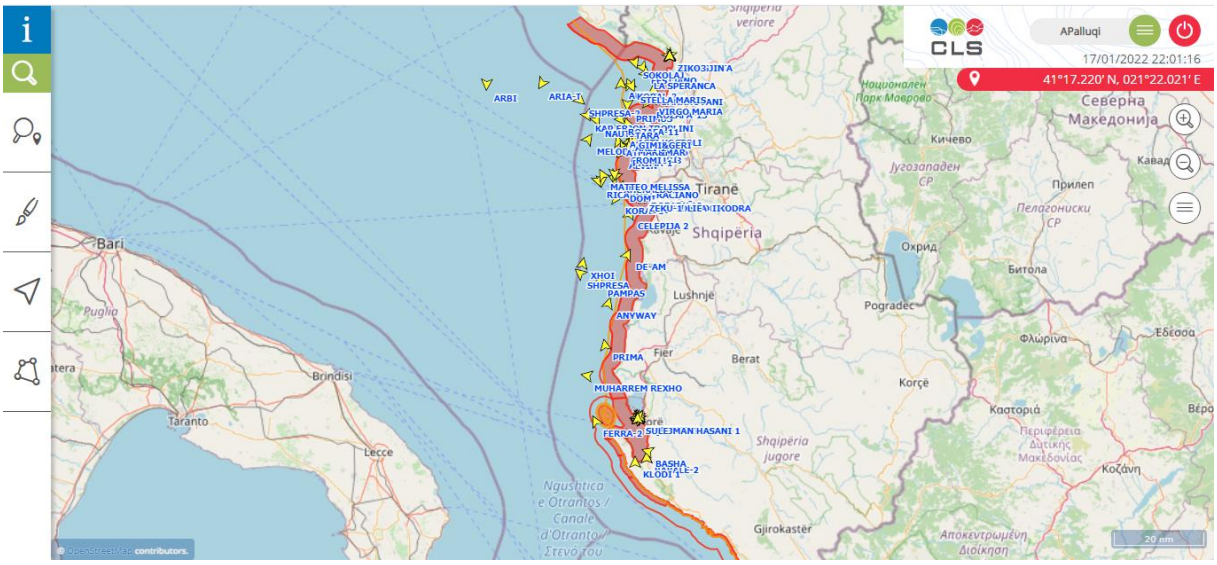



*Figure 6: Screen shots of fishing vessel activity of the Albanian fishing fleet on 14/01/2022 (picture above) and 17/01/2022 (picture below).*

2) Estimate of the longevity relationship

Benthic longevity estimates for the Southern Adriatic Sea (GSA 18) were based on epifauna data from MEDITS scientific survey (Figure 5). The hauls were carried out in the 10-800 m depth range, using the standard MEDITS trawl net GOC73 (AAVV, 2017; Spedicato et al. 2019). A total of 444 hauls were surveyed from 2015 to 2019. For each location, species were linked to a species-by-trait matrix of longevity based on the information derived by two different trait databases (Italian benthic experts from the Italian Society of Marine Biology (SIBM) working group; ICES FBIT trait database [benthis one]). Sampling locations probably undisturbed by fishing activities (in accordance with actual available AIS data) were selected using SAR < 0.5 in years 2015-2019 in order to estimate benthic longevity. After the removal of the disturbed locations, 202 samples were retained. The selection of not disturbed or less disturbed fishery locations is necessary to estimate the longevity relationship for each habitat under reference conditions. The cumulative biomass-longevity relationship was estimated based on Generalized Linear Mixed Models (GLMMs) using a stepwise forward selection approach and including MSFD habitat type and Depth as fixed effects and assuming stations as random effect (more info on the modelling in ICES FBIT report 2022). The selected model was used to predict the mean longevity as a function of habitat type (Figure 7). The mean longevity is considered a measurement of the seabed sensitivity to bottom trawling.

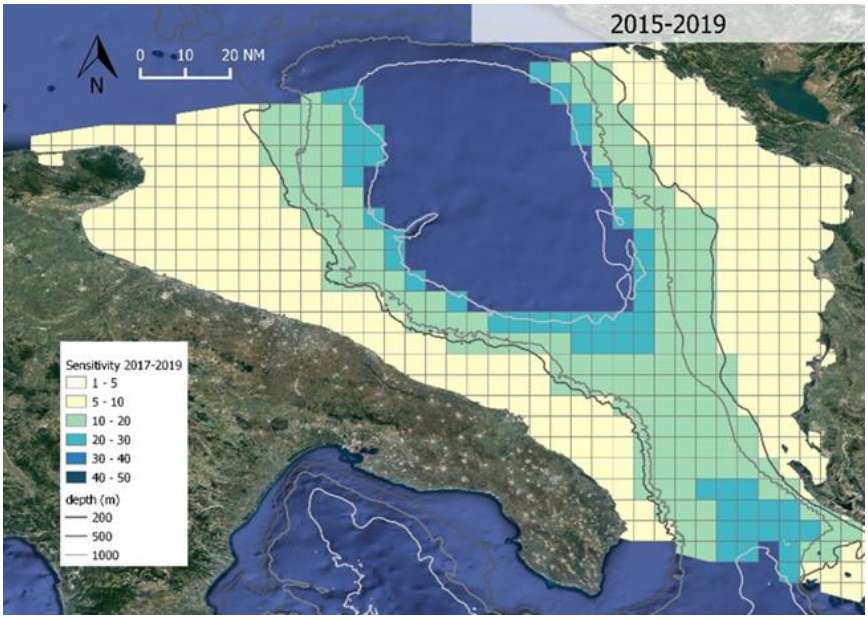



*Figure 7: The predicted longevity curves by MSFD habitat and maps for median longevity (sensitivity) of the Southern Adriatic Sea (screening samples SAR < 0.5).*

3) Impact assessment

Figure 8 shows the distribution of the Relative Benthic State (RBS) indicator across the Southern Adriatic Sea, estimated using the 0.06 depletion value reported in Hiddink et al. (2017). The RBS value ranges between 0 and 1 and is equivalent to the biomass over carrying capacity (B/K) indicating the state of the biomass over the habitat carrying capacity. The RBS value is high for a large part of the area indicating high recovery values of the benthic biomass. An ad hoc analysis of the fleet activities in the eastern side of the study area (Albanian area) could likely improve the next WGFBIT assessment due to the possible underreported AIS data of the fleet in the eastern side. Nevertheless, it is clear that the bottom impact in the northern part of Albania is higher compared to the rest of the area, which coincides with the higher fishing activities and possibilities in that area, compared to the Southern part of the Albanian waters. Also, operating with smaller boats and gears induced less bottom impact compared to the bigger Italian trawlers in the western part of the Southern Adriatic Sea. It is a preliminary assessment and far from complete, but the EU wide FBIT approach can be applied to this area to estimate benthic impact.

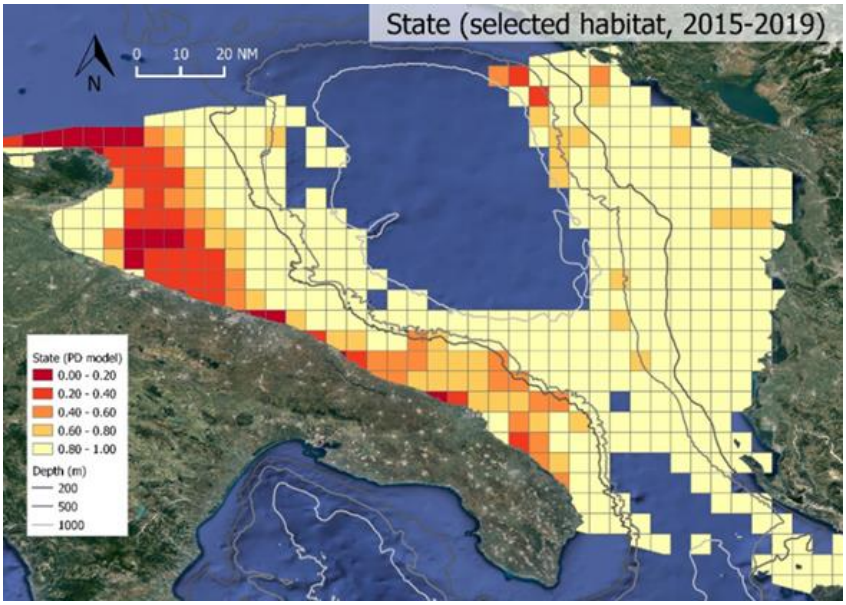



*Figure 8: Relative Benthic State (RBS) based on PD model of the Southern Adriatic Sea (SAR < 0.5).*

# 4. Existing fishing activities

This chapter describes the Albanian marine fishery sector and discusses the different types of fisheries and fishing gears in use.

## 4.1. Fleet composition

In 2020, the GFMC national register reports a total of 720 vessels, of which 473 or 66% had a licence and were active (personal communication, Albanian fisheries administration). The composition and characteristics of the different fleet segments are given in Table 2. Overall, law divides the Albanian fishing fleet into two main groups. The largest in number of vessels is the small scale fishery (SSF), which perform artisanal fishing in coastal waters with passive fishing techniques with small boats and engine power. This is in sharp contrast to the professional fishing segment, which only uses fishing vessels larger than 12 m using engine powers equal or greater than 56 kW (75 hp) to trawl, dredge or seine on fishing grounds outside the 3 nautical mile (nm) zone or fishing grounds deeper than 50 m within the 3 nm zone. The professional fisheries mirror the artisanal or small scale fisheries in terms of number of vessels, gross tonnage and engine power as illustrated in Figure 9.

*Table 2: Overview of the Albanian fleet, per fleet segment and overall length classes (LOA) based on the national fleet register as reported to DCRF-GFCM. Small scale/artisanal fisheries refer to passive fishing with gillnets or trammelnets close to the coast.*

| | | Artisanal fisheries | | | Professional fisheries | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Small scale | | Dredgers | Purse seiner | | Pelagic trawler | | Bottom trawler | | Total fleet |
| | | All size | | | All size | | All size | | All size | | |
| | Size (m) | 0 - 6 | 6 -12 | 12 -24 | 12 - 24 | > 24 | 12 - 24 | > 24 | 6 - 24 | > 24 | |
| Number of vessels | number | 495 | | 5 | 9 | | 20 | | 191 | | 720 |
| | | 331 | 164 | | 4 | 5 | 15 | 5 | 154 | 37 | |
| | % of total | 68,8% | | 0,7% | 1,3% | | 2,8% | | 26,5% | | |
| | | 46,0% | 22,8% | | 0,6% | 0,7% | 2,1% | 0,7% | 21,4% | 5,1% | |
| Gross tonnage | ton | 766 | | 17 | 746 | | 766 | | 5776 | | 8071 |
| | | | | | 135 | 611 | 388 | 378 | 3207 | 2569 | |
| | % of total | 9,5% | | 0,2% | 9,2% | | 9,5% | | 71,6% | | |
| | | | | | 1,7% | 7,6% | 4,8% | 4,7% | 39,7% | 31,8% | |
| Engine power | kW | 9707* | | 559 | 6570 | | 7661 | | 66649 | | 91146 |
| | | | | | 1066 | 5504 | 5526 | 2135 | 47991 | 18658 | |
| | % of total | 10,6% | | 0,6% | 7,2% | | 8,4% | | 73,1% | | |
| | | | | | 1,2% | 6,0% | 6,1% | 2,3% | 52,7% | 20,5% | |

*Nine of these vessels did not have an engine at all.

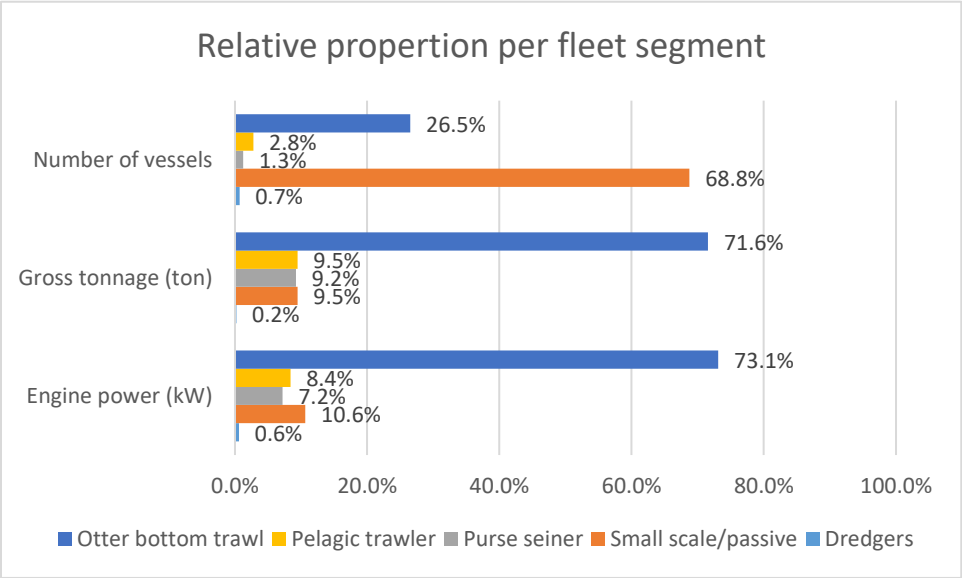



*Figure 9: The relative proportion of each fleet segment in terms of their number, gross tonnage (GT) and engine power.*

As shown in Table 2, most Albanian vessels (495) are small scale artisanal vessels. Despite the fact that this segment of the fishery sector is still underdeveloped and not well formalized, it employs a large number of people coming from the local coastal communities. As reported by FAO-GFCM, SSF represent in average 83% of the fleet, 57% of employment onboard vessels, 29% of revenue and 15% of catch in the Mediterranean and Black Sea region (FAO, 2020). Naturally, these vessels

fish close to shore, usually on fishing grounds 1 – 2 nm from the coast. Since the 3 nm zone is closed for any type of trawls or bottom fishing gears, this coastal fishing is characterized by passive fishing techniques such as gill nets and trammel nets.

