

MANAGEMENT OF LIVING MARINE RESOURCES

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The Mediterranean region is one of the most populous regions in the world. It is made up of more than twenty countries representing varying stages of economic development and diverse political systems. Despite the diversity of the region, these countries are united by their reliance on the Mediterranean Sea and their shared interest in the exploitation of its living marine resources.

The Mediterranean Sea is home to more than 694 described species of marine vertebrates, of which over 500 are recorded species of fish; 363 of these fish species are living marine resources that are targeted by fisheries. It is this incredible diversity that has drawn fishermen to this region for millennia. Indeed, fishing activities in the Mediterranean have been evolving and expanding continuously since the Upper Palaeolithic period, over 40,000 years ago (Van Neer *et al.*, 2005), leaving an indelible imprint on the socio-economic and cultural fabric of this region.

However, anthropogenic activity has had an important impact on the biodiversity of the Mediterranean region's coastal and wetland ecosystems. Pollution from atmospheric and land-based sources has taken a toll on the marine environment. Furthermore, overfishing and fishing methods result in an abundance of bycatch and discards. Moreover, illegal, unreported and unregulated (IUU) fishing has led to inefficient and wasteful exploitation of marine resources and pernicious effects on the status of fish stocks.

To address such threats, sustainable governance of the Mediterranean Sea requires the coordination of a large number of countries and the alignment of diverse environmental and economic development interests. This chapter discusses such governance efforts, focusing in particular on management measures to improve the health of Mediterranean fisheries and to reduce wasteful activities. Firstly, this chapter

describes the characteristics of Mediterranean fisheries, outlining the principal management challenges contributing to inefficient and wasteful exploitation of living marine resources. The review of tangible actions conducted to address these challenges at both regional international levels and that of management measures and legal frameworks that are currently in force will enable discussions on current challenges and suggestions for future action.

Characteristics and principal challenges of fishing activity

This chapter will specifically focus on the impact of fishing activity on the Mediterranean marine environment, the steps that have been taken to improve the management of these resources and the challenges that remain. A summary of the main characteristics of Mediterranean fisheries and their management is provided here below. Further discussion and analysis of Mediterranean fisheries can be found in the GFCM's report *The State of Mediterranean and Black Sea Fisheries* (SOMFI) (FAO, 2016), as well as in key publications of the CIHEAM (CIHEAM, 2014; Oliver, 2002; Basurco, 2008).

The marine environment

The Mediterranean Sea is a rich and diverse environment, characterised by its temperate climate, its deep blue colour, and its numerous important ecosystems. Despite representing only 0.8% of the surface area and less than 0.25% of the volume of the world's oceans, approximately 7% of the world's known marine fauna and 18% of the world's known marine flora can be found in the Mediterranean, 28% of which are endemic to the region (Oliver, 2002; FAO, 2011). In order to recognise and protect this diversity, the International Union for Conservation of Nature (IUCN) has designated the Mediterranean as a global biodiversity hotspot (Cuttelod *et al.*, 2008; Bazairi *et al.*, 2010).

Unfortunately, this biodiversity hotspot faces numerous threats. In particular, uncontrolled development, urbanisation, land-based pollutants, and atmospheric pollutants threaten the health of Mediterranean ecosystems. Eutrophication, resulting from land-based and atmospheric pollution, has had a particularly negative impact on Mediterranean fisheries (Caddy, 1993), and in particular, increased incidents of toxic blooms have been reported, with blooms of phytoplankton and benthic diatoms resulting in local fish mortality due to anoxia (UNEP and FAO, 1990). The negative impacts of pollution on fisheries are further compounded by overfishing and other detrimental fishing activity that exacerbate the adverse impacts on fish stocks.

Attempts have been made to curb these negative impacts. The Global Environment Facility (GEF) has been adopted by all twenty Mediterranean nations under the Barcelona Convention¹ and has resulted in a Strategic Action Programme (SAP) for land-based sources of marine pollution, living resources and critical habitats.

¹ - Mediterranean Action Plan (1999).

Furthermore, the General Fisheries Commission for the Mediterranean (GFCM or “The Commission” – see Box 1) of the FAO has made important strides with regards to the development of management plans, legal frameworks, and conservation efforts to promote the sustainability of living marine resources in the Mediterranean.

Socio-economic characteristics of fishing activity

Unlike in other regions of the world, Mediterranean fishing activity is not characterised by an over-reliance on large mono-stocks (Farrugio *et al.*, 1993). Due to the high species diversity of the region, modern fishing activity in the Mediterranean employs a variety of fishing techniques and gears, which have allowed fishing activity to adapt to the region’s diverse environments, socio-economic contexts, available materials, and target species. The vast majority of capture fishing activity is carried out on board fishing vessels, although some traditional passive and active fishing techniques are still operated from the coast without the use of vessels.

