Socio-economic effects deriving from actual management measures of the fish-related activities (Small pelagic species report)

Deliverable Number D.3.3.1

European Regional Development Fund

www.italy-croatia.eu/argos

Project Acronym	ARGOS
Project ID Number	10255153
Project Title	Shared Governance of Sustainable Fisheries and Aquaculture Activities as Leverage to Protect Marine Resources in the Adriatic Sea
Priority Axis	3 - Environment and cultural heritage
Specific objective	3.2 - Contribute to protect and restore biodiversity
Work Package Number	WP3
Work Package Title	Governance framework
Activity Number	3.3
Activity Title	Assessment of interactions between environmental management and socio- economic effects
Partner in Charge	PP12 CNR IRBIM
Partners involved	PP12 – PP13
URL	https://www.italy-croatia.eu/web/argos
Status	Final version
Distribution	Public
Date	June 2023

Report	Socio-economic effects deriving from actual management measures of the fish-related activities (Small pelagic species report)
Description	Assessment report for small pelagic Adriatic stocks concerning the socio-economic effects deriving from actual management measures of the fish-related activities.
Version	V.1
Author	PP12 – PP13

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Executive summary

WP3 has the aim of setting a common governance framework for the Adriatic institutions dealing with fishing and aquaculture and partners of the ARGOS project. The ultimate object of WP3 is to create an organism able to express scientific advice about the protection and the management of the shared resources. The framework for governance is thus structured by 2 strictly-linked organisms: 1) the AAC (Adriatic Advisory Committee), coordinated by WP responsible and composed by 1 scientific representative delegated by each partner and 4 representatives, 2 from fishery and 2 from aquaculture associations of operators, respectively for Italy and Croatia; 2) the Steering Committee (SC), given its authoritative role and due to the high supervision role taken by the 2 Ministries for fisheries (Associated Partners), approves and puts into effect the proposals/recommendations from the AAC. In a such well-defined and coordinated process for governance, the AAC manages all technical-scientific topics, finally established by the SC. Such harmonized process for the governance will in future promote coordinated interventions and management measures on the Adriatic partnership area, provide addresses for shared schemes for the reduction of human pressures and the promotion of sustainable management of fisheries, both at environmental and socio-economic levels, in the framework of the Common Fishery Policy (CFP) and Water Framework Directive.

This specific task is oriented to forecast the economic and biological effects deriving from the adoption of actual management measures (i.e. control of the fishing effort) and plans, both in the fisheries and fish-related chains.

First of all, current compulsory management measures will be described, then possible different effects will be analyzed through the bibliography and DISPLACE model's projections and scenarios.

The target is to deeply analyze both the conservation of target fish stocks and the vitality of the Adriatic fisheries sector and coastal communities, to firstly agree (AAC) and then put into effect (SC) possible integrative/alternative management measures (see also Act. 3.4), able to achieve the principles of both environmental and socio-economic sustainability.

The report will include the assessment for both pelagic and demersal Adriatic stocks concerning the socio-economic effects deriving from actual management measures of the fish-related activities.

The report is elaborated assessing different regulative scenarios at different time stages (short, mid and long term), where the baseline is the current situation (business as usual). The consequences on the economy of communities and pressures on the environment linked to fisheries and aquaculture will be studied in both reports.

MANAGEMENT SCENARIO: *Status quo*

European and national fisheries policies are aimed at restoring sustainable exploitation of fisheries resources, guaranteeing economic and social sustainability in the medium to long term for fishing activities (Article 2 EU Reg. 1380/2013).

Improved management of fisheries requires not only an understanding of the axioms and working assumptions underlying the current approaches and how these evolved in response to regional or local conditions and target species, but should also promote the integration of methodologies that better reflect local situations and can be expressed in the form of one or more working paradigms (Caddy, 1999).

In Italy, the history of management of fishing activities started at the beginning of the 80s. Law 41/82 laid the foundations for a management system based on the **fishing effort** control; in fact, given the intrinsic characteristics of Italian and, more generally, Mediterranean fisheries, the management system based on the control of fishing effort was considered the most appropriate for many years. However, in light of the current state of demersal resources, the management of effort based on input measures did not give rise to the expected results (Colloca et al., 2017) and it was questioned in favor of the inclusion also in the Mediterranean of output-based management measures, such as catch quotas (Cardinale et al., 2017).