The professional fishery uses exclusively active and energy-intensive fishing technologies such as trawling. The industrial vessels used for these activities are all larger than 12 m and were mostly constructed in Albania (35%), Italy (34%) or Greece (29%). However, little new boats have been built in recent years. Indeed, over 90% of the fleet is older than 20 years, almost 60% older than 40 and nearly 20% older than 60 years. As a result, the need for maintenance and refurbishments are high, the poor status of many of the vessels indicates that there is insufficient re-investment in repair & maintenance. This is corroborated by the fact that 95% of new entrants are second-hand rather than new builds (personal communication, Albanian fisheries administration).

## 4.2. Fishing metiers

### 4.2.1. Small-scale fishing

This segment consists of small artisanal ships using passive fishing techniques to exploit coastal fishing grounds. Indeed, about two third of the vessels is smaller than 6 m, the other between 6 and 12 m (Table 2). They were mainly built as pleasure vessels, which is why 95% is undecked and most do not have a cabin and little on-board electronic equipment or adequate safety systems. Although a few vessels do not have a motor at all, they are generally equipped with engines up to 30kW. Generally, these are low-capital ventures where the fisherman is often the owner of the vessel, in contrast to industrial fisheries involving major investments by companies or financial groups. They perform daytrips spending approximately 10-12 hour at sea and do not have catch preservation systems. Their annual landings are estimated to be 400 – 500 tons per year according to the Albanian fisheries administration, .i.e. roughly 10% of the industrial fisheries landings in 2020.

Small scale fisheries (SSF) are characterised by their diversity. Indeed, the variety and marked seasonality of target species, habitat heterogeneity, the market demand, weather conditions, … involve frequent gear switches (Forcada et al., 2010). Albanian SSF mostly use gillnets and trammel nets (Figure 10) which should have a minimum mesh size of 48 mm. Although the soaking time of these nets is always around 8-10 hours, the length of trammel- and gillnets can vary considerably between 400 and 2500m (personal communication, Albanian fisheries administration). To a small extent, Albanian fishermen also use two types of traps: concrete pots to catch cuttlefish and stationary uncovered pound nets (stavnik) for pelagic fish (Grati et al., 2018), although these are being phased out to avoid ghost fishing (personal communication, Albanian fisheries administration).

Quantitative information on landing compositions, size distributions of the target species and the value and biomass of the landings is scarce or lacking. Moreover, Grati et al. (2018) finds big differences in catch composition and landings of gillnets, trammel nets and traps between neighbour countries such as Italy, Croatia, Montenegro and Slovenia making it strongly dissuaded

to apply or extrapolate their data/situation to that of Albania. However, the little available data highlights clear seasonal trends for the main target species.

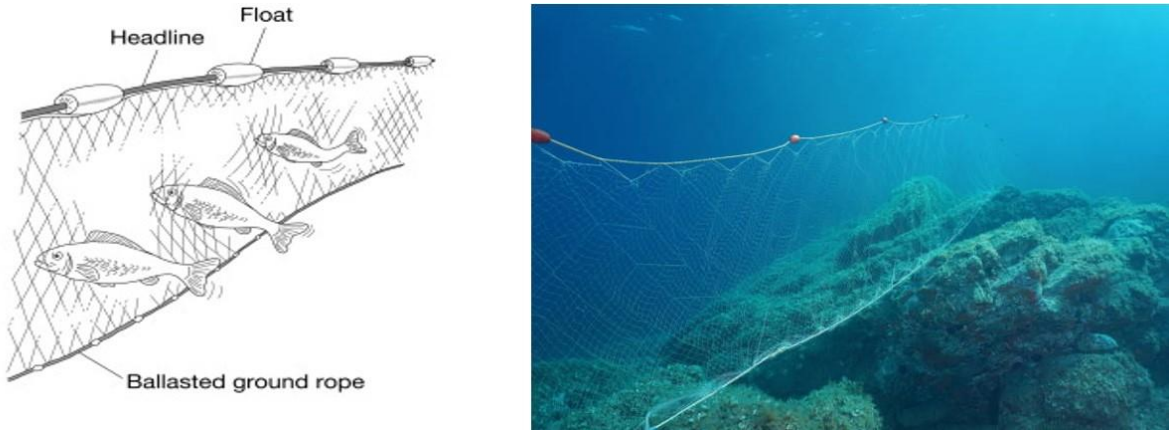



*Figure 10: Schematic illustration of a gillnet by FAO (left) and a underwater photo of a gillnet (right). The drawing illustrates how a first big fish is blocked by the net, a second fish of the targeted size tries to swim through the mesh but only the head passes after which it struggles to free itself and the twine slips behind the gill cover preventing escape, while the third smaller fish manages to pass entirely through the meshes.*

Gillnets were used from March to June to target European hake (*Merluccius merluccius*) and in winter to fish the gilthead sea bream (*Sparus aurata*), whereas trammel nets were used in May-July period for the catch of red mullet (*Mullus surmuletus*) and the caramote prawn (*Penaeus kerathurus*). Traps were used in spring to catch cuttlefish (*Sepia officinalis*) during spawning season from April to June (Grati et al., 2018).

This lack of exhaustive data and statistics is still a major constraint for most Adriatic coastal countries (Stagličić et al., 2011), often confining SFFs to a marginal role and undermine the potential for their sustainable growth. In fact, even though passive gears have a limited impact on the environment (being less destructive than towed gears) and on resources (providing higher selectivity than towed gears), they are commonly used in coastal fishing grounds, which include ecologically important habitats such as spawning areas, nursery grounds, feeding areas and migration routes (Grati et al., 2013; Colloca et al., 2015)

### 4.2.2. Bottom trawling

Bottom trawling in Albania is done with otter trawls. These trawls consist of two so called otter boards or trawl doors connected with cables or sweeps to the net. While this trawl is towed, the cables in between the boards and the net sweep the seafloor and herd demersal fish towards the front of the net where they are ultimately caught (Figure 11). This energy-intensive process makes the Albanian bottom trawlers represent over two third of the fleets total engine power. The drawback of the seafloor contact is that these trawls often have a severe impact on the ecosystem by causing physical disturbance to the seabed and degradation of associated communities. Additionally, the low selectivity of these trawls in terms of the sizes and species caught result in huge amount of bycatches and discards as well as overfishing, which is often encouraged by the

high marketability of small and juvenile fish. However, this low selectivity also results in high harvests, hence profitability, which makes them predominant in the Albanian, as well as many Mediterranean fisheries (Tudela, 2004).

*Figure 11: Computer animation of an operating bottom otter trawl by Monterey Aquarium Bay (left) and a picture of two bottom trawls vessels in the port of Shengjin, Albania (right).*

The Albanian otter bottom trawlers are equipped with 40 mm square-mesh cod-ends which are towed at 2,6-3 knot. Each haul takes about 2 hours. Some of the newer vessels fishing for shrimp are well-equipped with onboard freezing-shock freezer, whereas others are old and decrepit with inadequate ice and conservation facilities. The smaller (12 – 18 m) otter trawlers do fishing trips up to two days whereas the larger ones (18-24 m) often fish up to three days (personal communication, Arian Palluqi). Their main target species are European hake, red mullet, horse mackerel (*Trachurus trachurus*), bogue (*Boops boops*), common octopus (*Octopus vulgaris*), common squid (*Loligo vulgaris*), and Norway lobster (*Nephrops norvegicus*).

### 4.2.3. Pelagic trawling

Pelagic trawls also use otter boards to keep the spread of the net optimal, albeit in the water column targeting pelagic species and not operating on the sea floor (Figure 12). The higher the engine power of the vessel, the larger the dimensions of the fishing gear that can be towed. In Albania, these trawlers mainly do daytrips of 12-16 hours. Since this segment targets small pelagics, the cod-end has square-meshed openings of only 20 mm. European anchovy (*Engraulis encrasicolus*) and sardine (*Sardina pilchardus*) count for over 97% of the small pelagic catches in the Adriatic (source EU-DCF database 2019).

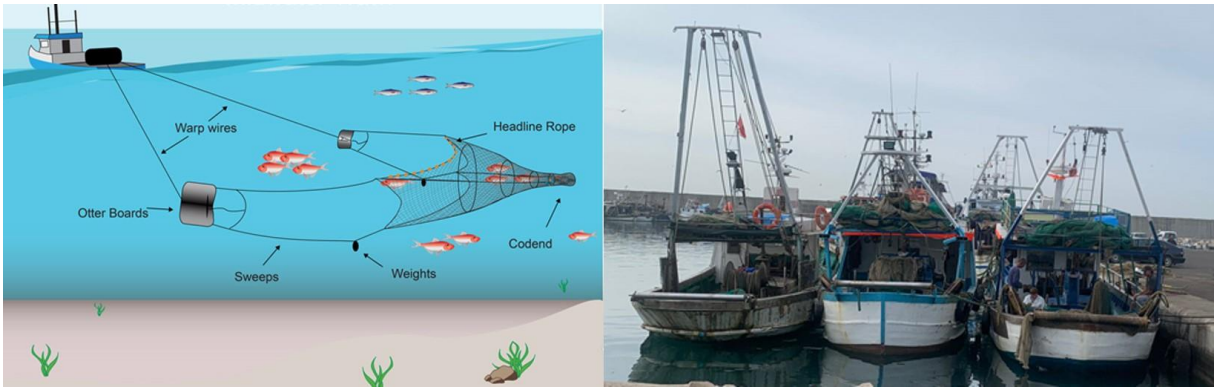



*Figure 12: Schematic drawing of a pelagic otter board trawl (left) and 3 pelagic trawlers in the port of Durres, Albania (right).*

The impact of pelagic fisheries is generally much smaller than that of bottom fisheries as they target fish living in the water column with very limited or no biological interaction with the sea bottom. Hence, this segment has no direct physical impact on the seafloor ecosystems. Second, the target species usually live in dense shoals, which results in very little by-catch compared to bottom fisheries which have much more heterogenous catch compositions. Moreover, the little by-catch of other species such as European sprat (*Sprattus sprattus*), mackerels (*Scombrus spp.*) or horse mackerels (*Trachurus spp.*) is most often also marketable.

### 4.2.4. Purse seiner

Purse seines generally target the same species as the pelagic trawls, although by applying a different strategy and in case of Albania with a smaller minimal mesh size up to 14 mm. Where a pelagic trawl basically haunt the fish and 'sieve' them out of the water by having a higher speed, a purse seine first surrounds the fish with a long net curtain whereafter the bottom of the net is pursed/closed underneath and the shoal is enclosed. This way, the entire shoal is caught and dragged to the ship where it can be processed (Figure 13). These vessels are the most important and most effective vessels to catch aggregating pelagic species near the surface (Soldo et al., 2019). Purse seiners comprise a large group of fishing vessels appearing in all sizes and ranging from small boats to open ocean-going vessels. The main target species of this Albanian segment are anchovy and sardine, although Atlantic bluefin tuna (*Thunnus Thynnus*) is increasingly being targeted and landed by these vessels as well in recent years.

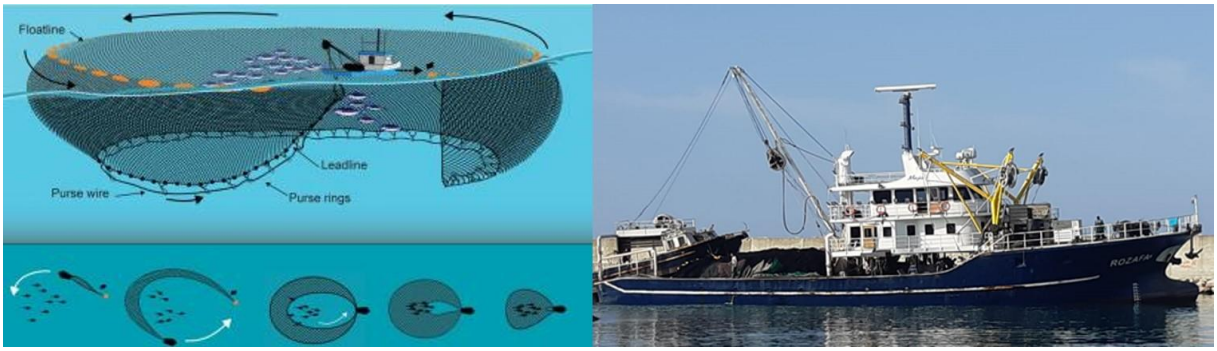



*Figure 13: Schematic figure illustrating the catch mechanism of a purse seine (left) and a purse seine vessel in the port of Durres, Albania (right).*

### 4.2.5. Hydraulic dredges

Dredges are heavy rigid structures that are slowly towed over the sediment to harvest mollusks, generally using a bar (with or without teeth) at the front to mechanically dislodge shellfish after which they are collected in a metal basket (Figure 14). For some species, hydraulic dredges are allowed, which use waterjets instead to release the bivalves from the seabed. Although the swept area is rather low due to the small dimensions and towing speed of the dredge compared to f.e. bottom trawls, these gears are known for having a deep and intense impact on the seafloor (Eigaard et al., 2016). Hence, they require proper management as they can have detrimental impacts on many ecologically important habitats.