The urgent and important need for measures to manage Mediterranean fishing activity must be reconciled with the important socio-economic impact of this sector. To this end, fishery management strategies are that consider topics such as livelihood strategies and poverty reduction alongside scientific advice needed. Reducing waste in fishing is one potential policy strategy that addresses the joint issues of environmental, social and economic sustainability in fisheries. Not only do policies addressing this important issue reduce pressure on the resource, but they also potentially make fishing activity more economically efficient. The exploitation of living marine resources plays a significant role in the livelihoods of people residing along the Mediterranean coast and the status of stocks is highly dependent on their socio-economic significance. The total value of fish landings in the Mediterranean is approximately USD 2.7 billion, representing approximately 0.04% of the combined GDP of those Mediterranean riparian states that have reported landing data. Furthermore, this value is underestimated as not all data for all riparian countries were reported. Of this total landing value, five countries account for over 85%, namely, Italy, Turkey, Spain, Greece and Tunisia. Of these countries, Italy garners the highest landing value in the region (approximately USD 1 billion) (FAO, 2016).

In terms of employment, the primary fishing sector (employment on board fishing vessels) provides just under a quarter of a million jobs in the Mediterranean. Data on youth or women’s employment is not collected for all Mediterranean countries, although some evidence, especially in the field of small-scale activities suggests that women contribute significantly to the sector. Furthermore, total employment in Mediterranean fisheries becomes much higher if employment in related secondary sectors, such as fish processing, vessel maintenance, or port services is also considered. Data for EU member countries indicates that the fish-processing sector accounts for, on average, one-third of total employment in fisheries (STECF, 2015). Furthermore, the role of women in fish processing is significant, with female employment accounting for, on average, 45% of fish processing employment in EU-member Mediterranean riparian states (STECF, 2014).

Overall, small-scale or artisanal fisheries (SSF) represent the dominant fleet sector in the Mediterranean. Small-scale fleets, also frequently called artisanal or coastal fisheries, can be described as “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” (Oliver, 2002). These fisheries are often associated with the notion of “coastal fishing”, that is to say, fisheries located on the continental shelf and very close to the coastal zone. Exploitation areas can be reached in a few hours from the ports, or even from the beaches (Oliver, 2002). In this region, the role of these fisheries has always been vital, representing a crucial link between local knowledge, cultural heritage, and the local environment.

In this regard, this sector is highly diverse and dynamic, varying enormously from one location to another, targeting a wide variety of species and highly adaptable. Small-scale fleets are able to adjust techniques relatively easily and can adapt to fishing seasons based on a rotational system. Over fifty types of fishing gear are used to target hundreds of species including demersal fishes, crustaceans and some small and large pelagic species. They also provide a significant contribution to food security and rural economic development and tend to produce little waste (FAO, 2016).

Approximately 67,000 vessels are officially declared as small-scale fleets, which is roughly 80% of the entire Mediterranean fleet. Furthermore, this sector employs at least 60% of the total number of people working directly in the fishing sector, amounting to nearly 132,000 people. However, these figures are likely to be much higher, considering that landing sites for artisanal fisheries are highly dispersed along the coastline and therefore the monitoring, control and surveillance (MCS) of artisanal fisheries is typically weak. Likewise, the contribution of fish workers engaged in the post-harvesting activities of SSF is similarly difficult to quantify. Moreover, these estimates do not take into account the un-registered small vessels, especially those without engines, and those fishermen, recreational or not, that operate without boats, fishing from the shoreline.

Despite their social importance, the total capture by weight from SSF is relatively small, currently representing about 12% of the total catches in the Mediterranean and Black Sea region. It is estimated, however, that this small volume represents a significant percentage of the value of the region's catch; production from the small-scale fleet segment represents approximately 23% of the total value of capture fisheries in the region. Considering these figures, fish produced by SSF are of high economic value. Generally, the catch is sold fresh in local markets, marketed directly to private consumers or restaurants, or directly exported (FAO, 2016).

The role of fishermen organisations or cooperatives is particularly important for the small-scale sector, often representing a useful way to manage fishing activity, both from a biological and economic point of view. Thus, on the French Mediterranean coast, producer fishermen organisations called “prud’homies” help to regulate small-scale fishing activity, resolve conflicts, and ensure the economic sustainability of its members. In Spain fisher guilds called “cofradías” cover 83% of Spanish fishing employment and they are present across the entire Spanish coastline and its islands. In addition to developing strong, common management measures, these guilds also

provide important economic guidelines for the sale and marketing of catches, allowing them to use market mechanisms to enforce compliance with regulations and punish transgressors (FAO, 2016).

The role of fishermen organisations is also highlighted through the recently adopted FAO *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication* (June 2014), which underlines the importance of small-scale fleets and the need to ensure that they continue to provide for decent livelihoods within coastal communities. Their role in promoting sustainable development is paramount and efforts are needed to preserve this sector, irrespective of increasing competition coming from other uses of the sea. Such is the case in the Mediterranean Sea, where small-scale fleets are in need of support in order to maintain the vitality of Mediterranean fishing communities.