Fishing effort management was implemented through fishing capacity control e of the activity of fishing vessels. The two key tools on which fishing capacity control is based are: (a) fishing licenses, only a regular license issued by the public administration authorize to professionally exploit fish resources (Law 41/1982); (b) Fishing capacity may not exceed the established limits by the Common Fisheries Policy (PCP) (Annex II Reg. EU 1380/2013) which for Italy is 173,506 GT and 1,070,028 kW. The entry and exit of fishing vessels from the fleet must be managed in such a way that the entry of a new capacity into the fleet is offset by the preliminary withdrawal of at least identical capacity.

The maximum engine power of bottom trawlers in Croatia is limited to 184 kW in major part of inner fishing sea (except in certain parts of the Northern Adriatic channels, where the limit is 110 kW), while in the outer fishing sea it is limited to 662 kW.

In addition to control measures based on restrictions on fishing capacity, they are being implemented various **technical measures** introduced by Reg. EU 1967/2006 amended by Reg. EU 1241/2019.

Technical measures, in general, aim to control various aspects of fishing operations, ranging from gear restrictions to bycatch limits and closed areas. They represent an important toolbox in the management policy of many fisheries around the world, including Europe. One of the main reasons for imposing technical measures, particularly those related to gear restrictions, has been to create conditions that minimize the capture of juveniles of commercially important species or incidental catches of non-target species (Suuronen & Sardà, 2007).

The Mediterranean Regulation, in addition, providing a series of technical measures, has introduced the **Management Plans** (Article 19) that the Member States of the Mediterranean are required to adopt for some fishing activities in territorial waters. The goal of the European Commission was to introduce an approach to fisheries management based on a decentralized decision-making process and the creation of multi-annual management plans at the national and community level capable of combining effort management with specific technical measures. Starting from 2011 and until 2019, four separate management plans entered into force in GSA 17 and 18, two for bottom trawling and two for others for fishing systems called "other systems" that exploit demersal species, mainly gillnets. From 2013 GFCM issued yearly recommendations (n. 37-42) specifically directed to small pelagic fisheries to implement a multiannual plan for the management and conservation of these stocks in the whole Adriatic basin.

The most important regulation measures in Croatia are temporal and spatial bottom trawl fishing restrictions (temporary or permanent prohibition in certain areas). This is a complex system created as a consequence of long-lasting evolution process in balancing exploitation needs with necessity for the protection of demersal resources. Basis for management of bottom trawl fishery in Republic of Croatia is national management plan for bottom trawling in territorial waters (hereinafter: MP). MP consists comprehensive overview of bottom trawl fishery in Croatia with detailed information on fleet capacity and activity. It also brings overview of catch dynamics and compositions, complemented with scientific results from

monitoring, on-board sampling and specific surveys'. MP also brings economic analysis based on the best available data at that time.

MP foresees the implementation of a complex spatial management framework of bottom trawling, particular in the channel areas. This framework has been in force for over two decades (with some amendments over time) and proves to be effective in terms of resource management. This can be seen in quantitative distribution of target species in terms of abundance and biomass, which shows that status of targeted species is much better in the inner and territorial waters than in the area outside territorial waters. This framework includes spatial and temporal rules for closure of specific areas but also limitation in terms of fleet capacity where only vessels with certain power are allowed to operate in inner sea.

MP also foresees number of actions to be taken in order to achieve sustainable level of exploitation. One of the most important ones introduced by the MP is the authorisation process, which implies issuing of special permits in addition to the existing licenses. . This process limited fleet capacity and thus prevented the increase of both fishing effort and capacity. This process at the end resulted with the reduction of the total number of vessels authorised to use bottom trawl from 599 in 2013 to 351 in 2021.

MP also provided basis for temporal and permanent cessation of fishing activities which has been in place in the past period.