*Figure 14: Computer animation of an operating mechanical dredge by Monterey Aquarium Bay (left) and a picture of a small vessel equiped with two dredges in the port of Durres, Albania (right).*

In 1983, five clamshell fishing vessels, so called 'turbosofiantti' purchased in Italy, started fishing for striped venus clam (*Chamellea gallina*) and other species of bivalves. However, this fishery was closed already in 1990 after stocks of bivalve mollusks on the Albanian coast had fallen drastically as a result of poor regulation and the indiscriminate use and depletion of the mollusk stocks. This fishery restarted only in 2018, after Albanian administration had made a first regulatory framework (Regulation Nr. 1, dated 5.6.2018 for Fishing Bivalve Mollusks) in full compliance with COUNCIL REGULATION (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea. This regulation limits the power (120 kW), length (15 m), gross weight (12 tons) of the fishing vessel; the maximum width (3

m) and weight (600 kg) of the dredge and species-specific limitation of the hydraulic dredges. Additionally, it also stipulates the length of fishing trips, closures for certain fisheries, the minimum landing size of the mollusks and the maximum daily landings. The dredgers target mollusks like clam, Warty venus (*Venus verrucose*), Bean clams (*Donax sp.*), smooth clam (*Callista chione*) and *Solen* spp. The total annual production is small (2 tons), which can be explained by the small local consumption on one hand and the inability to export live mollusks to EU due to a sanitary ban of the EU (personal communication, Albanian fisheries administration).

# 5. Fisheries resources

This chapter covers the Albanian landing data and the status of the stocks of the main commercial species. Unwanted bycatch of undersized species, non-commercial species or endangered, vulnerable or rare species are discussed. The commercial species are subject to a minimum landing size and bycatches of undersized species are discarded.

## 5.1. Landings

Marine fish species are an important resource for Albania, however most Albanian vessels are small scale artisanal vessels and the Albanian contribution to the landings in the Mediterranean is relatively low (Figure 15).

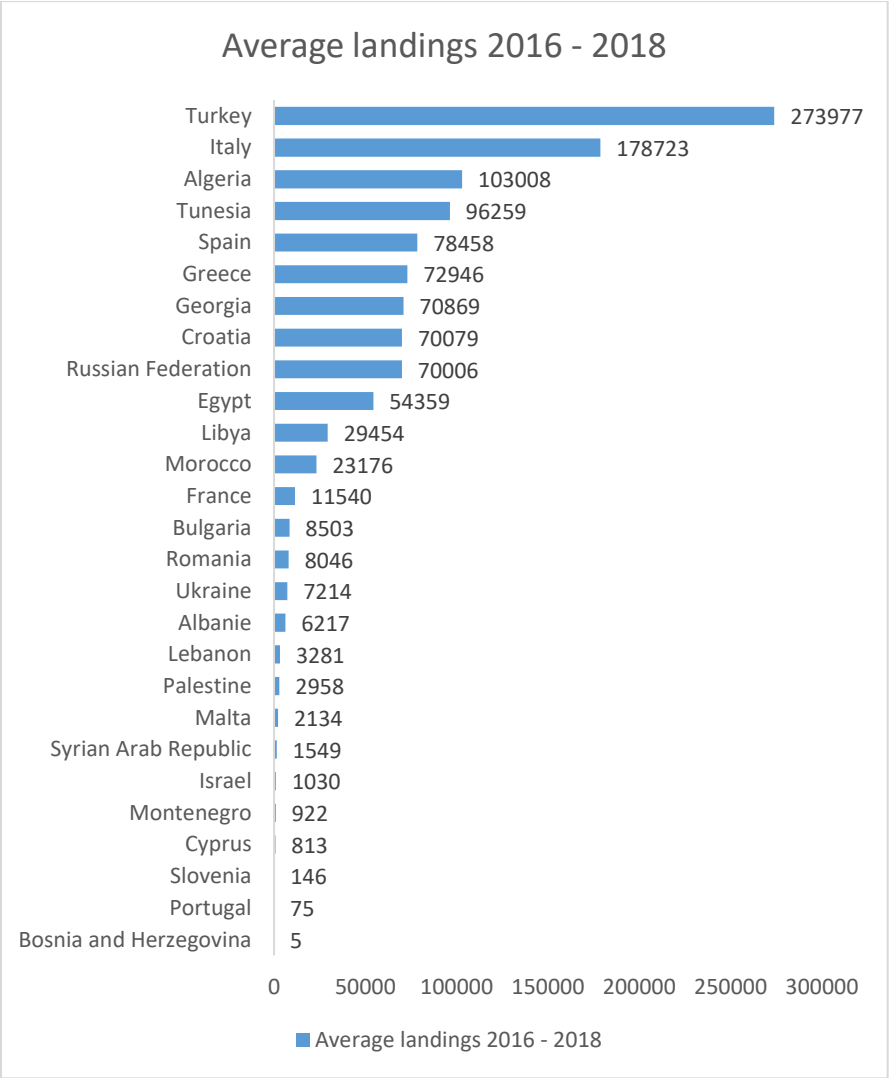



*Figure 15: Total landings per year by GFCM contracting party, cooperating non-contracting party, non-contracting party and relevant non-state actors in the GFCM area of application: the Mediterranean and the black Sea (FAO, 2020).*

The Albanian fishery is situated in the Adriatic and Ionian Sea and targets small pelagic species (sardine and anchovy), which make up about 30% of the total catch, and demersal species such as deep-water rose shrimp, European hake, red mullet, Norway lobster, common octopus, common squid, horse mackerel, bluefin tuna, red shrimp, mantis shrimp, etc. (Table 3). The historic landing data between 2012 and 2020 are shown in Table 3. The variation in landings is mainly caused by differences in catches of small pelagic species (sardine and anchovy). The most landed species (in weight) are deep-water rose shrimp, sardine, hake and anchovy.

*Table 3: Landings (tons) between 2012 and 2020, ordered according to catch weight, as reported by Albania to GFCM-FAO. The main species determine 83 to 93% of the total landings. The other part is composed of different species combined in the fraction 'marine fishes nei'.*

| Species | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | mean 2018-2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pelagic** | | | | | | | | | | |
| European anchovy (*Engraulis encrasicolus*) | 1206 | 1591 | 1236 | 250 | 280 | 320 | 1516 | 1227 | 256 | 1000 |
| European pilchard (=sardine) (*Sardina pilchardus*) | 1690 | 1474 | 1106 | 1200 | 890 | 1065 | 460 | 677 | 384 | 507 |
| **Demersal** | | | | | | | | | | |
| Deep-water rose shrimp (*Parapenaeus longirostris*) | 1170 | 1210 | 1430 | 1290 | 1460 | 1473 | 1275 | 962 | 1026 | 1088 |
| European hake (*Merluccius merluccius*) | 899 | 851 | 902 | 914 | 948 | 940 | 872 | 731 | 751 | 785 |
| Surmullets nei (*Mullus barbatus, Mullus surmuletus*) | 450 | 448 | 380 | 466 | 475 | 470 | 347 | 373 | 333 | 351 |
| Norway lobster (*Nephrops norvegicus*) | 435 | 398 | 400 | 405 | 411 | 389 | 257 | 212.5 | 194 | 221 |
| Common octopus (*Octopus vulgaris*) | 165 | 170 | 173 | 124 | 154 | 137 | 176 | 185 | 154 | 172 |
| Common squids nei (*Loliginidae/Ommastrephidae spp.*) | 76 | 92 | 105 | 134 | 128 | 113 | 129 | 170 | 183 | 161 |
| Jack and horse mackerels nei (*Trachurus spp.*) | 80 | 93 | 95 | 115 | 100 | 105 | 95 | 163 | 171 | 143 |
| Atlantic bluefin tuna (*Thunnus thynnus*) | | 9 | 34 | 40 | 47 | 57 | 100 | 156 | 169 | 142 |
| Blue and red shrimp (*Aristeus antennatus*) | | | | | | 198 | 125 | 130 | 135 | 130 |
| Mantis Shrimp (*Squilla mantis*) | | | | | | 101 | 116 | 123.1 | 125 | 121 |
| Scomber mackerels nei (*Scomber spp.*) | 13 | 25 | 24 | 39 | 28 | 37 | 116 | 97 | 116 | 110 |
| Bogue (*Boops boops*) | 55 | 50 | 78 | 90 | 80 | 83 | 75 | 100 | 101 | 92 |
| Common cuttlefish (*Sepia officinalis*) | 80 | 85 | 75 | 82 | 83 | 83 | 79 | 60 | 67 | 69 |
| Caramote prawn (*Penaeus kerathurus*) | 19 | 24 | 33 | 22 | 34 | 33 | 38 | 43 | 66 | 49 |
| **Total main species** | **6338** | **6520** | **6071** | **5171** | **5118** | **5604** | **5776** | **5409** | **4231** | **5139** |
| Marine fishes nei | 788 | 904 | 996 | 1045 | 1078 | 678 | 426 | 433 | 734 | 531 |
| Marine fishes nei (%) | 11 | 12 | 14 | 17 | 17 | 11 | 7 | 7 | 15 | 9 |
| **Total landings** | **7126** | **7424** | **7067** | **6216** | **6196** | **6282** | **6202** | **5842** | **4965** | **5670** |

## 5.2. Stock assessment & status

### 5.2.1. Stock assessment

The stock assessment of primary species in the Adriatic Sea (GSA 17 and 18) is done regularly. The Scientific Advisory Committee (SAC) of GFCM has determined the priority species and divided them in three categories:

- **Group 1 species**. Species that drive the fishery and for which assessment is regularly carried out
- **Group 2 species**. Species which are important in terms of landing and/or economic value and for which assessment is not regularly carried out

- **Group 3 species**. Species within (inter)national management plans and recovery and/or conservation action plans; non-indigenous species with the greatest potential impact.

The Group 1 species for Albania (GSA 18) are:
Small pelagic species

- Sardine *(Sardina pilchardus)*
- Anchovy *(Engraulis encrasicolus)*

Demersal species
- European hake *(Merluccius merluccius)*
- Red mullet *(Mullus barbatus)*
- Deep water Rose shrimp (*Parapenaeus longirostris*)
- Norway lobster (*Nephrops norvegicus*)

The GFCM has developed a unique framework for the planning and implementation of regional demersal trawl and pelagic acoustic surveys based on existing protocols – namely the MEDiterranean International Bottom Trawl Survey (MEDITS) and the MEDiterranean International Acoustic Survey (MEDIAS) that are being implemented in the European Union (Carpentieri et al., 2020). These types of routine surveys provide essential information on many stocks in the Mediterranean and estimate annually the total mortality, growth parameters, sex ratios and average length at maturity of species so as to fine-tune assessments on the status of resources and to estimate indicators more precisely at the level of fish populations and communities (Carpentieri et al., 2020).

Albania has no Fishery Research Institute or fish stock experts but does participate with its fishery technicians on board of fishing vessels and provides landing data and biological data to GFCM. Fisheries statistics from vessels over 12 m are collected from logbooks and delivered to inspectors. Within the FAO project AdriaMed (FAO-AdriaMed Project) Albania provides, following the instructions of MEDITS, yearly the biological data such as total landings, length frequency, weight, sex and maturity stage for priority species: *E. engrasicolus, S. Pilchardus, M. merluccius, M. barbatus, N. norvegicus, P. longirostris, S. officinalis, S. mantis*. Also in the frame of the AdriaMed project, the fishery service started collecting data on discards since 2019, to help the protection of vulnerable species.

### 5.2.2. Stock status of the main commercial species

Most stocks in de GFCM area of application (Mediterranean and Black Sea), for which validated assessments are available, are in overexploitation. In 2014 the percentage of stocks in overexploitation was 88% while in 2018 this was 75% (FAO, 2020).

An overview of the available stock assessments in the Adriatic Sea is shown in Table 4. These data were presented and discussed during the 2021 meeting of scientific advisory committee on fisheries by GFCM, and they serve as a scientific base for the formulation of management advise in the area. Biomass reference points ($B_{ref}$) are not commonly available for assessed stocks; therefore, the percentage of stocks fished outside biologically sustainable limits is mainly estimated from the

current level of fishing mortality ($F_c$) in relation to the fishing mortality reference point ($F_{ref}$) (FAO, 2020). Almost all available stock assessments show that stocks are in overexploitation, which means the fishing pressure is too high and the stocks are fished outside biologically sustainable limits. The status of Adriatic Sea priority demersal species showed some improvements (in terms of decrease in fishing mortality and/or increase in biomass) with respect to previous years. Despite these positive signals, the levels of fishing mortality for key stocks are still far from the levels expected to provide maximum sustainable yield (MSY), which is the largest average catch or yield that can continuously be taken from a stock under existing environmental conditions (FAO, 2020).