In addition to small-scale fleets operating in the Mediterranean, a sizable industrial fishing sector is also present. While making up only 20% of the fleet operating in the region, these vessels are responsible for the largest share of landings, both in terms of volume and value. These fleet segments include purse seiners of over 12 metres, 38% of total volume of landings, trawlers of between 12 and 24 metres, 13% of total volume of landings and polyvalent vessels of over 12 metres, 10% of total volume of landings. The fleet segments that account for the highest value of landings are trawlers of between 12 and 24 metres (27% of total landed value) and purse seiners (21% of total landed value). These trawlers and purse seiners tend to be more highly concentrated in the Western and Adriatic sub-regions of the Mediterranean. The economic impact of this industrial sector is significant, with the annual landed value (value of first sale prior to processing) amounting to just below USD 2 billion. Approximately 80,000 people are employed on board fishing vessels in the industrial fishing sector in the Mediterranean, amounting to approximately 40% of total employment (FAO, 2016).

Altogether, the total value of trade in fishery products by Mediterranean countries (the sum of both inter-Mediterranean and extra-Mediterranean trade) is over USD 26 billion. This value includes both the value added from fish processing, marketing and transport costs, and trade tariffs for both fishery and aquaculture products from Mediterranean countries. Overall, the majority of Mediterranean riparian states are net importers of fish products, the exceptions being Morocco, Malta, Tunisia, Turkey, Croatia, Albania, and Greece, that are net exporters (FAO, 2016). Although imports of fish products in the region show a positive trend, on average increasing by 24% over the period 1999-2009, this average is significantly less than the global average increase of 39% (Basurco *et al.*, 2014).

Such trends may reflect the diverse fish consumption habits throughout the region. On the one hand, in many Mediterranean countries, fish consumption is quite high; particular in Spain (12.4% of daily protein consumption from seafood), France (8.1%), Malta (7.8%), Cyprus (7.7%), and Croatia (6.7%) all consume more than the global average (6.6%). On the other hand, many Mediterranean countries have very low seafood consumption, despite their proximity to the sea. Consumption is particularly low in many of the Balkan and North African countries (e.g. 1.6% in

both Algeria and Albania).² Although cultural and culinary traditions may account for low fish consumption in certain countries, in general, intense regional population growth and rising incomes across the region have resulted in growing demand for fish products. On average in the Mediterranean region, fish consumption has grown by approximately 10% over the past decade.

Stock assessment and data collection

As mentioned previously, living marine resources in the Mediterranean face numerous threats including overfishing, environmental pollution and adverse impacts from commercial activity in the region (CIHEAM, 2014). Combined with the growing regional demand for fish products, these factors intensify the pressure on the living marine resources of the Mediterranean and are the principal causes of unsustainable fish mortality. To reduce such pressure, management measures, including efforts to reduce waste and protect vulnerable habitats, are vital.

A crucial step in developing strong management measures is the accrual of accurate knowledge on the status of living marine resources. Scientific assessments of the status of fish stocks are carried out regularly in the Mediterranean. Recent assessments have concluded that approximately 85% of the main commercial stocks are currently subject to unsustainable levels of fish mortality throughout the Mediterranean and Black Sea. (on average, fish mortality is approximately 2.5 times higher than is considered sustainable). In the Mediterranean, the species subject to the highest mortality is hake, averaging a fish mortality that is nearly five times the desired level. In some hake stocks, fish mortality can reach up to twelve times the target sustainable level. Species mortality rates are subject to great regional variation throughout the Mediterranean and, for this reason, a sub-regional approach to management has been advocated. In general, demersal species suffer higher exploitation rates than small pelagics (sardines, anchovies or sprats) whose average fish mortality rates are closer to a sustainable level. Only a few demersal species, such as whiting, some shrimp species, picarel, and red mullet, are considered sustainably fished in certain areas.³

Despite the best efforts of the scientific community, a number of issues pose challenges to the accuracy of the overall information on the status of stocks. First, due to the high diversity of species in the area and the lack of information on catches, biology, ecology or distribution of some of the species caught, not all stocks are assessed. Furthermore, IUU fishing and discarding of unwanted catches lead to inaccurate data on landings. Although techniques are employed to account for this activity in stock assessments, such activity impairs the accuracy of scientific knowledge and thus the effectiveness of the management advice that is produced.

2 - FAOSTAT, protein supply quantity (g/capita/day).

3 - More precise details regarding the status of stocks, along with the results of the Stock Assessment Forms and landing statistics, can be found in chapter 3 of the SOMFI Report (FAO, 2016).

IUU fishing

Indeed, IUU fishing is inordinately detrimental to the rational management of living marine resources. Despite the efforts made to enact regulations regarding legal fishing activity and to improve country-level compliance with these regulations, a significant portion of fishing activity in the Mediterranean still takes place within an illegal context and therefore escapes regulation. As such, IUU activity can derail management plans and undo progress made. Globally, it is estimated that IUU fishing results in a loss of approximately 10 billion euros annually, equal to approximately 19% of the global value of reported catches. In the Mediterranean, IUU activity (typically in the form of unreported fishing) is particularly prevalent in small pelagic, tuna, swordfish, turbot, whiting, shrimp, and Norway lobster fisheries (Ozturk, 2015). The fight against IUU fishing in the Mediterranean is a major challenge and a priority of fishery management in this region.⁴

Bycatch and discards

During the harvesting process, the production of unwanted species or unwanted fractions of commercial species (“unwanted catches” [Kelleher, 2005]) is a recurrent problem of world fisheries and this is mainly due to imperfect selectivity of the fishing gear. Unwanted catches are in many cases returned to the sea (“discards”), dead generally, representing a waste of natural resources (Condie *et al.*, 2014). Unwanted catches and discards are usually poorly documented and result in fish mortality that is usually not taken into account in fisheries assessment models, potentially leading to the underestimation of the true fish mortality. Unwanted catches are detrimental to the productivity of stocks, for example, by killing juvenile individuals before their optimum production potential is achieved (i.e. production forgone). Under the current trawl selection pattern, for instance, undersized individuals predominate in the catches of hake and red mullet in the Mediterranean, especially during the periods of recruitment (Sala and Lucchetti, 2011).