All measures arising from the MP have been implemented based on the provision of the Marine Fisheries Act and through the Ordinance on commercial fishing with bottom trawl (OG 102/17, 74/18 and 20/19), Ordinance on temporal and spatial limitations for commercial fishing with bottom trawl (adopted on annual basis) and Ordinance on the issue an authorisation for commercial fishing with bottom trawl with a validity period until 30 June 2022 (OG 107/20).

A third set of management measures in the Mediterranean Sea incorporate the establishment of permanent **marine protected areas** (MPAs). However, the extension of MPAs is still rather limited in the Mediterranean Sea, covering around 9.5% of the EU water within 200 nautical miles (NM) and being mostly located in the Western Mediterranean (European Environment Agency, 2021).

1. Fishing effort

1.1 Effort regime

The main technical management measure identified is the regulation of the fishing effort through a progressive reduction in fleet capacity or fishing days; plus to the period of the fishing ban, additional days of arrest are foreseen, the number of which varies according to the GSA and the LOA.

All vessels fishing actively for small pelagic stocks in the Mediterranean Sea, independently from length overall (LOA) and fishing area, can fish only for 20 days in a month (average) and can not exceed 180 fishing days in one year. In addition, there is a maximum of 144 days of fishing for sardines and/or for anchovies.

Moreover, two additional restrictions are imposed based on the fishing technique: Purse seine activity is forbidden from 5 pm on Friday to 5 pm on Sunday or, in alternative from 5 pm on Saturday to 5 pm on Monday; while Midwater pair trawl activity is prohibited from 00 on Saturday to 00 on Monday.

For Croatia, additionally, in 2019 from 15th of February to 28th of February each vessel was limited to a maximum of 5 fishing days and a maximum total catch limit of 35 tonnes per vessel. In 2020 and 2021 in period 15th February – 28 th (29 th) February total allowed catch per vessel was 40 tonnes with no additional restrictions with regards to number of fishing days during that period.

1.2 Fishing ban

In Italian waters, temporal closure regarding bottom and midwater trawl fleets are mainly enforced for 30-45 days, mostly during the summer season, when the majority of the stocks recruits in coastal areas where juveniles tend to aggregate (Grati et al., 2018). In general, the closure depends not only on the target species but also on the maritime compartment. In fact, for the small pelagic fishery, two fishing bans per year are expected: one in autumn/winter for sardine and another one in spring/summer for anchovy. These closures last 30 days each and they are programmed at different times depending on harbors and fishing gears (D.M. 17821/2017, DM 17562/2018, D.M. 406/2019, DM 53/2019, D. Dir. 9140286/2020).

In Croatia, small pelagic fleets is subject to a period of fishing closure for sardine from 1st of January to 15th of February. Targeting the spawning period of anchovy in 2019-2021 temporal closure for entire small pelagic fleet was implemented in period from 1 to 30 of May. In numerous parts of Croatian waters trawl fishing is prohibited in certain part of the year or of the week.

2. Technical measures

2.1 Spatial restrictions

In general, in the whole Italian waters, the use of towed gears is prohibited within 3 NM from the coast or within the isobath of 50 m when such depth is reached at a shorter distance from the coast. Moreover, both in Italian and Croatian waters, all fisheries are forbidden on *Posidonia oceanica* meadows and all the seagrasses species, as well as coralligenous habitats and maerl. In Croatia, any fishing activity is also forbidden inside of 3 marine national parks (315 km2), disposal sites for explosives (266 km2) and in other sensitive areas (ichthyologic reserves, nature parks, etc).

Fishing vessels targeting small pelagic stocks are forbidden to fish within 6 NM from the Italian coast (from Monfalcone to Gallipoli compartment) in the second part of the year (From June in 2019, May in 2020, April in 2021 up to December). Vessels shorter than 15 meters of LOA and authorized by the local Maritime Authority are allowed to fish from 4 NM from the coastline.

Since 2016 Croatia is implementing spatio - temporal regulation. In 2019 more than 50% of inner water was closed for the period of 7 months area for entire fleet above 12m. For 2020 period of spatio-temporal closure for the same fleet in inner sea was 8 months while in 2021 period of closure was over 9 months.