The resource situation of the most landed species (in weight), deep-water rose shrimp, sardine, hake and anchovy, is not very good and under stress (FAO 2022). Anchovy and sardine stocks were considered outside safe biological limits. Current fishing mortality ($F_c$) was greater than the fishing mortality level to provide maximum sustainable yield ($F_{MSY}$) for both species, while the current spawning stock biomass ($B_c$) was between the precautionary level ($B_{pa}$) and the limit reference point ($B_{lim}$) for both species. So based on these assessment results both anchovy and sardine stocks are overexploited and in overexploitation. The stock status of deep-water rose shrimp shows the $F_c$ is greater than the $F_{ref}$ which means the stock is being overfished, however the biomass is still relatively high. The stock of European hake is overfished ($F_c > F_{MSY}$) however the biomass is larger than the precautionary reference point $B_{pa}$ (Table 4).

These data serve as a scientific base for the formulation of management advise in the area. As a consequence, the Commission (GFCM) adopted a new recommendation, to establish a multiannual management plan for sustainable small pelagic fishing activities in the Adriatic Sea. The multiannual management plan will be designed to provide high long-term yields consistent with the maximum sustainable yield (MSY) and to guarantee a low risk of stock collapse while maintaining sustainable and relatively stable fisheries including dependent industries (FAO, 2020).

*Table 4: Stock assessment results of stocks in the Adriatic Sea, based on data until 2019. Demersal species results are sourced from FAO and GFCM (2021). Results for pelagic species, common sole and norway lobster are retrieved from FAO (2021). $F_c$ = current level of fishing mortality, $F_{MSY}$ = fishing mortality consistent with achieving Maximum Sustainable Yield (MSY), $F_{pa}$ = precautionary reference point for fishing mortality, Fref = reference point for fishing mortality, $F_{0.1}$ = The fishing mortality rate at which the marginal yield-per-recruit is only 10 percent of the marginal yield-per-recruit on the unexploited stock., SSB = Spawning stock biomass. Total weight of all sexually mature fish in the stock (tons), $SSB_{lim}$ = Limit reference point for SSB (tons), $SSB_{pa}$ = precautionary reference point for SSB (tons), $B_c$ = current SSB level (tons), $B_{pa}$ = precautionary reference point for SSB (tons), $B_{lim}$ = Limit reference point for SSB (tons).*

| Species | GSA | Current Levels | Reference points | Quantitative status | Stock status | Scientific advise |
|---|---|---|---|---|---|---|
| Pelagic species | | | | | | |
| Anchovy | 17, 18 | | | $SSB/SSB_{lim}$ = 1.05<br>$SSB/SSB_{pa}$ = 0.80<br>$F/F_{MSY}$ = 1.51 | Overexploited and in overexploitation | Reduce fishing mortality |
| Sardine | 17, 18 | | | $SSB/SSB_{lim}$ = 1.11<br>$SSB/SSB_{pa}$ = 0.67<br>$F/F_{MSY}$ = 4.43 | Overexploited and in overexploitation | Reduce fishing mortality |

| Species | GSA | Current Levels | Reference points | Quantitative status | Stock status | Scientific advise |
|---|---|---|---|---|---|---|
| Demersal species | | | | | | |
| Deep-water rose shrimp | 17, 18, 19 | $F_c$ = 1.49<br>$B_c$ = 3221 | $F_{0.1}$ = 0.5 | $F/F_{ref}$ = 2.98 | In overexploitation, with relatively high biomass | Reduce fishing mortality |
| Red mullet | 17, 18 | $F_c$ = 0.69<br>$B_c$ = 7587 | $F_{0.1}$ = 0.34 | $F/F_{ref}$ = 2.03 | In overexploitation, with relatively high biomass | Reduce fishing mortality |
| European hake | 17, 18 | $F_c$ = 0.45<br>$B_c$ = 3978 | $F_{MSY}$ = 0.167<br>$B_{pa}$ = 2543<br>$B_{lim}$ = 1858 | $F/F_{MSY}$ = 2.72<br>$B/B_{pa}$ = 1.56<br>$B/B_{lim}$ = 2.14 | Biomass above the reference point and in overexploitation | Reduce fishing mortality |
| Common cuttlefish | 17 | $F_c$ = 0.2<br>$B_c$ = 12000 | $F_{MSY}$ = 0.252<br>$B_{MSY}$= 24341 | $F/ F_{MSY}$ = 0.81<br>$B/B_{MSY}$ = 0.49 | Overexploited with low fishing mortality | Reduce fishing mortality and/or implement recovery plan |
| Mantis shrimp | 17 | $F_c$ = 0.33<br>$B_c$ = 4833 | $F_{40}$ = 0.36<br>$B_{40}$ = 6543 | $F/F_{ref}$ = 0.24<br>$B/B_{target}$ = 0.74 | Overexploited with low fishing mortality | Reduce fishing mortality and/or implement recovery plan |
| Giant red shrimp | 18, 19 | $F_c$ = 1.09<br>$B_c$ = 82 | $F_{0.1}$ = 1 | $F/F_{ref}$ = 1.09 | In overexploition with relative low biomass | Reduce fishing mortality |
| Purple dye murex | 17 | $F_c$ = 0.57<br>$B_c$ = 2863 | $F_{MSY}$ = 0.53<br>$B_{MSY}$ = 2549 | $F/ F_{MSY}$ = 1.08<br>$B/B_{MSY}$ = 1.12 | Biomass above the reference point and in overexploitation | Reduce fishing mortality |
| Black bellied angler | 17 | $F_c$ = 0.31<br>$B_c$ = 1672 | $F_{MSY}$ = 0.22<br>$B_{MSY}$ = 1864 | $F/ F_{MSY}$ = 1.383<br>$B/B_{MSY}$= 0.897 | Possibly in overexploitation | Reduce fishing mortality |
| Great Mediterranean scallop | 17 | $F_c$ = 0.71<br>$B_c$ = 232 | $F_{MSY}$ = 0.248<br>$B_{MSY}$ = 2971 | $F/ F_{MSY}$ = 2.86<br>$B/B_{MSY}$ = 0.08 | In overexploitation and depleted | Close the fishery and implement a recovery plan |
| Horned octopus | 18 | $F_c$ = 0.555<br>$B_c$ = 2220 | $F_{MSY}$ = 0.442<br>$B_{MSY}$ = 1950 | $F/ F_{MSY}$ = 1.27<br>$B/B_{MSY}$ = 1.13 | Biomass above the reference point and in overexploitation | Reduce fishing mortality |
| Norway lobster | 17, 18 | $F_c$ = 0.71<br>$B_c$ = 2171 | $F_{MSY}$ = 0.45<br>$B_{MSY}$ = 4868 | $F/ F_{MSY}$ = 1.58<br>$B/B_{MSY}$ = 0.45 | In intermediate overexploitation with low biomass | Reduce fishing mortality |
| Common sole | 17 | $F_c$ = 0.5 | $F_{0.1}$ = 0.49 | $F/F_{ref}$ = 1.02 | In low overexploitation with relatively low biomass | Reduce fishing mortality |

## 5.3. Bycatch & discards

Bycatch is that part of the catch that is unintentionally captured during a fishing operation in addition to the target species. It may refer to the catch of other commercial species that are landed, commercial species that cannot be landed (e.g. undersized, damaged individuals), discards of non-commercial species, as well as to incidental catch of endangered, vulnerable or rare species (e.g. sea turtles, seabirds, sharks and marine mammals)" (FAO, 2020). Bycatch can either be landed or discarded. Discards represent a major source of uncertainty in the actual fishing mortality rates of several commercial stocks.

Reasons for discarding are highly variable and can be economic, sociological, environmental or biological and often act together especially in multispecies fisheries. The main drivers of discards in the Mediterranean include: (i) Compliance with regulations on minimum conservation reference sizes (MCRS), (ii) High-grading (retention only of larger sizes of catch) of small pelagic species to avoid lower prices and (iii) Non-commercial value of a significant proportion of the catch (Fitzpatrick et al., 2017).

According to the analysis carried out in The State of the Mediterranean and Black Sea Fisheries (FAO, 2018), discards in the Mediterranean are estimated at around 230 000 tonnes per year, corresponding to approximately 18% of the catch. The trawl fishery is generally responsible for the bulk of discards in all the Mediterranean and Black Sea geographical subareas, while available information for small scale fisheries suggests that the discard rate is generally lower than 10% (FAO, 2018). These estimates have a low precision since information was lacking for many types of fishing gear, countries and GFCM subregions, and most available studies only cover relatively short periods and small areas. Discard monitoring programmes and standardized practices are needed to assess discards appropriately (FAO, 2020).

Specific discard data in Albania are currently lacking. An estimated discard rate for the total fishing fleet of Albanian is estimated at 24% between 2006 and 2010 (Moutopoulos et al. 2015). The GFCM has launched a number of initiatives to improve knowledge on bycatch by fleet, subregion and species group across the Mediterranean and Black Sea. The most important of these projects include the implementation of discards monitoring programmes in several countries and participation in the MedBycatch project '*Understanding Mediterranean multi-taxa bycatch of vulnerable species and testing mitigation – a collaborative approach*', to monitor and mitigate incidental catch of vulnerable species (FAO, 2020). With the support of GFCM, Albania started a discard monitoring program on the bottom trawlers since 2019, to help the protection of vulnerable species (Commission, 2019). This data will be published by GFCM in the frame of 'the state of the Mediterranean and black sea fisheries 2022' (personal communication, Albanian fisheries administration).

Adriatic small scale fisheries are diverse, complex and dynamic. They are active throughout the year and exploit coastal fishing grounds, where the seasonal fluctuation of water column physicochemical parameters strongly influences species abundance and distribution (Grati et al., 2018). Accordingly, fishermen tend to increase the fishing effort when target species concentrate in coastal areas during recruitment or spawning. Landings peak in such periods and often include a large portion of juveniles and/or spawners. The study highlighted that there is inadequate data on this juvenile or spawning catch which is a major constraint for most Adriatic countries that induces small scale fisheries marginalization (Grati et al., 2018).

The reformed Common Fisheries Policy [Regulation (EU) 1380/2013] introduced the obligation for EU member states to land unwanted catches with the aim to reduce discards. The ecological and economic consequences of this regulation for the North-Eastern Adriatic Sea are evaluated in the study of Celic et al. (2018). Results indicate that landings will increase, causing an increase in fishermen workload, reduction of biomasses at sea for species of both commercial and non-commercial interest, thus a small decrease in fisheries revenue. An alternative scenario were

selectivity was improved and quotas were introduced showed the best results. This study suggests that the landing obligation has ecological and economic negative effects in systems where fisheries are not regulated by quota such as the Mediterranean Sea.

## 5.4. ETP species

Incidental catch of Endangered, Threatened or Protected species (ETP, e.g. sea turtles, seabirds, sharks and marine mammals) is part of the unwanted bycatch. The reported incidental catch of turtles, elasmobranchs, seabirds and marine mammals in the Mediterranean Sea between 2000 and 2020 is given in Table 5. No specific ETP data is routinely collected by the Albanian fishery, however Albania started a discard monitoring program on the bottom trawlers since 2019, to help the protection of vulnerable species (Commission, 2019).

Sea turtles and elasmobranchs represent the highest numerical share of reported incidental catch of vulnerable species in the Mediterranean and Black Sea area (FAO, 2020). Seabirds and marine mammals are the two groups of bycatch with the lowest numbers of reported specimens. Longliners and bottom trawlers are the most relevant vessel groups affecting conservation-priority species in the whole region, followed by small-scale vessels (FAO, 2020).

Data which would allow assessing the magnitude of these impacts at population level is lacking. There are currently no national or international set limits for catches of the Mediterranean populations of the relevant ETP species. A quantitative analysis to assess the impact of fishery-related mortality on turtles and cetaceans needs to be carried out. Also, data on post-release impacts due to injuries is lacking. Specific data for Albania is lacking as well.