Discarding practices and amounts vary considerably in different areas and across fishing gears in the Mediterranean Sea, although bottom trawls typically have among the highest discard rates. Mediterranean trawlers may discard approximately 40% of hake or red mullet, particularly during the recruitment periods (European Commission, 2011). Discards are not restricted to trawl fisheries, although the discard ratios of other gears are generally lower due to the higher species or size selectivity of most static gears (Kelleher, 2005). Purse seines also produce significant discards, despite having a lower proportion of unwanted catches (15% or lower) (Tsagarakis *et al.*, 2013), simply because they are responsible for the majority of fish catches. Small-scale fleets predominantly have low discard rates in the Mediterranean, although some exceptions exist, such as trammel nets for the prized spiny lobster (42% discard rate) (Quetglas *et al.*, 2014) or hydraulic dredges for clams (50% discard rate) (Morello *et al.*, 2005).

4 - OTH GFCM 38/2014/1, Roadmap on fighting IUU fishing in the Mediterranean Sea; OTH GFCM 37/2013/2, Roadmap on fighting IUU fishing in the Black Sea.

A recent review (Tsagarakis *et al.*, 2013) shows that discards can vary from 10% to as high as 90% of the total weight caught in Mediterranean fisheries, with lower discard rates in coastal fisheries of the eastern basin (e.g. mixed fisheries in Turkey or Egypt) and high discard rates in trawl fisheries and high discard rates in most bottom trawl Mediterranean fisheries (approximately 30% in weight). Nevertheless, these average figures do not fully capture the great heterogeneity in discard practices across different fleets, at different times of the year and among the different markets for which they are producing. Further examination of the breakdown of discard activity by gear type and Mediterranean sub-region can be found in SOMFI, the GFCM's flagship report (FAO, 2016).

During fishing operations, unwanted catches may be partially or entirely discarded. Some species that are routinely caught and marketed may be discarded at specific times of the year for economic reasons (market glut for instance). In general, discarding is associated with inadequate fish handling technology or market constraints (Catchpole *et al.*, 2005). For instance, there are cases when unwanted catches cannot be avoided because the fishing gear has selectivity limitations and the on-board storage capacity is limited. A market rationale for discarding is mainly present in the case of species with low commercial value or when specimens are damaged or of poor quality.

In addition to producing unwanted catches of species subject to regulation, imperfect fishing methods and practices have a direct impact on components of exploited marine systems, such as sensitive habitats or protected species, resulting in a diminished social value of marine ecosystems (Suuronen *et al.*, 2012). Low selective fishing gears are detrimental to marine mammals, sea turtles or seabirds, which are unintentionally caught and subsequently released with low chances of survival (Tudela *et al.*, 2005; Snape *et al.*, 2013). Seabirds offer a further example of the negative ecological impact of discarding: bird populations have suffered artificial increases as they become accustomed to exploiting discards as a predictable foraging resource, rather than pursuing traditional natural food sources. Ultimately this increase in seabird populations affects the structure of marine communities by interference competition (Arcos *et al.*, 2008; Oro *et al.*, 2013). Some fishing operations also generate significant discards of habitat-forming invertebrates by fishing in sensitive habitats (maërl beds, sea-grass beds, cold corals) (Barberà *et al.*, 2003).

Given the impossibility of completely avoiding unwanted catches, it is necessary to devise technical solutions along with economic and social incentives to eliminate these catches. Through the Common Fisheries Policy and the so-called “discard ban”, European countries have agreed to phase out discards of commercial species subject to quotas or Minimum Conservation Reference Size⁵. A number of research projects, currently funded by the European Commission, are seeking to achieve this goal (especially the MINOUW,⁶ DiscardLess,⁷ DISCATCH⁸ projects). Furthermore, all

5 - EU Reg. 1380/2013.

6 - <http://minouw.icm.csic.es>

7 - www.nsrac.org/category/project/discardless

8 - <http://fr.med-ac.eu/index.php>

Mediterranean countries have prioritised the reduction of incidental taking of vulnerable species by approving dedicated GFCM Decisions.⁹ A general programme to address discards at the Mediterranean-level is currently being launched within the GFCM.

Management achievements: institutional responses

Considering these challenges for the management of living marine resources in the Mediterranean, a number of concrete actions have been taken at regional level to ensure their future sustainability. The following legal framework and management measures are the result of productive international and regional cooperation to address these management challenges.