„ZTB: Zone di Tutela Biologica“

In addition to the specific spatial interdictions for each fishery, between GSA17 and GSA18, in Italian waters, there are 6 biological conservation areas called „ZTB: Zone di Tutela Biologica“. ZTBs are areas of the open sea, geographically and legally defined and regulated. They are established by the Ministry of Agricultural, Food and Forestry Policies, to safeguard and repopulate marine resources concerning the need to have a constant

presence of resources for better economic management of fishing. The regulation of these areas has considerable flexibility: it can limit the use of one or more fishing gear or set particular technical characteristics for the gear, place limitations for a period of a few months a year or the whole year; it is an instrument conceived for the management of the biological resources object of fishing and its use is foreseen also in some management plans.

Table 1: ZTB's management details (fishing gears are described using International Standard Statistical Classification of Fishing Gear).

ZTB Name	Restricted fisheries
Miramare	OTB and DRB
Tenue Chioggia	OTB, TBB, PS, PTM (GNS&GTR allowed only in some zones)
Porto Falconera-Caorle	OTB, TBB, PS, PTM and SSF (all)
Fuori Ravenna	OTB, TBB, PS, PTM
Barbare	OTB, TBB, PTM
Area Tremiti	OTB and PTM from 1 November to 31 March

Temporary spatio-temporal regime in Croatian territorial waters

Croatian fishing sea consists of three parts: inner fishing sea with an area of 12,461 km2, encompassing inner sea from coastland to the baseline, and outer sea consisting of territorial sea within 12 NM off the baseline (area of 19,267 km2) and exclusive economic zone–IGP/EEZ (area of about 25,000 km2). Inner fishing sea is divided into three fishing zones (E, F and G), territorial sea into four fishing zones (A, B, C and D) and EEZ into four fishing zones (H, I, J and K). According to the existing regulations, trawl fishing is permanently prohibited in approximately 30% of the territorial sea of Croatia, with additional 10% of the area prohibited for bottom trawling between 100 and 300 days annually.