*Table 5: Reported incidental catch of the main turtle, elasmobranch, seabird and marine mammal species in the Mediterranean Sea, 2000-2020 (FAO, 2020).*

| Species | Scientific name | % of reported number | Number of reported individuals | IUCN status in Mediterranean (IUCN, 2022) |
|---|---|---|---|---|
| Turtles | | | 463687 | |
| Loggerhead turtle | *Caretta caretta* | 98.79 | | least concern |
| Green turtle | *Chelonia mydas* | 1.19 | | least concern |
| Leatherback sea turtle | *Dermochelys coriacea* | 0.02 | | vulnerable |
| Elasmobranchs | | | 37729 | |
| Sandbar shark | *Carcharhinus plumbeus* | 20.9 | | endangered |
| Smooth-hound shark | *Mustelus mustelus* | 15.9 | | vulnerable |
| Blackchin guitarfish | *Rhinobatos cemiculus* | 7.9 | | critically endangered |
| Piked dogfish | *Squalus acanthias* | 7.2 | | endangered |
| Cuckoo skate | *Leucoraja naevus* | 7.2 | | near threatened |
| Tope shark | *Galeorhinus galeus* | 6.2 | | vulnerable |
| Speckled ray | *Raja polystigma* | 3.9 | | least concern |

| Species | Scientific name | % of reported number | Number of reported individuals | IUCN status in Mediterranean (IUCN, 2022) |
|---|---|---|---|---|
| Atlantic catshark | *Galeus atlanticus* | 3.3 | | near threatened |
| Spotted skate | *Raja montagui* | 2.4 | | least concern |
| Blue shark | *Prionace glauca* | 2.3 | | critically endangered |
| Other | | 22.8 | | |
| **Seabirds** | | | 6767 | |
| Mediterranean shearwater | *Puffinus yelkouan* | 12.7 | | vulnerable |
| Great cormorant | *Phalacrocorax carbo* | 11.5 | | least concern |
| Cory's shearwater | *Calonectris diomedea* | 9.7 | | least concern |
| Yellow-legged gull | *Larus michahellis* | 2.7 | | least concern |
| European shag | *Phalacrocorax aristotelis* | 1.7 | | least concern |
| Balearic shearwater | *Puffinus mauretanicus* | 1.6 | | critically endangered |
| Black-necked grebe | *Podiceps nigricollis* | 1.6 | | vulnerable |
| Audouin's gull | *Larus audouinii* | 0.8 | | vulnerable |
| Northern gannet | *Morus bassanus* | 0.6 | | least concern |
| Mixed species | | 57 | | |
| **Marine mammals** | | | 669 | |
| Striped dolphin | *Stenella coeruleoalba* | 47.7 | | vulnerable |
| Common dolphin | *Delphinus delphis* | 20.5 | | endangered |
| Common bottlenose dolphin | *Tursiops truncatus* | 13.8 | | vulnerable |
| Risso's dolphin | *Grampus griseus* | 5.4 | | data deficient |
| Long-finned pilot whale | *Globicephala melas* | 1 | | data deficient |
| Sperm whale | *Physeter macrocephalus* | 1 | | endangered |
| Rough-toothed dolphin | *Steno bredanensis* | 0.4 | | near threatened |
| Common minke whale | *Balaenoptera acutorostrata* | 0.3 | | least concern |
| Fin whale | *Balaenoptera physalus* | 0.1 | | vulnerable |
| Non identified species | | 9.7 | | |

### 5.4.1. Turtles in the Adriatic Sea

Sea turtles are incidentally caught by various types of gear. The highest rates of capture of these animals are attributed to fisheries operating in coastal waters or near-shore zones (potential feeding areas for sea turtles). Loggerhead turtle is the main species caught (around 99%), while green turtle and the leatherback sea turtle represent the other impacted species (FAO, 2020).

The northern Adriatic, with its shallow waters and rich benthic communities, is a major feeding habitat for sea turtles nesting in Greece, Turkey, Cyprus and Libya (Bertuccio et al., 2019), as well as an important fishing ground for bottom-towed fishing gear (Lucchetti and Sala, 2012). GSA 17 (i.e. the central-northern Adriatic) is frequented by over 1 000 bottom trawlers, mainly from Italy

and Croatia, and to a lesser extent from Slovenia, Montenegro and Albania, while aerial surveys have made it possible to estimate the sea turtle population in the Adriatic Sea at over 70 000 turtles (Fortuna et al., 2011). Therefore, loggerhead sea turtle-trawler interactions are quite common. Multiple incidental catch events (up to eight sea turtles caught hourly during towing; A. Lucchetti, personal observation, 2018) are not uncommon. Around 560 sea turtles were also estimated to be caught annually by Albanian fishers, according to Casale (2011). Therefore, the Adriatic Sea represents a key area for the management and conservation of this species (Carpentieri et al., 2021).

In the Adriatic Sea, Italy, Croatia and Slovenia combined can catch 9 000 sea turtles per year in set nets. Lucchetti, Vasapollo and Virgili (2017a, 2017b) estimated that the annual incidental catch per vessel in the Adriatic (Italian fleet) ranged from 1.8 (southern Adriatic) to 5.3 (at the Po River Delta), for a total of more than 5 000 sea turtles caught per year. In the southern Adriatic Sea, Lucchetti, Vasapollo and Virgili (2017b) estimate that 2 000 sea turtles are caught per year (Carpentieri et al., 2021).

In the southern part of the Adriatic Sea around 1 000 sea turtles are caught annually by drifting longlines (Fortuna et al., 2008; Casale, 2011). Bycatch will also occur in the central Adriatic by the fishery for swordfish, bluefin tuna and albacore during summer and autumn, meaning that the number of sea turtles caught may be higher (Lucchetti, Vasapollo and Virgili, 2017a; Carpentieri et al., 2021).

### 5.4.2. Elasmobranchs in the Adriatic Sea

The sandbar shark, the smooth-hound shark and the Blackchin guitarfish are the most frequently captured elasmobranchs bycaught in the Mediterranean (Table 5).

In the Adriatic Sea, the large majority of elasmobranch bycatch records are reported from pelagic trawlers, mainly targeting anchovies, sardines and mackerel. Bonanomi et al. (2018) assessed the impacts of the pelagic trawl fishery on four species of elasmobranchs: the common smooth-hound (*Mustelus mustelus*), piked dogfish (*Squalus acanthias*), common eagle ray (*Myliobatis aquila*) and pelagic stingray (*Pteroplatytrygon violacea*) by examining the incidental catch recorded in a longer data series (i.e. from 2006 to 2015). These species had already been identified by Fortuna et al. (2010) as the most impacted by pelagic trawlers in the Adriatic Sea. According to Bonanomi et al. (2018), piked dogfish was the species of elasmobranch with the highest bycatch (2160 individuals of piked dogfish were caught, with an average frequency of 0.061 per fishing haul), followed by the common eagle ray (1880 individuals; average frequency of 0.054 per fishing haul), the common smooth-hound (833 individuals; average frequency 0.027), and the pelagic stingray (555 individuals; average frequency 0.033). It was shown that depth, season and fishing area strongly influenced the bycatch of the above-mentioned species. Additionally, the presence of a nursery area identified in the northern Adriatic was probably a major factor affecting the bycatch of the common smouth-hound and piked dogfish. The study also revealed that demersal elasmobranchs were caught by pelagic trawlers when these vessels operated in relatively shallow waters. The CPUEs of

common eagle rays and bull rays declined significantly with haul duration and net vertical opening (Carpentieri et al., 2021).

Few studies report elasmobranch bycatch in small-scale fisheries in the Adriatic Sea, though captures of large pelagic species are occasionally reported (Carpentieri et al., 2021).

The WWF SafeSharks project (WWF, 2021) that began in 2018, was carried out along the Apulian Adriatic coast in southern Italy. The project aims to provide important information on bycatch in the long-established Monopoli longline swordfish fishery (about 26 boats); preliminary analysis indicates that the fishery captures large elasmobranchs. However, the fishers release almost all caught specimens back into the sea alive, only retaining a few large individuals for sale (Carpentieri et al., 2021).

### 5.4.3. Cetaceans in the Adriatic Sea

The types of vessel groups with the greatest rates of interactions with marine mammals seem to be those using set gillnets and trammel nets in coastal areas (FAO, 2020).

Beginning in 2006, a project (Fortuna et al., 2012) was carried out to monitor the possible non-commercial incidental catch, including protected species, occurring during pelagic trawling activities in the Adriatic Sea. Dolphins were present at over 30 percent of the hauls and often interacted with the fishing operations. Nevertheless, only small numbers of bottlenose dolphins were caught and many were immediately released alive (Fortuna et al., 2010a). The survey was extended year by year and on the basis of these data, the estimated annual number of dolphins captured as bycatch for 2011 was estimated at 72; considering the entire period 2006–2011, a total estimate of 35 dolphins per year was calculated (Fortuna et al., 2012; Carpentieri et al., 2021).

### 5.4.4. Seabirds in the Adriatic Sea

About 99% of the available records in the Mediterranean on seabird bycatch refer to longliners and small-scale vessels (FAO, 2020). This could be linked to the importance of these fishing activities across the whole Mediterranean Sea and to the presence of some endemic and threatened (according to the IUCN Red List) seabird species, for which the western Mediterranean, in particular, represents an important breeding area, as well as a major feeding ground.

## 5.5. Minimum sizes of marine organisms

One of the management measures to protect stocks is the implementation of minimum conservation reference sizes (MCRS, Table 6). Species smaller than these sizes cannot be landed or sold. Mesh size and mesh shape of fishing gear should be adapted to mainly catch species larger than the MCRS. The minimum fish size is included in the DCM No. 402 dated 08.05.2013 "Concerning

management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea". The corresponding EU legislation that this DCM refers to is Council Regulation 1967/2006.

The MCRS is not always well aligned with the age at maturity. The captured species have not always been able to reproduce. For example the mean length at maturity of *Nephrops norvegicus* is 3 cm carapace length (CL) (Palomares and Pauly, 2021), while the MCRS is 2 cm CL. The length at maturity of sardine is around 13-14 cm (Palomares and Pauly, 2021), while the MCRS is 11 cm. Sardine is caught together with anchovy that is mature around 8-9 cm (Palomares and Pauly, 2021).

*Table 6: The minimum conservation reference sizes, MCRS (DCM No. 402 dated 08.05.2013).*

| Scientific name | English name | MCRS dimension |
|---|---|---|
| Fish | | |
| *Dicentrarchus labrax* | european seabass | 25 cm |
| *Diplodus annularis* | annular seabream | 12 cm |
| *Diplodus puntazzo* | sharpsnout seabream | 18 cm |
| *Diplodus sargus* | white seabream | 23 cm |
| *Diplodus vulgaris* | common two-banded seabream | 18 cm |
| *Engraulis engrasicolus** | european anchovy | 9 cm |
| *Epinephelus spp.* | groupers | 45 cm |
| *Lithognathus mormyrus* | sand steenbras, striped seabream | 20 cm |
| *Merluccius merluccius* | european hake | 20 cm |
| *Mullus spp.* | mullets | 11 cm |
| *Pagellus acarne* | axillary seabream | 17 cm |
| *Pagellus bogaraveo* | blackspot seabream | 33 cm |
| *Pagellus erythrinus* | common pandora | 15 cm |
| *Pagrus pagrus* | red porgy | 18 cm |
| *Polyprion americanus* | wreckfish | 45 cm |
| *Sardina pilchardus ** | european pilchard, sardine | 11 cm |
| *Scomber spp.* | mackerels | 18 cm |
| *Solea solea (Solea vulgaris)* | common sole | 20 cm |
| *Sparus aurata* | gilthead seabream | 20 cm |
| *Trachurus spp.* | jack mackerels | 15 cm |
| Crustacea | | |
| *Hommarus gammarus* | european lobster | 105 mm CL<br>300 mm TL |
| *Nephrops norvegicus* | norway lobster | 20 mm CL<br>70 mm TL |
| *Palinuridae* | spiny lobster | 90 mm CL |
| *Parapenaeus longirostris* | deep-water rose shrimp | 20 mm CL |
| Bivalve mollusk | | |
| *Challista chione* | brown venus clam | 6.0 cm |
| *Chamelea gallina* | striped venus clam | 2.5 cm |
| *Donax trunculus* | truncate Donax | 2 cm |
| *Mytilus galloprovincialis* | mediterranean mussel | 5.0 cm |
| *Nassarius mutabilis* | changeable nassa | 2.2 cm |
| *Ostrea spp* | oysters | 6.0 cm |
| *Pecten jacobeus* | great mediterranean scallop | 10 cm |
| *Ruditapes decussates* | grooved carpet shell | 3.6 cm |
| *Solen spp* | razor clam | 8.0 cm |
| *Tapes philippinarum* | japanese carpet shell | 3.0 cm |
| *Venerupis spp.* | carpet shells | 2.5 cm |
| *Venus spp.* | venus clams | 2.5 m |
| *Venus verrucosa* | warty venus | 2.7 cm |

* Anchovy: The minimum dimension can be converted to 110 individuals per kilogram

** Sardine: The minimum dimension can be converted to 55 individuals per kilogram

# 6. Pollution & marine litter

## 6.1. Marine litter

With the technical support of GFCM, Albania started a discard monitoring program on bottom trawler vessels in 2020. The preliminar data reveal that the bycatch of marine litter made up for about 5% of the total catchweights. Over one third of this bycaught trash were old fishing gears and about a quarter consisted of rubber and plastic. Other fractions in order of decreasing abundancy were metals, processed wood, glass, ceramics and cloths (personal communication, Albanian fisheries administration).

Information on marine litter in the Adriatic and Ionian Seas remains limited, inconsistent and fragmented, although it is widely accepted that the Mediterranean is one of the most affected seas by marine litter, worldwide (Vlachogianni et al., 2017). This report estimates that fisheries and aquaculture related litter is responsible for 1.5% to 14.8% of the beach litter and 8.8% of the floating litter. The contribution of fisheries and aquaculture related items to the total number of items collected by the seafloor trawl surveys and the seafloor visual surveys with scuba/snorkelling was at regional level 17% and 6%, respectively, being mussel nets, fishing lines, fishing nets and other items (Vlachogianni et al., 2017). Although these numbers are much lower than the preliminary estimates in Albania (38% of the litter in the catch, personal communication, Albanian fisheries administration), it is clear that they are much higher than the 5% calculated for the Mediterranean (UNEP/MAP, 2015) indicating that fisheries and aquaculture industries are one of the main polluters in the Adriatic and Ionic Sea.