International legal framework

First and foremost, a strong international legal framework must be in place in order to enact effective management measures. There are certain goals that States cannot achieve alone. Sustainable fisheries, for instance, can only be achieved through cooperation among States, as the stocks and ecosystems, and in some cases the resource exploitation, are shared. Various legal frameworks have emerged over time to support and facilitate such regional cooperation. Such legal frameworks lay the groundwork for the successful achievement of a number of the Post-2015 Sustainable Development Goals, in particular, those goals pertaining to the conservation and sustainable use of oceans, seas and marine resources, as well as those goals that seek to end hunger and poverty and to promote economic development and decent work. Of utmost importance to the global management of marine resources is the 1982 United Nations Convention on the Law of the Sea (UNCLOS), or the so-called “Constitution for the Seas”¹⁰, which defines the responsibilities of States to manage and use fishery resources within their Exclusive Economic Zones (EEZ) and also obliges States to cooperate with the competent Regional Fisheries Management Organisations (RFMO) in their area.

Additional international legal frameworks that support management efforts in the Mediterranean include the FAO’s own Code of Conduct for Responsible Fisheries (1995), the International Plan of Action to prevent, deter, and eliminate IUU fishing (IPOA – 2001), the Port State Measures Agreement (2009) and, most recently, the above-mentioned FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries (FAO, 2015). These “SSF Guidelines” are particularly important in that they were developed through a unique consultative process which brought together stakeholders in order to address the complimentary issues of responsible fisheries and social development in coastal and inland fishing communities.

9 - REC.CM-GFCM/35/2011/3 On reducing incidental bycatch of seabirds in the GFCM area of application; REC.CM-GFCM/35/2011/4 On the incidental bycatch of sea turtles in fisheries in the GFCM area of application.

10 - UN Division for Ocean Affairs and the Law of the Sea, 1998 (www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm).

The role of the GFCM

As the competent RFMO in the Mediterranean, the GFCM is strongly supported by the aforementioned international legal frameworks. It is the logical body to coordinate Mediterranean, as well as Black Sea, riparian countries in the targeted governance of the region's living marine resources in a way that is adaptable to the evolving nature of the Mediterranean marine environment. Although the responsibility of overseeing and coordinating region-wide management measures falls under the auspices of the GFCM, its work complements and supports the work of riparian state governments, the European Union, numerous partner organisations and countless academic institutions and scientific experts.

The functioning of the GFCM

The evolution of the GFCM

The General Fisheries Commission for the Mediterranean (GFCM) came into force in 1952. Unlike other regional fisheries bodies, safeguarding the living marine resources in the Mediterranean and Black Sea, the GFCM was created within the institutional framework of the FAO, thus becoming the medium through which FAO fishery policies were tailored to the specific regional and sub-regional needs of the Mediterranean (Major Fishing Area 37 according to the FAO). Over the years, the role of the GFCM has evolved considerably, resulting in a more modern legal and institutional framework, strengthened compliance mechanisms and enhanced cooperation with States and organisations. An important evolution in the history of the GFCM came in 1997 when it was empowered to adopt conservation and management measures in the form of binding recommendations for its Contracting Parties. Since then, binding measures have been enacted, improving the Commission's ability to safeguard the living marine resources in its area of application.

The GFCM and its subsidiary bodies

Today, the GFCM benefits from the membership of 24 Contracting Parties, including 22 Mediterranean and Black Sea riparian states, Japan and the European Union.¹¹ From an institutional point of view, the GFCM serves as the primary mechanism for coordinating fishery policy among the riparian states of the two Seas. During the sessions of the Commission – the GFCM governing body being made up of national delegates from Contracting Parties – decisions are made regarding fisheries management, compliance and enforcement efforts in the GFCM area of application. Binding recommendations made by the Commission must be transposed by Contracting Parties into their national legislations.

Through the Commission's subsidiary bodies, meetings that provide fora for national scientists to address technical issues of interest to the Commission are organised. In particular, during the working groups and thematic workshops available data is gathered and analysed. Scientific advice which is subsequently revised and validated by the technical subsidiary committees, such as the Scientific Advisory Committee on Fisheries (SAC) is then formulated. Contracting Parties and Cooperating non-Contracting Parties are required to report data on national catches, bycatch, fleet, effort, socio-economic components, and biological aspects, which are then used as the basis for the formulation of scientific advice. All activities of the GFCM, including the technical and statutory meetings, are open to partner organisations and observers in order to promote transparency and consultation.

¹¹ - The EU is a contracting party to the GFCM and its participation to the GFCM is subject to EU applicable rules. Further explanation of this relationship and EU fisheries policies can be found in Churchill and Owen (2010).