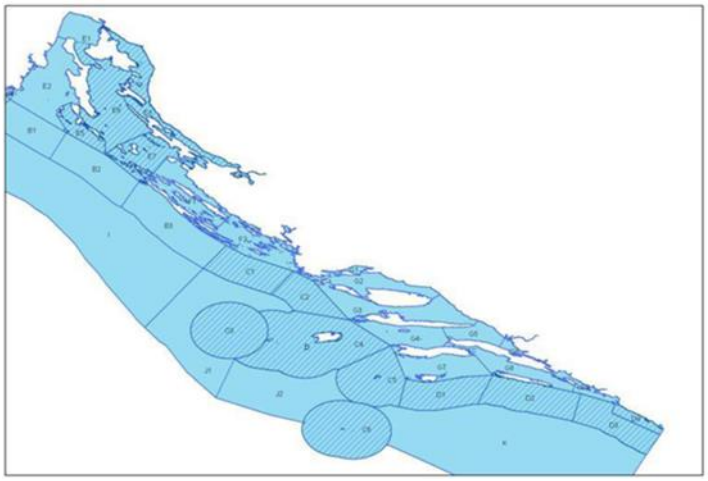


Figure 1: Map of fishing zones in the Republic of Croatia

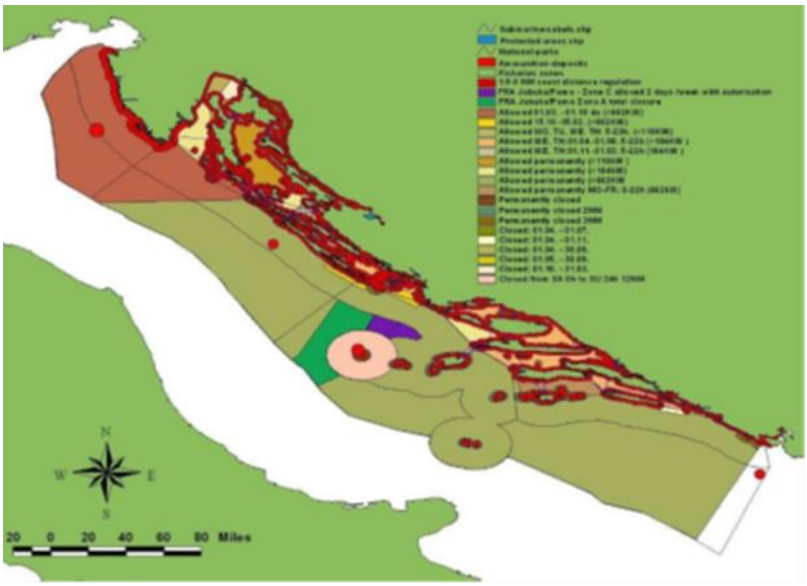


Figure 2: Map of permanent spatio-temporal fisheries regulation scheme in the Republic of Croatia for bottom trawl (including FRA Jabuka/Pomo Pit)

Fishery restricted areas (FRAs)

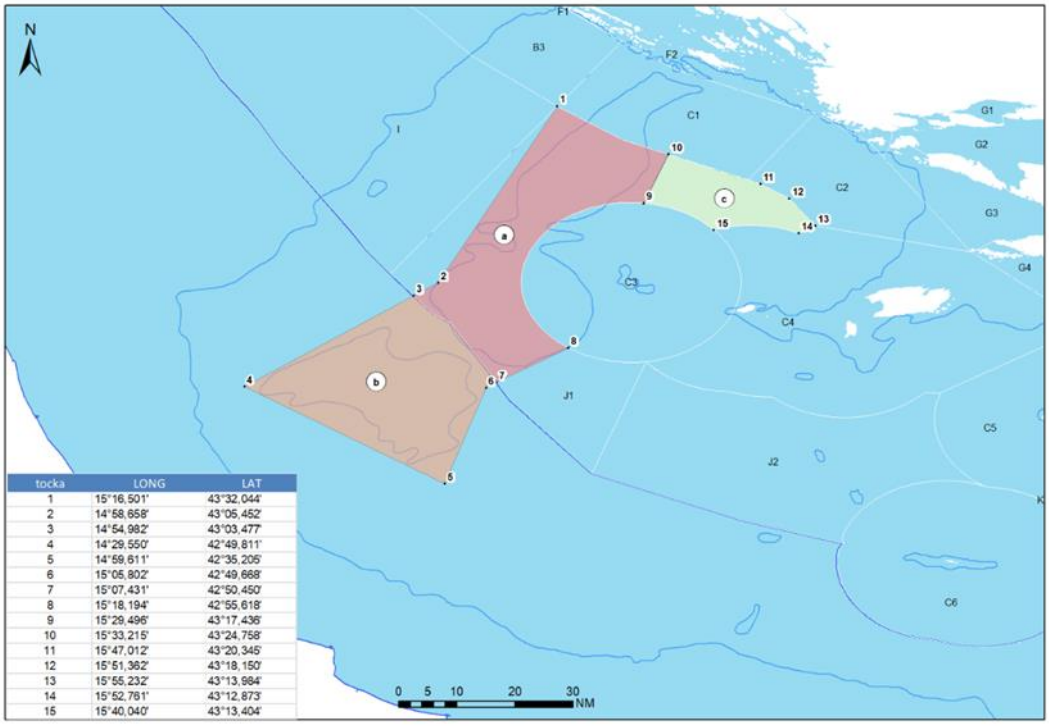
In 2017, it was established the first Fishery Restricted Area (FRA) in the Adriatic Sea managed by two countries, Italy and Croatia.

At the beginning, in 2015, the area was established as ZTB, and an Italian Ministerial Decree was issued prohibiting trawling carried out with bottom otter, rapido and twin divergent nets. In 2016 trawling was again allowed in the area, only for vessels equipped with Vessel Monitoring System (VMS). In the Ministerial Decree of 19 October 2016, any form of fishing

was prohibited in the northern area, starting from 1 May 2017; with Ministerial Decree n. 466 of 1 June 2017, the area was expanded. In 2017 the European Commission, implementing Recommendation 41/2017/3 of the General Fisheries Commission for the Mediterranean (GFCM), transformed this area into a Fishery Restricted Area (FRA).