A recent review by Schmid et al. (2021) focussing on plastic pollution in the Adriatic Sea states that the majority of floating macro wastes appear to be plastics such as bags and expanded polystyrene (EPS), both floating as a result of their lower density than seawater. Several studies estimated concentrations in the Adriatic but results vary considerably depending on the sampling method, the speed of the vessel and the threshold size chosen. The reported concentration range from 0.5 items/km$^2$ for larger waste exceeding 20 cm (Arcangeli et al., 2018), over 332 ± 749 items/km$^2$ visually observed with a size larger than 2.5 cm (Vlachogianni et al., 2017) up to 127 000 items/km$^2$ of floating micro debris (Palatinus et al., 2019). Where identified, the majority of plastics were found to be polyetheen (PE) and polypropeen (PP), even though significant percentages of polyamide (PA) and Polyvinylchloride (PVC) were found in some cases (Schmid et al., 2021). The type of debris on the seabed on the contrary consisted of more heavy materials such as glass and metal, as also observed in the Albanian survey. In general, the greatest quantity of seabed litter is found in coastal areas, while offshore the seabed is less dirty (Macic et al., 2017; Palatinus et al., 2019).

While Albania is not the highest contributor to the plastic pollution problem in the Adriatic-Ionian basin (IPA Adriatic DeFishGear project), there is a clear need for more effective marine litter management. With 60% of the Albanian population living in coastal areas, the effects of intensive construction, growing coastal tourism, and inadequate waste stream management could cause deterioration of the quality of the coastal and marine environment. As the Albanian coastal economy continues to grow, it is vital to find ways of reducing plastic pollution (World bank, 2020).

### 6.2. Marine pollution

Unfortunately, Albania does not have any data on waste water, fuel loss or gas emissions of commercial fishing vessels as referred to in the International Convention for the Prevention of Pollution from Ships (MARPOL).

# 7. Fishery policies

## 7.1. SSF

### 7.1.1. Current regulation

Although an estimated 85% of the artisanal small-scale fishing was considered unreported in 2003 (Cobani, 2005), Albania is joining other countries in an effort to make the SSF better organised and understood within the FAO Regional Plan of Action for Small Scale Fisheries in the Mediterranean and Black Sea (RPOA-SSF). This political commitment aims to address challenges and reinforce opportunities for SSF, focussing on safeguarding environmentally sustainable fishing practices and providing economic, social and employment benefits. So far, nearly half of the SSF is following the obligation to apply for a paid licence and monthly report their landings. These vessels are allowed to fish with 48 mm gill or trammel nets anywhere in the 3 nm zone except for the radial region of 2 km in front of river mouths and coastal lagoons.

### 7.1.2. Proposed and future regulation

The traditional knowledge of artisanal fishers needs to be framed and valued by scientific programmes and needs to be considered by policy makers in a way that this fishing category could be an integral part of management plans (Cobani, 2005). Indeed, several compelling arguments can be made to why this segment deserves more esteem. Firstly, the SSF often have a unrivalled knowledge of fish behaviour, local habitats and seasonal dynamics to which they continuously have to adapt. Second, these skills and their small scale benefit their ecological impact which is why they are often associated with a more sustainable exploitation pattern compared to other larger scale fisheries (Grati et al., 2018). This was corroborated by Lucchetti et al. (2020) who found that Mediterranean passive nets are size-selective, catching mature individuals above MCRS, although they highlight that this size is currently well below length at first maturity of certain species which warrants further attention. Third, although this category of fishers is usually poor, their activities add enormous value to local communities which is illustrated by the high associated employment rates. Last, artisanal traditional fisheries may contribute to deter illegal fishing by semi-industrial fishing boats operating in shallow water near the coast (Cobani, 2005). Therefore it is important to further invest in this segment and use the knowledge of other SSF in the Adriatic or Mediterranean to help developing it into a sustainable cornerstone of the Albanian fishery.

## 7.2. General rules for Industrial fisheries (>12 m)

### 7.2.1. Current regulation

The large vessels (>12 m) that use industrial fishing techniques are more monitored and bound to directives. A first set aims to guarantee selectivity by specifying technical parameters such as the dimensions of the gears, the mesh size of the cod-end and minimum landing sizes for the landings (Decision of Counsel of Minister No. 402, date 8.5.2013 "Concerning management measures for the sustainable exploitation of fishery resources in the sea"). Besides, their effort and impact is being controlled by limiting fishing time or using spatial or temporal closures of certain areas.

Albania has one fishery legislation for both the Adriatic and Ionic Sea. All regulatory measures, including those for the Ionic sea, are implementations of the GFCM-recommendations for the Adriatic Sea. The main practical consequence that the Ionic Sea coast is much steeper and reaching 50 m depth within the 3 nm zone, allowing fishermen to fish there nevertheless.

A recent milestone has been the implementation of the vessel monitoring system (VMS), a satellite surveillance system used to monitor the location and movement of commercial fishing vessels. VMS is used to support law enforcement initiatives including regional fishing quotas, the endangered species act, and the marine mammal protection act. The VMS has been implemented in Albania for vessels > 12 m and is working properly since May 2021 allowing fishery inspections to detect violations (Commission, 2019).

### 7.2.2. Proposed and future regulation

To potentially join the EU, Albania needs to be able to implement the Common Fisheries Policy (CFP). This CFP lays down rules on fisheries management with the goal of protecting living resources of the sea and to limit the environmental impact of fisheries. The main tools for achieving this are catch quotas, managing the fleet capacity, rules on markets and aquaculture and support for fisheries and coastal communities. Recent and future regulation will therefore most often be implementations of the CFP, focussing on qualitative scientific data collection and managing fishing efforts and SSF.

Within this framework, Albania and their neighbour countries have agreed to progressively reduce its catches of the key stocks each year aiming to achieve the MSY target for all key stock species in 2026. Additionally, GFCM proposed to reduce the total engine power of the fishing fleets in the Adriatic to the 2014 level. However, Albania wants to use 2017 as reference year since its fleet (i) had not yet had the time to modernize and catch up with that of neighbouring countries prior to that, due to its political historical backlog and consequently (ii) doesn't bear equal responsibility in the historical overexploitation of the fish stocks (personal communication, Albanian fisheries administration).

## 7.3. Bottom trawlers

### 7.3.1. Current regulation

Fishing time in Albania was not limited prior to 2020. However, since Albania complied with the GFCM recommendations for sustainable demersal fisheries in the Adriatic Sea (REC. GFCM/43/2019/5, geographical subareas 17 and 18), there were designated fishing days for bottom trawlers of each Adriatic country. The goal is to gradually lower fishing days yearly in order to reduce the impact on the stocks and environment. Based on stock status and the historical fishing days reported by Albania in GFCM, it was recommended that Albanian bottom trawls fishing demersal fish should not exceed 23124 fishing days in 2020, 22748 fishing days in 2021 and 22109 fishing days in 2022. Based on the logbook data, the Albanian authorities distribute the total amount of fishing days over the different ports, attributing 56%, 22%, 11% and 11% to Durres, Shengjin, Vlore and Sarande respectively. From 2022 onwards, this would be further specified per fleet segment and size (12 – 18 m, 18 – 24 m and > 24 m) and a conversion factor will be used to transfer fishing day quota among different fleet segments (pers. Comm. Albanian Fisheries Administration). Until 2021, this effort quota was monitored and controlled by the fisheries inspection based on total fishing days, which will be fishing days per fleet segment from 2022 onwards.

The spatial and temporal closures for trawlers state that 'Fishing up to 6 nm from the shore or 4 nm for vessels not authorized to fish more than 6 nm, for all bottom trawl fishing vessels fishing demersal fish stocks, is prohibited for the period July 1st to September 15th'. This authorisation to fish either up to 6 nm or 12 nm and beyond is given by the Harbour Master based on the fuel capacity, engine power and safety standards of the vessel. Last, all demersal trawlers are obliged to fish with a minimum mesh size of the cod-end of 40 mm.

### 7.3.2. Proposed and future regulations

Bottom trawling is inherently unselective with a significant impact on the benthic ecosystem, hence most impacting scenarios could be avoided by restricting trawling both spatially and temporally. As stated by Tudela (2004), the banning of bottom trawling in large marine protected areas throughout the Mediterranean Basin appears to be the only way of maintaining a sample set of demersal ecosystems free of the damage caused by this widespread fishing practice. These areas would moreover be very useful as a basic reference guide to healthy bottom communities in the context of a future ecosystem-based management of Mediterranean fisheries. Besides, other (technical) measures can be used to improve selectivity such as stimulating the use of larger and square meshes, shorter trawl hauls to reduce discard rates (Moranta et al., 2000), excluding devices and by proper enforcement of spatial limits that protect vulnerable areas such as the 3 nm zone.

## 7.4. Pelagic trawlers & purse seines

### 7.4.1. Current regulation

The GFCM recommendations on further emergency measures for small pelagic stocks in the Adriatic Sea (REC. GFCM/42/2018/8, geographical subareas 17 and 18) were fully implemented in Albanian legislation by minister order, covering both pelagic otter trawlers as purse seiners. This included, among other, a temporal closure of the fishery for sardine from mid-February to mid-March and of anchovy in June. Additionally, the pelagic vessels targeting small pelagic shall not fish more than 180 days per year, with a maximum of 144 fishing days targeting sardine or 144 fishing days targeting anchovy. Fishing vessels over 12 m LOA fishing for small pelagic also have spatial limitations and are only allowed in the 3 to 6 nm zone from January 1st to March 31th. The rest of the year they have to fish outside the 6 nm zone.

The GFCM recommendations also specify that the fleet targeting small pelagic stocks does not exceed the capacity in terms of gross tonnage, engine power and number of vessels as reported in 2014 in national and GFCM registers. However, this is not yet implemented by Albania as they argue that their fleet was still developing back than suggesting to take the data of 2017 as reference year. The technical regulations specify a minimum mesh size of 20 mm for pelagic trawlers and 14 mm for purse seiners. It also stipulates a minimum landing size of 9 cm and 11 cm for anchovy and sardine respectively, corresponding with 110 specimens per kg. Finally, a total allowable catch (TAC) exists for several target species of this segment, which consists of quantitative limitations on the amount of catch (tons) that can be taken from a given stock. TAC is an effective instrument used to regulate catch in such a manner as to attain maximum sustainable yield (MSY). The TAC is usually split into quotas among countries, which can, if needed, be further subdivided by gear type (or by any other category required) (FAO, 2020). Only two fisheries in Albania are managed using annual catch limits or TAC: the small pelagic fishery and blue fin tuna fishery. The blue fin tuna quota was 156 tons in 2019 and 170 tons in 2020 and 2021 (ICCAT recommendation REC. ICCAT/2021/19-04). The GFCM recommendations state that the level of catches in 2019, 2020 and 2021 for small pelagics should not exert the reported level of 2014 (recommendation GFCM/42/2018/8).

### 7.4.2. Proposed and future regulation

The Albanian TAC for small pelagics which was fixed at the 2014 level during the 2019-2021 period will be revised on annual basis from 2022 onwards as recommended by GFCM. Albania shall not exceed 70% of the total joint limit with Montenegro of 4650 and 4301 ton in 2022 and 2023 respectively. Additionally, a progressive reduction of 5% for anchovy and 8 or 9% for sardine is recommended in 2022-2023 in order to help stocks reach MSY levels by 2026. Further limitations are currently unknown.

## 7.5. Dredges

Dredges are only allowed to fish between 5 a.m. and 5 p.m. on weekdays and fishing activity is prohibited entirely for 1 to 6 months depending on the target species. Hydraulic dredges can be used for all mollusks except for *M. galloprovincialis*, *Donax trunculus*, *Venus verrucose* and *Ruditapes philippinarum*. Additionally, gear-technical prescriptions determine a minimal distance between the metal rods and the lower part of the cage between 7 and 25 mm depending on the mollusc targeted.

## 7.6. Control & enforcement

### 7.6.1. Obligations for fishermen

Conform the GFCM recommendations (REC. GFCM/43/2019/5) the following requirements apply for authorized bottom trawl vessels actively fishing for key stocks, i.e. hake, red mullet, common sole, deep-water rose shrimp and Norway lobster: (i) VMS (>12 m LOA) or other most appropriate geo-positioning system (<12 m LOA), (ii) all catches of key stocks shall be reported in the logbook and catches of non-target species in excess of 50 kg shall be reported in the logbook and (iii) fishing is prohibited once effort quota or fishing days are exhausted. The authorized small pelagic vessels on the other hand have to land all catches to facilitate monitoring, with the exception of those catches which may be discarded in accordance with existing national legislation (REC. GFCM/42/2018/8).

### 7.6.2. Obligations for Albania

Albania is expected to set up adequate mechanisms to ensure compliance with the conservation and management measures contained in the GFCM recommendations. Therefore, each fishing vessel, its catches and fishing effort should be registered in a national fleet register. Additionally, an observation and inspection program should comprise, inter alia, (i) high seas inspection, (ii) procedures for exchanging information and investigating alleged violation of the conservation and management measures, (iii) provision for appropriate action and follow-up when serious violations are revealed, (iv) port inspections, (v) monitoring of landings and catches and statistical follow-up for management purposes, (vi) specific monitoring programmes including boarding and inspection and (vii) observer programmes. Albania has already progressed a lot in this process by starting with the implementation of vessel monitoring systems (VMS) and electronic reporting systems (ERS) on larger vessels (>12 m LOA), two EU patrol vessels to put in service and by-catch monitoring program. The vessel monitoring systems will be managed by the inter-institutional maritime operation centre (IMOC) that has to ensure the surveillance of the Albanian maritime space once the VMS is fully operational. Together with the ERS data, it will support fishery inspections, help to detect violations and generate valuable data for fisheries research. The patrol vessels will be used to fight illegal fisheries and perform on-board controls to reveal infringements with mesh sizes, illegal landings or malicious reportings. The by-catch monitoring program was implemented in 2019 for trawlers and purse seiners in the Adriatic Sea with the support of GFCM. The results will be published by GFCM in 'the state of the Mediterranean and black sea fisheries 2022' after which this program should be continued and tailored according to the needs.