Improved scientific knowledge and increased stock assessments

In addition to building a strong legal framework to support management efforts, scientific knowledge on the status of stocks has also improved. The increasing trend in the number of validated stock assessments throughout the region is an important achievement for Mediterranean living marine resource management. The number of assessments performed annually by the GFCM's Sub Committee on Stock Assessment (SCSA) and subsequently validated by the GFCM SAC has typically fluctuated between 20 and 40 stocks. However, this number has increased in recent years. Considering that assessments for small pelagic species remain valid for a maximum of two years and assessments for demersal species are valid for a maximum of four years, approximately 200 validated stock assessments are currently valid. In 2014, the percentage of landings assessed has nearly doubled from the previous year, with around 45% of total landings assessed in 2014, that is, an increase of 20% with regards to 2013.¹² Such improvements in the quantity of stock assessments in the Mediterranean allow for more accurate and effective management solutions.

Regional management plans

Other major achievements include the implementation of management measures that build upon the scientific knowledge gathered from stock assessments and other research activities. Such management measures have included regional management plans, Fisheries Restricted Areas (FRAs), gear selectivity measures and species prohibitions and restrictions. These measures serve not only to limit fishing activity, but also to curtail bycatch, discards, and other wasteful fishing activity.

Multiannual management plans are a principal tool employed by the Commission for achieving long-term sustainability of stocks.¹³ Moreover, per applicable GFCM rules, the Commission has the mandate to ensure compliance with these plans. This tool has been increasingly used in recent years, with several regional management plans having been adopted as of late. Of particular note is the multiannual management plan for fisheries of small pelagic stocks in the Adriatic Sea, which was revised in 2014 and 2015 following the advice of the SAC. Management guidelines also exist in the Mediterranean for red coral, whose populations are nearly depleted in certain areas. Two recommendations have been issued in 2011 and 2012 as a temporary measure for the conservation of this highly valuable species from an ecological and economic point of view. More recently, at its 39th session, the Commission adopted a recommendation on the sensitive zone of the Strait of Sicily, as a first step towards the establishment of a management plan for demersal fisheries in the area.¹⁴ This recommendation restricts Contracting Parties and Cooperating non-Contracting Parties to exclusively fish deep-water rose shrimp

12 - Information regarding further efforts to improve stock assessments in the Mediterranean can be found in chapter seven of the GFCM's Biennial Report (CFM, 2016).

13 - *Guidelines for Multiannual Management Plans towards Sustainable Fisheries in the GFCM Area* (GFCM, 36th Session, 2012).

14 - Recommendation GFCM/39/2015/2 on the establishment of a set of minimum standards for bottom trawling fisheries of demersal stocks in the Strait of Sicily, pending the development and adoption of a multiannual management plan.

and hake whose size exceeds the minimum reference conservation size. Those elements of the recommendation are currently being transposed into national management plans.

In general, GFCM Members are in favour of adopting common or harmonised measures for the management of selected fisheries. However, technical and operational issues persist regarding how best to evaluate alternative management measures, how to take decisions regarding management plans and how to ensure adequate stakeholder participation. Above all, a strong political will is required to enact effective management plans.

Fisheries Restricted Areas (FRAs)

To preserve fishery resources and to minimise the impact of fishing on certain habitats of high ecological value, the use of area-based management tools such as fisheries restricted areas (FRAs) have also been utilised (GFCM and RAC/SPA, 2007; GFCM, 2012; GFCM, 2013). In this regard, the GFCM is one of the few RFMO's in the world that is able to restrict fishing activity by closing fishing areas or prohibiting the use of certain gears in certain areas.

To date, eight FRAs have been established in the Mediterranean in order to protect deep-sea sensitive habitats.¹⁵ As a result of decisions taken in 2006 and 2009, fishing with towed dredges and bottom trawl nets has been forbidden in the *Lophelia* reef off Capo Santa Maria di Leuca, Italy; the Nile delta area cold hydrocarbon seeps in Egypt; the Eratosthenes Seamount in Cyprus; and the Gulf of Lion in France. Together, these four FRAs represent a total area of 17,678 km² or roughly 0.7% of the Mediterranean Sea's surface area.

In 2016, the GFCM established an additional three new FRAs, prohibiting fishing with bottom trawlers in three areas of the Strait of Sicily: East of Adventure Bank, West of Gela Basin and East of Malta Bank. In 2016, the GFCM also formally declared all waters below 1,000 meters as a FRA, based on the 2005 decision to bar bottom-trawling activities in those the deep-sea benthic environment.¹⁶ This decision resulted in the protection of over 58% of the total surface of the Mediterranean and Black Sea.

Gear selectivity measures

The establishment of gear selectivity measures is an example of management achievement that directly results in a reduction of waste from fishing activity (particularly a reduction of unwanted catches and discards). In particular, the use of driftnets larger than 2.5 km is prohibited in the Mediterranean.¹⁷ A minimum mesh size has also been adopted throughout the region, requiring a minimum of 40 mm for square codend or 50 mm for diamond mesh for demersal trawling.¹⁸ A prohibition on the use of towed gears and ROVs for red coral harvesting and the total prohibition of

15 - Recommendation GFCM/30/2006/3, Recommendation GFCM/33/2009/1 and Recommendation GFCM/40/2016/4.

16 - REC.CM-GFCM/29/2005/1 on the management of certain fisheries exploiting demersal and deepwater species.

17 - REC.CM-GFCM/22/1997/1 on limitation of the use of driftnets in the Mediterranean.