Actually, the FRA consists of three areas: i) zone A is forbidden to any professional and recreational fishing activity, ii) zone B has been subject to a temporary stop of fishing from 1 September to October 31 of each year, while in the other months, fishing is allowed no more than two days per week to the vessels specifically authorized by the Member States by virtue of historical use of the area and iii) zone C is subject to a temporary fishing ban from 1 September to 31 October of every year, while in the other months fishing is allowed to the authorized vessels only.

The 44° Commission of GFCM proposed the creation of another FRA, that is the area named „Bari Canyon“. This area is located in the southern Adriatic Sea (GSA 18), 40 km off the city of Bari (Italy) and 100 km south of the Gargano National Park, in the Puglia Region. This zone represents both a Vulnerable Marine Ecosystems (VME) and an Essential Fish Habitats (EFH) for the recovery of fish stocks and to sustain human activities, especially fishery.



tocka	LONG	LAT
1	15°16,501'	43°32,044'
2	14°58,658'	43°05,452'
3	14°54,982'	43°03,477'
4	14°29,550'	42°49,811'
5	14°59,611'	42°35,205'
6	15°05,802'	42°49,668'
7	15°07,431'	42°50,450'
8	15°18,194'	42°55,618'
9	15°29,496'	43°17,436'
10	15°33,215'	43°24,758'
11	15°47,012'	43°20,345'
12	15°51,362'	43°18,150'
13	15°55,232'	43°13,984'
14	15°52,761'	43°12,873'
15	15°40,040'	43°13,404'

Figure 4: FRA Area in the Jabuka/Pomo Pit

2.2 Gear restrictions: Minimum Mesh Size (MMS) and gear configuration

Gear modification to improve selectivity through a variety of sorting devices has been proven to reduce by-catch and discard rates. Many prescriptions and restrictions have been introduced through legislation, and some devices are being used voluntarily.

Based on Reg. Eu. 1967/2006 the minimum mesh size is 20 mm for pelagic trawlers and 14 mm for purse seiners.

2.3 Minimum conservation reference size (MCRS)

In 2006 it was approved for the first time the regulation regarding the introduction of the Minimum Landing Size (MLS) for some species listed in Annex III Reg. EU 1967/2006. MLS is the smallest fish measurement at which it is legal to keep or sell a fish; it is strongly dependent on the fish species. The idea behind this limitation was that only the older, mature fish get taken, leaving juveniles behind to continue breeding and propagating their species. This regulation was modified over the years, until reaching Regulation EU 1241/2019 which substituted MLS with Minimum Conservation Reference Size (MCRS). The principle at its basis is exactly the same and the reference measure for fish species in the Mediterranean Sea are reported in Annex IX. Here, in Table 2, are reported the most important, in terms of landing and economic value, Adriatic commercial species having MCRS.

Table 2: Main Adriatic commercial species with their MCRS.

Species	MCRS
European anchovy (*Engraulis encrasicolus*)	9 cm
Hake (*Merluccius merluccius*)	20 cm
Red mullets (*Mullus* spp.)	11 cm
European sardine (*Sardina pilchardus*)	11 cm
Mackerel (*Scomber* spp.)	18 cm
Common sole (*Solea solea*)	20 cm
Deepwater rose shrimp (*Parapenaeus longirostris*)	20 mm CL

Scallop (*Pecten jacobeus*)	10 cm
Norway lobster (*Nephrops norvegicus*)	20 mm CL

2.4 Landing Obligation (LO)

The Landing Obligation (LO) introduced in 2015 has been fully in force since January 2019. Its goal is to eliminate discards by encouraging fishers to fish more selectively and to avoid unwanted catches. Rules related to the landing obligation stipulate that:

- all catches of species regulated through catch limits or MCRS should be landed and counted against the fishers' quotas;
- undersized fish caught and landed should not be used (sold) for direct human consumption, but for products such as pet food, fish meal, pharmaceuticals, and food supplements;
- producer organizations have to help their members find adequate outlets for undersized catches, without promoting the creation of a market for them;
- EU countries also must assist fishers by facilitating the storage of undersized fish and finding possible outlets.