# 8. Risk analysis based on the Marine Strategy Framework Directive (MSFD)

Human activities (including fishery) have to be operating in a sustainable way and in balance with a healthy marine ecosystem. To evaluate the sustainability and estimate possible effects of Albania's fishery on the marine ecosystem, an evaluation framework is needed. As the EU's environmental legislation is based on the Marine Strategy Framework Directive (MSFD), this framework is used. The goal of the MSFD is to protect the marine ecosystem and biodiversity upon which our health and marine-related economic and social activities depend. The MSFD evaluation framework for the marine ecosystem is based on 11 qualitative descriptors (EU, 2008; Commission decision (EU) 2017/848) to evaluate the environmental status and aim to achieve 'good environmental status'. The relevant descriptors for fisheries are used as a guideline to evaluate the risk of the Albanian fishery impacting the marine environment (Table 7).

*Table 7: An overview of the evaluation of the MSFD indicators relevant for the Albanian fishery and their criteria.*

| MSFD indicator | Criteria | Score* | Status indicator** | Impact from Albania fishery | Explanation |
|---|---|---|---|---|---|
| D1 Biodiversity | D1C1 | 1 | HIGH RISK | Medium | No quantitative analysis has been carried out to assess the impact of fishery-related mortality on ETP species however (juvenile) bycatch can be significant. |
| | D1C2 | 0 | | | |
| | D1C3 | 0 | | | |
| | D1C4 | 0 | | | |
| | D1C5 | 0 | | | |
| | D1C6 | 0 | | | |
| D2 Invasive species | D2C1 | 0 | HIGH RISK | Low | Albania's fishing fleet does not operate outside of the Adriatic or Ionic sea. |
| | D2C2 | 0 | | | |
| | D2C3 | 0 | | | |
| D3 populations | D3C1 | 1 | HIGH RISK | Medium | Almost all stocks in the Adriatic are overfished, however Albania's fishing effort is small in comparison to other nations active in the Adriatic. |
| | D3C2 | 1 | | | |
| | D3C3 | 1 | | | |
| D4 food web | D4C1 | -1 | HIGH RISK | Unknown | Albanian fishery affect the food web, but the degree of it could not be assessed. |
| | D4C2 | -1 | | | |
| | D4C3 | -1 | | | |
| | D4C4 | -1 | | | |
| D6 sea floor integrity | D6C1 | -1 | HIGH RISK | Unknown | Fishery disturbance affect habitat status. A preliminary assessment for the Southern Adriatic is available, however improving the monitoring of the fishing activities is needed to evaluate this criteria. |
| | D6C2 | 1 | | | |
| | D6C3 | 1 | | | |
| | D6C4 | -1 | | | |
| | D6C5 | -1 | | | |

| MSFD indicator | Criteria | Score* | Status indicator** | Impact from Albania fishery | Explanation |
|---|---|---|---|---|---|
| D8 pollution | D8C1<br>D8C2<br>D8C3<br>D8C4 | -1<br>-1<br>-1<br>-1 | HIGH RISK | Unknown | No info available |
| D9 food safety | D9C1 | 1 | MEDIUM RISK | Unknown | insufficient info available |
| D10 marine liter | D10C1<br>D10C2<br>D10C3<br>D10C4 | -1<br>-1<br>-1<br>-1 | HIGH RISK | Medium | insufficient info available |
| D11 energy & noise | D11C1<br>D11C2 | -1<br>-1 | Unknown | Unknown | No info available |

* Criteria is relevant and discussed (1), relevant but lacking sufficient data to discuss (-1) or irrelevant/not applicable (0).
** The status of the indicator is high risk, medium risk, low risk or unknown.

## 8.1. D1. Biodiversity

With Descriptor 1 (D1), the marine directive aims to ensure that biodiversity is maintained and kept in line with the natural state appropriate to the area in question. For D1, 5 species groups (birds, mammals, reptiles, fish and cephalopods) and 2 habitats (pelagic and benthic) are considered, for which several criteria on by-catch, population and demographic status are defined. The criteria are:

- D1C1 (primary): The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its longterm viability is ensured.
- D1C2 (primary): The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.
- D1C3 (primary or secondary): The population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity, and survival rates) of the species are indicative of a healthy population which is not adversely affected due to anthropogenic pressures.
- D1C4 (primary or secondary): The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.
- D1C5 (primary or secondary): The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.

- D1C6 (primary): The condition of the habitat type, including its biotic and abiotic structure and its functions (e.g. its typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), is not adversely affected due to anthropogenic pressures.

A key pressure on marine biodiversity is fisheries. Fishing removes a considerable biomass of fish from the ecosystem, both target species as well as unwanted by-catch. The population status of the target species is discussed under D3 and the physical damage to the sea floor is discussed under D6. Under D1, bycatch assessment, is most relevant for fisheries.

Incidental catch of ETP species (e.g. sea turtles, seabirds, sharks and marine mammals) is part of the unwanted bycatch in Albanian fisheries (see 5.4). Data which would allow assessing the magnitude of these impacts at population level is lacking. Also, data on post-release impacts due to injuries is lacking. With the support of GFCM, Albania started a discard monitoring program on the bottom trawlers since 2019, to help the protection of vulnerable species (Commission, 2019). This data will be published by GFCM in the frame of 'the state of the Mediterranean and black sea fisheries 2022' (personal communication, Albanian fisheries administration).

Loggerhead sea turtle-trawler interactions are quite common in the Adriatic Sea. Around 560 sea turtles were estimated to be caught annually by Albanian fishers, according to Casale (2011). Therefore, the Adriatic Sea represents a key area for the management and conservation of turtles (Carpentieri et al., 2021). In the Adriatic Sea, the large majority of elasmobranch bycatch records are reported from pelagic trawlers, mainly targeting anchovies, sardines and mackerel. It was shown that depth, season and fishing area strongly influenced the bycatch (Carpentieri et al., 2021). Dolphins often interact with the pelagic trawling operations targeting anchovies and sardines in the Adriatic Sea. A total estimate of 35 dolphins caught per year was calculated during the period 2006–2011 (Fortuna et al., 2012; Carpentieri et al., 2021).

To date no detailed quantitative analysis has been carried out to assess the impact of fishery-related mortality on turtles and cetaceans (FAO, 2016). D1C1 'The mortality rate per species from incidental by-catch should be below levels which threaten the species, such that its long-term viability is ensured.' is consequently evaluated as at high risk. Since the Albanian contribution to the landings in the Mediterranean is relatively low, the Albanian impact is assessed as medium despite its high bycatches.

## 8.2. D2. Invasive species

D2 aims to ensure that non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems. The criteria are:

- D2C1 (primary): The number of non-indigenous species which are newly introduced via human activity into the wild is minimised and where possible reduced to zero.
- D2C2 (secondary): Thresholds are not exceeded of abundance and spatial distribution of established non-indigenous species, particularly of invasive species, contributing significantly to adverse effects on particular species groups or broad habitat types.

- D2C3 (secondary): Thresholds are not exceeded of the proportion of the species group or spatial extent of the broad habitat type which is adversely altered due to non-indigenous species, particularly invasive non-indigenous species.

Recent publications indicate that most non-indigenous species are introduced in the Mediterranean through the Suez Canal and shipping, as well as aquarium trade (Zenetos & Galanidi, 2020; Sliskovic et al., 2021). Since Albania's fishing fleet does not operate outside of the Adriatic or Ionic sea, their fishery won't act as a vector for non-indigenous species. Therefore, Albanian impact is low, however the risk not to meet D2 is high since non-indigenous species is a problem in the area.

## 8.3. D3. Population of commercial fish stocks

A good environmental status for indicator D3 is achieved when all relevant stocks are exploited sustainably, have full reproductive capacity and when the proportion of older and larger fish and shellfish is maintained. The three criteria are:

- D3C1 (primary): The fishing mortality rate of populations of commercially-exploited species is at or below levels which can produce the maximum sustainable yield (MSY).
- D3C2 (primary): The spawning stock biomass of populations of commercially-exploited species are above biomass levels capable of producing maximum sustainable yield.
- D3C3 (primary): The age and size distribution of individuals in the populations of commercially-exploited species is indicative of a healthy population. This shall include a high proportion of old/large individuals and limited adverse effects of exploitation on genetic diversity.

The stock assessment of primary species in the Adriatic Sea is done regularly (see 5.2). The MEDITS and the MEDIAS routine surveys provide essential information on many stocks as to fine-tune assessments on the status of resources. Fisheries statistics from vessels over 12 m are collected from logbooks and delivered to inspectors. But, in Albania there is neither a Fishery Research Institute nor a fish stock expert actively contributing to the stock assessments in the Adriatic Sea.

Almost all available relevant stock assessments shows that the stocks are in overexploitation, which means the fishing pressure is too high and the stocks are fished outside biologically sustainable limits. The status of Adriatic Sea priority demersal species showed some improvements (in terms of decrease in fishing mortality and/or increase in biomass) with respect to previous years. Despite these positive signals, the levels of fishing mortality for key stocks are still far from the levels expected to provide MSY (see Table 4) (FAO, 2020).

Consequently this criteria is evaluated as at high risk. Albanian fisheries are evaluated to have a medium impact, due to relatively low Albanian contribution to the landings in the Mediterranean (Figure 15), however with high (undersized) bycatch and discards. Discards represent a major source of uncertainty in the actual fishing mortality rates of several commercial stocks.

## 8.4. D4. Food webs

D4 is the most complex descriptor as it tries to evaluate changes in the entire food web due to human induced pressures. It is hard to develop food web state indicators and especially to collect enough data to run specific food web models for entire regions. The EU recommended that not all trophic guilds in each ecosystem need to be assessed but that, by region, a minimum of at least three trophic guilds should be monitored, preferably covering both lower and higher trophic levels. EU member states can monitor as many guilds as deemed appropriate (with a minimum of three), but at least two non-fish guilds should be required to ensure that not only fish are monitored. The four criteria are:

- D4C1 (primary): The diversity (species composition and their relative abundance) of the trophic guild is not adversely affected due to anthropogenic pressures.
- D4C2 (primary): The balance of total abundance between the trophic guilds is not adversely affected due to anthropogenic pressures.
- D4C3 (secondary): The size distribution of individuals across the trophic guilds is not adversely affected due to anthropogenic pressures.
- D4C4 (secondary, and to be used in support of criterion D4C2, where necessary): The productivity of the trophic guild is not adversely affected due to anthropogenic pressures.

When evaluating the risk, the Albanian fishery has an effect on the above mentioned criteria, but no specific food web models for the Southern Adriatic Sea are available to evaluate the degree of changes in diversity, abundance or size structure of certain trophic guilds. Nevertheless, there is a risk, the Albanian fishery causes an impact on the food web in the Southern Adriatic Sea, despite their restricted industrial size. Therefore, dedicated monitoring is needed, which can of course rely on monitoring for other descriptors (e.g. D1, D3).

## 8.5. D6. Sea-floor integrity

The aim of D6 on sea-floor integrity is that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected. Following sea-floor criteria are determined:

- D6C1 (primary) (pressure indicator): Spatial extent and distribution of physical loss (permanent change) of the natural seabed.
- D6C2 (primary) (pressure indicator): Spatial extent and distribution of physical disturbance pressures on the seabed.
- D6C3 (primary) (state indicator): Spatial extent of each habitat type which is adversely affected, through change in its biotic and abiotic structure and its functions, by physical disturbance. This through changes in species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species.
- D6C4 (primary) (state indicator): Extent of loss per habitat type from anthropogenic pressures.
- D6C5 (primary) (state indicator): Extent of adverse effects on the condition of the habitat.

In relation to seafloor integrity, the spatial extent of physical loss (D6C1) and disturbance (D6C2) due to pressures on the seabed is evaluated. This is done to determine the spatial extent of each habitat which is adversely affected due to this loss (D6C4) and disturbance (D6C3) and what influence it has on the condition of the habitat (D6C5) (Figure 16). Physical loss could not be assessed, but the Albanian fishery is mainly fishing on soft sediments (sand, muddy sand to sandy mud) and will not change those habitat types. The major habitat of concern in the region are seagrass fields at the nearby coast, which can decline due to fishery. But as far as reported, the Albanian fishery is not active in those areas and some seagrass areas are included in an MPA. In chapter 3.3, the spatial extent of physical disturbance due to bottom trawling is given, based on global fish watch data. Those data are far from complete and accurate, so improving the monitoring of the fishing activities (e.g. VMS data) is needed to evaluate this criterion. However the preliminary assessment indicates an impact of bottom trawl fishery within the area. Bottom trawlers risk adversely affecting the habitats. The overall condition of the benthic habitat could not be assessed, due to the absence of benthic impact data covering the wider area.