18 - REC.CM-GFCM/33/2009/2 on the minimum mesh size in the codend of demersal trawl nets.

any red coral harvesting below a depth of 50 m are also in effect.¹⁹ These measures are set up to ensure the protection of large marine vertebrates such as pelagic sharks, cetaceans, sea turtles, and sea birds; the protection of demersal stocks; and the protection of red corals, respectively.

Species prohibitions and restrictions

Measures have also been implemented to promote the protection and conservation of selected threatened species. To this end, a number of species restrictions are in effect in the Mediterranean. For example, throughout the Mediterranean, it is prohibited to retain on board, transship, land, store, sell, or offer for sale any part or whole carcass of bigeye thresher sharks (*Alopias superciliosus*) or hammerhead sharks (with the exception of *S. tiburo*).²⁰ To offer further protection to sharks and rays throughout the region, the GFCM has also prohibited shark “finning”, has reduced trawl fishing in coastal areas, and has prohibited the capture of species listed in Annex II of SPA/BD Protocol (Special Protection Area/Biological Diversity).²¹ The GFCM has established a closed season for fisheries using Fish Aggregation Devices (FADs) in order to protect dolphin fish.²² The GFCM has prohibited harvesting of red coral colonies whose basal diameter is smaller than 7 mm in order to protect red corals.²³ Finally, the GFCM has established a minimum landing size to protect small pelagic species (sardines and anchovies) in the Adriatic.²⁴

Improved compliance mechanisms

In parallel with the establishment of sound management measures based on the best available scientific advice, developments have also taken place to buttress compliance mechanisms to ensure that such management measures are enforced. For the past several years, the GFCM has been carrying out work to clarify and identify the compliance status of each of its members. Each year, the GFCM Compliance Committee (COC) has the mandate from the Commission to verify the correct implementation of the GFCM decisions by Contracting Parties, ensuring that the Cooperating non-Contracting Parties and non-Contracting Parties are compliant with the GFCM recommendations and the international legal framework. In the case of non-compliance, the GFCM, through the COC, has the authority to take measures to resolve the situation of non-compliance. Since 2013, this clarification process has

19 - REC.CM-GFCM/35/2011/2 on the exploitation of red coral in the GFCM area of application.

20 - REC.ICCAT-GFCM/34/2010/4 (C) Recommendation [09-07] by ICCAT on the Conservation of thresher sharks caught in association with fisheries in the ICCAT convention area and REC.ICCAT-GFCM/35/2011/7 (C) Recommendation [10-08] on hammerhead sharks (family Sphyrnidae) caught in association with fisheries managed by ICCAT.

21 - REC.CM-GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area of application.

22 - REC.CM-GFCM/30/2006/2 on establishment of a closed season for the dolphin fish fisheries using fish aggregating devices.

23 - REC.CM-GFCM/36/2012/1 on further measures for the exploitation of red coral in the GFCM area of application.

24 - REC.CM-GFCM/37/2013/1 on a multiannual management plan for fisheries on small pelagic stocks in the GFCM-GSA 17 (Northern Adriatic Sea) and on transitional conservation measures for fisheries on small pelagic stocks in GSA 18 (Southern Adriatic Sea) and REC.CM-GFCM/38/2014/1 amending Recommendation GFCM/37/2013/1 and on precautionary and emergency measures for 2015 on small pelagic stocks in the GFCM GSA 17.

already yielded fruit and, in fact, has helped fortify cooperation, allowing Members and non-Members the opportunity to ask for technical assistance and to better comply with GFCM decisions.

Efforts to reduce IUU fishing in the Mediterranean

Strides have also been made to reduce IUU activity in the region, an important element in ensuring that all fishing activity can be accounted for and thus that appropriate and effective management measures are applied. Since 2001, when the FAO first highlighted and defined the issue of IUU fishing through the IPOA²⁵ (International Plan of Action) the GFCM has adopted several recommendations to combat this scourge in the Mediterranean, including a recommendation on Port State Measures (PSM), a recommendation providing for a list of IUU vessels, and a recommendation on the use of VMS (Vessel Monitoring Systems). In fact, the GFCM PSM recommendation,²⁶ coupled with the FAO PSM Agreement, constitutes one of the most important weapons in the fight against IUU fishing. These texts give States the mandate to take action, for example by requiring Port States to refuse entrance to a vessel involved in illegal fishing or by compelling Port States to inspect suspected IUU vessels.

In consideration of this important issue, the GFCM has also developed a roadmap for the fight against IUU fishing in the region and is actively seeking ways to provide technical assistance to countries that have experienced difficulties in implementing this roadmap.

Ongoing challenges and future action

Although tremendous progress has been made, the living marine resources of the Mediterranean remain under critical human pressure and additional work is needed to meet sustainable development goals in the context of the Post-2015 Agenda. At a regional level, improving the management of living marine resources in the Mediterranean requires constant improvement on a number of fronts.