2.5 Catch limit

In most European fisheries, fishing possibilities are linked to stock status with output limits through total allowable catches (TACs) (Sánchez Lizaso et al., 2020). Output limits are flexible and may adapt fishing mortalities to stock status but they may be ineffective due to several reasons, mainly insufficient enforcement and discard of marketable fish in mixed fisheries

From 2019, and for the next 2 years, the small pelagic fishery in the Adriatic Sea (GSA 17 and 18) has to not exceed the catches exercised in 2014, as established in Annex IL of EU

Council Regulation 1241/2019. In addition, a progressive reduction of 5% of catches was applied yearly.

MANAGEMENT EFFECTS

In general, the results from STECF (2021) suggest that the largest improvements in yield and juvenile protection can be made through optimizing the gear selectivity of bottom trawl gears, allocating less effort to fish with those gears, or shifting the effort to areas/season where the impacts on juveniles can be minimized. However, is fairly still not possible to fully evaluate the impact of the new technical Regulation, because it had only been in force for a bit more than 2 years (since August 2019).

3. Fishing effort

North-East Atlantic and the Mediterranean Sea fisheries are governed by the European Common Fisheries Policy (CFP). Although both areas are managed under the same broad fishery management system, a large discrepancy in management performance occurs, with the recent considerable improvement of stock status witnessed in the North-East Atlantic and a rapidly deteriorating situation in the Mediterranean Sea (Cardinale et al., 2017). Here, there is no apparent relationship between nominal effort and fishing mortality for all species; fishing mortality (F) has remained stable during the last decade, for most species, even if nominal effort decreased. Also, the current F is larger or much larger than the reference point (F_{MSY}) for all species. According to the recent GFCM stock assessments in the recent years it is clear decrease in F for majority of demersal species, as well ase increase in the SSB. Despite catch advice being produced by STECF each year, the realized catches have usually been much larger than the scientific advice.

4. Technical measures

4.1 Spatial restrictions

The advantages of the application of spatial restrictions, such as FRAs, have been demonstrated by the closure of the Pomo/Jabula pit. This area represents a successful example of efficient spatial planning and international cooperation, that has involved both the Italian and Croatian administrations, but also the relevant stakeholders, thus ensuring ownership of those involved and proper implementation of the measures.

Moreover, the scientific surveys carried out within the Pomo/Jabuka pits reported higher catches and bigger individuals, this is particularly true for hake and Norway lobster, which are the species for which this are is of relevant importance. Also, the hake stock assessment presents a continuous increasing trend in spawning stock biomass (SSB) in the most recent years; this is also shown, together with an increase of recruitment, by the preliminary assessment of Norway lobster presented at the last GFCM (GFCM, 2022).

4.2 Gear restrictions: Minimum Mesh Size (MMS) and gear configuration

In most countries bordering the Mediterranean, the present legal MMS in demersal trawl codend is 40 mm, which does not allow the effective escape of undersized fish (Bahamo´n et al., 2006). Experiments suggest that selectivity can be substantially improved by relatively

simple modifications such as square-mesh codend with a proper mesh size or sorting-grid installations with appropriate bar spacing. Otter bottom trawl (OTB) selectivity, above all, has negative effects in terms of yield loss when compared to the status quo selectivity of all fleets combined (STECF, 2021). The mixed-fisheries multi-gear examples, like the Adriatic one, are known to have higher complexity in improving selection patterns. Possible solutions differ case-by-case and include a combination of gear-based and spatial/temporal measures and reductions in fishing effort. Making these changes is politically, culturally, and economically difficult, and a collaborative approach with stakeholders is essential.