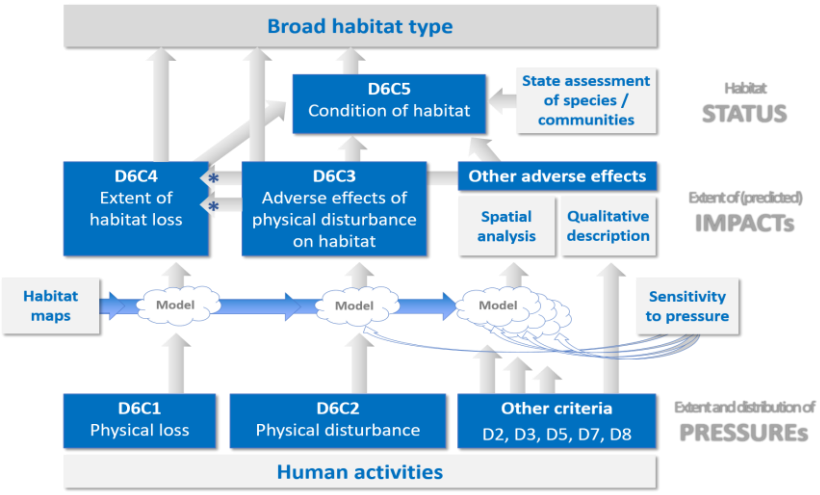



*Figure 16. conceptual framework for the evaluation of descriptor Sea (taken from D6 guidance document made by Technical group Seabed of Europe).*

## 8.6. D8. Pollution

The goal of D8 is that concentrations of contaminants are at levels not giving rise to pollution effects. Any type of ship contributes to increased contaminant levels as there is always some loss of fuel, oil, detergents, anti-fouling,... into the marine environment, especially in rather closed sea's such as the Adriatic or Mediterranean in general. This amount of pollution is increased for older fleets, as is the case in Albania. Unfortunately, the lack of data and thresholds makes it impossible to assess the relative share of the fishing vessels compared to other fleets and land-based pollution.

## 8.7. D9. Food safety

The D9 on food safety strives that contaminants in fish and other seafood for human consumption do not exceed levels established by Union legislation or other relevant standards. The criteria is:

- D9C1 (primary): The level of contaminants in edible tissues of seafood caught or harvested in the wild does not exceed: (a) for contaminants listed in Regulation (EC) No 1881/2006, the maximum levels laid down in that Regulation; (b) for additional contaminants, not listed in Regulation (EC) No 1881/2006, threshold values, which Member States shall establish through regional or subregional cooperation.

The first amendments determining the maximum levels for chemical contaminants in fishery products and seafood were only introduced by the European Council (EC) in 2006 and 2011. Overall, no major significant concerns or extreme high levels were observed in the Mediterranean Sea, although the number of research studies on this topic is still limited (Mediterranean Quality Status Report, 2017). Interestingly, a review by Zivkovic et al. (2017) found that fish species at the higher trophic levels have similar mercury concentrations everywhere in the Mediterranean, despite the fact that the Adriatic Sea has the highest mercury concentration in the whole Mediterranean Sea. This illustrates the incomplete understanding of the transfer mechanisms of mercury, and potentially also other contaminants, from seawater to upper trophic levels and the need for further research on this topic.

## 8.8. D10. Marine litter

This directive wants to ensure that properties and quantities of marine litter do not cause harm to the coastal and marine environment. The four criteria are:

- D10C1 (primary): The composition, amount and spatial distribution of litter on the coastline, in the surface layer of the water column, and on the seabed, are at levels that do not cause harm to the coastal and marine environment.
- D10C2 (primary): The composition, amount and spatial distribution of micro-litter on the coastline, in the surface layer of the water column, and in seabed sediment, are at levels that do not cause harm to the coastal and marine environment.
- D10C3 (secondary): The amount of litter and micro-litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned.
- D10C4 (secondary): Thresholds will be established on the number of individuals of each species which are adversely affected due to litter, such as by entanglement, other types of injury or mortality, or health effects.

The review of Schmid et al. (2021) states that information is lacking to fully understand the magnitude of the problem with marine litter. Furthermore, the authors conclude that the most sampled polymers have been PE, PP and PS and that the presence of plastic is ubiquitous, quantitatively variable and difficult to compare in spatial and temporal terms. The great amount of litter in the marine environment suggests that further action is needed, but no study has yet dealt with resolution of the problem. The feasibility and validity of installing permanent surface structures able to retain floating items in the areas of greatest accumulation is one solution that

should be evaluated. Additionally, monitoring programmes should sample from fixed locations over time, using standard methodologies to verify whether specific policies and legislations have a positive impact on marine pollution reduction.

Further research should also assess potential harm, as negative effects are documented on over 1400 species. Most known are plastic debris found in stomachs of non-selective surface foraging species such as seabirds and turtles (Wilcox et al., 2015; Domènech et al., 2019) and entanglement of fish or marine mammals in old fishing gears (Lusher et al., 2018). However, plastic litter can also represent a relevant source of chemical additives, some of them with suspected endocrine disrupting action, that easily leach into the water since they are not bound to the polymeric chains and become available to the estuarine and marine fauna (Hermabessiere et al., 2017). These leached plastic-associated contaminants are found to have ecotoxicological effects on marine invertebrates, seabirds and cetaceans with unknown effects on their survival rates or reproductive success (Galgani et al., 2019).

Although the high concentration of waste in the Adriatic warrants extra caution, this is definitely not an Albania-specific issue and further research on this topic is a regional and even world-wide challenge (see also chapter 6).

### 8.9. D11. Introduction of energy

D11 wants to avoid that the introduction of energy or underwater noise into the water adversely affect the marine environment. Fisheries are an anthropogenic source of low-frequency sound, contributing to the background noise that may affect marine animals. Albania has no useful dataset on this topic making it impossible to evaluate the impact of their fishery, let alone isolate it from other important contributors such as maritime traffic, tourism and other resource exploitations. This is not a challenge specific to Albania, as research on underwater energy and noise is still young and in full development. Noteworthy is the INTERREG project 'Soundscapes in the North Adriatic Sea and their impact on marine biological resources' carried out by Italy and Croatia in 2019-2021. It focussed on (i) implementing a shared monitoring network for a coordinated regional and transnational assessment of underwater noise, (ii) evaluating the noise impact on marine biological resources and (iii) developing and implementing a planning tool for straightforward management. Although Albania was not participating, it can definitely learn a lot from and start building on the erected monitoring network of its neighbour countries as well as from the findings obtained in the scientific studies.

## 9. Conclusion & Challenges

### 9.1. Challenges

Due to the absence of fisheries research and monitoring programs in the past, few data was available to assess the situation in Albanian waters. However, data of other fisheries in the Adriatic Sea allowed for an environmental impact assessment (Table 7) revealing several concerns:

- Biodiversity (D1): Fishing removes a considerable biomass of fish from the ecosystem, both target species as well as unwanted by-catch. Incidental catch of ETP species is part of the unwanted bycatch in Albanian fisheries (see 5.4). Data which would allow assessing the magnitude of these impacts at population level is lacking. D1 is consequently evaluated as at high risk. Since the Albanian contribution to the landings in the Mediterranean is relatively low, the Albanian impact is assessed as medium despite its high bycatches.
- Invasive species (D2): The presence of non-indigenous species is a problem in the area and there is a high risk not to meet D2. Since Albania's fishing fleet does not operate outside of the Adriatic or Ionic sea, their fishery won't act as a vector for non-indigenous species and the Albanian impact is low.
- Stock status (D3): almost all available relevant stock assessments show stocks are fished outside biologically sustainable limits, pointing at a high risk. Albanian fisheries are evaluated to have a medium impact, due to relatively low Albanian contribution to the landings in the Mediterranean, however with high (undersized) bycatch and discards. Discards represent a major source of uncertainty in the actual fishing mortality rates of several commercial stocks. A better management, control and enforcement is warranted to achieve MSY.
- Food web (D4): Albanian fishery will have an impact on the food web but better monitoring is needed to correctly assess and minimize this.
- Sea floor integrity (D6): Fisheries with bottom contacting gears create a relative high seafloor disturbance, which warrants attention. However, the Albanian fishery is mainly fishing on soft sediments and will not change those habitat types. The major habitat of concern in the region are seagrass fields at the nearby coast, which can decline due to fishery. But as far as reported, the Albanian fishery is not active in those areas and some seagrass areas are included in an MPA. Improving the monitoring of the fishing activities (e.g. VMS data) is needed to better evaluate this criterion.
- Pollution (D8): The lack of data and thresholds makes it impossible to assess the relative share of the fishing vessels compared to other fleets and land-based pollution.
- Food safety (D9): Overall, no major significant concerns or extreme high levels were observed so far in the Mediterranean Sea, although the number of research studies on this topic is still limited.
- Marine litter & pollution (D10): Marine litter is a significant issue in the Adriatic sea warranting regional solutions and more information to be fully understood. This is definitely not an Albania-specific issue and further research on this topic is a regional and even world-wide challenge.
- Introduction of energy (D11): Albanian fishery will contribute to the background noise but Albania has no useful dataset on this topic, making it impossible to evaluate the impact of their fishery, let alone isolate it from other important contributors such as maritime traffic. This is not a challenge specific to Albania.

These issues are characteristic for the entire Adriatic Sea, and Mediterranean as a whole. However, Albania is running behind when it comes to quantifying these topics and does currently not have the capacity to fully implement the Common Fishery Policy. Despite the significant efforts made in recent years, the knowledge of the Albanian marine fishery, its impact and the targeted stocks is still fairly limited. Therefore, the first and foremost important step is to develop the scientific,

management and enforcement capacity to ensure appropriate management of fish resources and minimize the fishery impact:

- A scientific department with sufficient trained experts, monitoring capacity and research facilities to collect data and increase knowledge on stocks to support advice and improve future regulations and international collaboration.
- An overarching fishery administration to design, implement and monitor the relevant policy measures and regulations and handle the administration.
- Adequate enforcement: control of VMS, cross check of ERS data & landings, patrol vessels on-sea control,...

Although this is an ambitious task, reducing the current overexploitation of fish stocks should improve profitability and sustainability in the long term. Additionally, transparent and efficient administrative structures will generate more trust among fishermen but also between fishermen and the government. Indeed, a cooperative scientific department could lead to cross pollination of knowledge and experience with (small scale) fishermen and further alignment of interests, such as illegal fishery and pollution.

Besides, the age of the fishing fleet also warrants attention and will require significant investments in the years to come. Indeed, the majority of the industrial vessels is over 40 years old, which implies high costs of maintenance and makes it difficult for the Albanian vessels to be competitive with surrounding countries in terms of the quality and safety of the working environment of the crew. The outdated infrastructure and the limited framework to guarantee quality also affects the market price and possibilities for the landed fish. This seems particularly true for the shellfish production which can no longer be exported to the EU due to a sanitary ban. From an economic standpoint, outlining the needs and provide the framework and resources to close this gap with surrounding EU countries should be a high priority for the Albanian government, as this would significantly grow export possibilities and help creating an environment in which fishermen feel confident to invest in the future.

Last, the government and fishery department will have to focus on a good understanding of and with the fishermen, both industrial and artisanal. Seen the fairly limited management and enforcement Albanian fishermen have known over the last decades, the increase in rules and enforcement, the decline in permitted landings, ... may feel as a threat. Clear communication can help clarifying the larger framework and explaining the necessity and long term benefits of conservation measures, safety or quality measures, use of certain fishing gears... Additionally, education can professionalize the work and safety on board and open possibilities for innovation. However, this is not a one-directional process. There is a lot scientists or fishery bureaucrats can learn from fishermen and mutual sharing of expertise will help build trust, align interests and optimise future regulation.

### 9.2. Conclusion

Albania has already taken several steps in its process to implement the Common Fisheries Policy (CFP), but still has some challenges to tackle. Although the Albanian fishery is no heavyweight in the Mediterranean, it operates in a region where the human pressure on the environment is already very high, stressing the importance of this process. The main task is therefore to build a coherent framework able to monitor fish stocks and fishing effort, use the available information to design and manage adequate policies and enforce compliance. To realise these objectives, Albania will need to continue to grow its fisheries research and administration capacity, as well as support the modernization of its fishing fleet and infrastructures.

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# Annex: meeting log and data collection process

| Date | Activity | Input | Attendees |
|---|---|---|---|
| May 2020 - | mails | Administration and approach | |
| 26 June 2020 | Online meeting | Discuss approach, data needed and administration | Massimo Gacci, Alberico Simioli, Luccio Trifiletti, Heleen Lenoir, Gert Van Hoey, Hans Polet |
| 19 October 2021 | Online meeting | Discuss data collection process | Arian Palluqi, Tom Miraku, Massimo Gacci, Luccio Trifiletti, Heleen Lenoir |
| 29 October | First data input from Albanian experts mailed to ILVO | First available data on Albanian fishery (fishery description) | |
| 9 November – 14u00 | Online meeting | Up to Albanian experts. We discussed the data send | Arian, Tom and Heleen |
| 26 November – 10u00 | Online meeting | Up to Albanian experts. We discussed the data send | Arian, Tom and Heleen |
| 7 December – 13u00 | Online meeting | Up to Albanian experts. We discussed the data send | Arian, Tom and Heleen |
| 21 December – 10u00 | Online meeting | All possible data. We discussed the data send | Arian, Tom, Heleen and Gert |
| 23 December | Deadline data collection Albanian experts | All possible data. OK | |
| January - February | Time for ILVO to analyse the data and write a report | | |
| End of February | Target deadline ILVO report | ILVO report: Fisheries Impact Assessment Albania | |
| End of April | End of project | | |

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