In general, any improvement in selectivity will (in the long term) most strongly benefit stocks characterized by greater growth overfishing, which are typically large-bodied and late-maturing (e.g., hake stock), while small-bodied and fast-growing species, have less to benefit in terms of yield. In some cases, increased selectivity for these species would lead to decreasing yield, but it would always result in larger SSB. In addition, a selectivity improvement that achieves a higher protection of juveniles of any stock often produces a higher increase in long-term yield. However, any long-term increase in yield linked to a change in selectivity will imply, in general, a short-term loss in yield, but this short-term loss is generally similar to the short-term loss that would result from reducing current F to the F levels in accordance with the scientific advice under current selectivity. Those short-term losses will be more than compensated by the long-term gains (STECF, 2021).

4.3 Minimum conservation reference size (MCRS)

The appropriate match between MMS and MCRS is a particular problem in multispecies fisheries like the Adriatic ones, because the MCRS regulations in those fisheries often generate discard problems, rather than helping to resolve them. MCRS regulations may work better with passive gears, because size selectivity is better and fish released are often in a better condition after the capture process than fish discarded from active gears (Suuronen & Sardà, 2007). In general, in fact, active gears perform worse in terms of juvenile catches and SSB.

4.4 Landing obbligation (LO)

In addition, under the LO (CFP, 2013), all catches of species which are subject to catch limits, and in the Mediterranean, species subject to minimum sizes, shall be brought and retained on board the fishing vessels, recorded, landed and counted against the quotas where applicable, except when used as live bait. As landings of species below MCRS cannot be used for direct human consumption, such landings should be stored, handled and recorded separately. However, large amounts of discards are still permitted thanks to the implementation of a vast number of exemptions from the LO. However, based on the EUMOFA (2020) report, all landings of catches above MCRS, both of targeted species and bycatch, are sold. As a result, bycatch above MCRS are not possible to identify in the data. The available data on landings of unwanted catches is incomplete and incomparable between EU Member States and it is very hard to evalute the efficiency of this kind of Management measure.

CONCLUSION

This report underlines the various management measures taking place in the Adriatic Sea over the years and for the different fishery. Also, the continuous revisions of these regulations and the introduction of new ones make difficult to understand which measures were most effective (Suuronen & Sardà, 2007).

Mediterranean sea is generally managed through fishing effort reduction, however this type of management seems not to directly improve the status of fishery resources (Cardinale et al., 2017). Other possible technical measures that could complement the fishing time reduction are the implementation of permanent and seasonal closures, selectivity improvements and local co-management plans (Sánchez Lizaso et al., 2020). In many cases, a decrease in F combined with increased selectivity is needed to see large changes in SSB. However, an increase in SSB has a multitude of positive effects, both for the fisheries through an increase in CPUE and average individual size of the fish caught, for the stock as it increases its resilience to climate change and for the ecosystem as larger biomass and size diversity in general increase ecosystem functionality, resilience and services.

Although overall exploitation patterns may be improved, gear modifications generally make net construction more expensive, and modified gears are often more difficult to operate and maintain. In mixed-fishery situations, technical measures are often compromises that tend to increase short-term costs for the industry, through short-term losses, re-designing of vessels and/or equipment costs. Although, this may cause reluctance among fishers to commit to such regulations, the short-term economic losses associated with selective fishing gears are a more important concern from the fishers' point of view (Suuronen & Sardà, 2007), and it could correspond in stakeholdes being not prone to these changes.

Another concern related to technical measures is that gear-related conservation measures are based traditionally on the assumption that fish escaping from fishing gears survive and live on to support the exploited population. For many commercially important fish species, there are currently no reliable estimates of post-capture survival, but the information collected indicates that escape-induced mortality may not always be negligible.

However, any improvement in the stock situation depends ultimately on enforcement, and compliance with existing rules has to improve dramatically.

In conclusion, simultaneously increasing the selectivity and decreasing F would demand smaller changes compared to only manipulating only one parameter. This may increase the incentive (or rather decrease the disincentive) for change.

From the DISPLACE model results, the projection over 10 years of the effect of the management measures actually in place on the stock status of small pelagic resources, gave the same perspective for the different species considered. Both European anchovy and Sardine abundance trends are estimated as increasing quite immediately.

It has to be underlined that given the time dedicated to the parametrization of the DISPLACE model, and the powerful effect of climate changes not taken into account in these simulations but strongly affecting, make these results not completely reliable.

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