Improved resource management based on the best available scientific advice is crucial. To this end, the GFCM's future work plan calls for activities to re-evaluate its approach to the management of stocks in order to better address sub-regional variations. Furthermore, activities to improve fisheries data collection, to improve estimations and monitoring of bycatch and to reduce waste are foreseen. An important challenge, however, is to couple this activity with constant improvements in compliance mechanisms. To this end, among other activities, the GFCM has taken an aggressive stance in the fight against IUU fishing and its future work plan calls for better monitoring and surveillance in order to combat IUU activity.

The integration of socio-economic considerations into living marine resource management is another enormous challenge. Social and economic incentives need to be considered in order to change behaviour and support vulnerable groups such as SSF,

25 - Article 3 of the "FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing" of 2001.

26 - REC.MCS-GFCM/32/2008/1 Regional scheme on port state measures to combat illegal, unreported and unregulated fishing activities in the GFCM area.

within the fishing sector. Based on the premise that healthy marine ecosystems are more productive and crucial for sustainable marine-based economies, the concept of Blue Growth has been presented as a vision for joining environmental, social, and economic management concerns.

Improvement of fisheries data collection

The continuous improvement of scientific knowledge on the status of stocks in order to support effective management plans work is underway to enhance the collection of fisheries data in the Mediterranean. Addressing data from both Mediterranean and Black Sea fisheries, the GFCM Data Collection Reference Framework (DCRF) will soon come into effect and will become the primary tool for the collection of the data upon which the SAC's scientific advice is based. This tool aims to be an efficient and streamlined instrument that will integrate data collection and sub-regional multiannual management plans. It will offer a standardised and yet flexible way of reporting all required information for the fisheries management decision-making processes. The data requested by the DCRF is designed to be wide-ranging and useful to multiple users and sectors. The DCRF includes seven tasks. Task I addresses global figures of national fisheries and requires annual data on total landing, number of vessels, total capacity and total engine power by country. Task II requires data on fish catches including total annual biomass landed by fleet segment, by country and by Geographical Sub-Area (GSA), as well as data on individual species. Task III requires the quantification of the bycatch of vulnerable species such as seabirds, turtles, marine mammals and sharks. Task IV requires data that allows for the monitoring of fleet capacity. Task V requires the data necessary to monitor the amount of effort deployed and evaluate fishing pressure and fishing trends in CPUE. Task VI requires data on socio-economics, particularly the economic value and social implications of fisheries and will require data collection not only at country level, but also at the GSA and fleet segment level. Finally, Task VII requires the collection of the biological data necessary for the assessment of the status of the main exploited stocks, the status of marine ecosystems and the status of special interest stocks such as red coral, eel and dolphinfish²⁷.

Improvement of estimations and monitoring of bycatch

The action of DCRF includes specific compulsory tasks aimed at estimating the extent of the bycatch of endangered species in the Mediterranean. The increased data collection on this important issue seeks to complement the binding GFCM decisions taken in recent years that are aimed at mitigating bycatch. Although the DCRF streamlines the process for reporting bycatch data, it requires highly detailed information regarding the incidental taking of seabirds, sea turtles, seals, cetaceans, and sharks and ray species as identified in Annex II (list of endangered and threatened species) and Annex III (list of species whose exploitation is regulated) of the Barcelona Convention (Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean). Moreover, according to Recommendation GFCM 36/2012/2, any incidental taking of rare sharks and rays, even if not

27 - You will find more detail in the GFCM's SOMFI report (FAO, 2016).

present in the Barcelona Convention, should also be reported. The information available to identify fisheries with incidental catches of vulnerable species is still currently limited. It will therefore be important to collect existing data and identify additional/alternative sources of information to guide any possible revision of monitoring schemes. Data on the number of specimens taken as well as the fleet segment and gear type (if available), is requested to be reported through the DCRF. Proposed suitable methods of recording incidental bycatch are the use of on-board observers and the self-sampling system. Such data collection will significantly aid in developing management measures to reduce waste from fisheries.

Better monitoring and increased struggle against IUU activity

The GFCM is committed to amplifying its fight against IUU, for example, by improving control measures and offering inspector trainings in cooperation with relevant partners. Ways to estimate IUU fishing activity and further enhance current measures already in effect are also being experimented. Another important challenge that the GFCM is taking on, in cooperation with other relevant actors, is the development of a fully-fledged prototype of a centralised GFCM control system. A pilot study to be overseen by the GFCM Secretariat will soon be launched. At the same time, while recognising the role of small-scale fisheries in IUU fishing in the Mediterranean, the GFCM is studying ways to address control issues not just in the industrial sector but also in the small-scale fishing sector.

The benefits of this fight against IUU are multiple and essential. The objectives of these actions are to improve the sustainable management of fisheries, to improve the monitoring of fishing activities carried out by a flag State's vessels and to ensure the fair trade of fishery products in the Mediterranean region. Finally, and perhaps most importantly, such action seeks to improve the welfare and safeguard the livelihoods of communities and individuals that rely on the long-term sustainability and good environmental status of living marine resources in the Mediterranean.

Better support provided to Small Scale Fisheries

Considering that the small-scale fishing sector in the Mediterranean offers significant employment opportunities for coastal communities and has a relatively low impact on Mediterranean living marine resources, efforts to support and promote SSF should be considered. The FAO is actively promoting a Blue Growth strategy that seeks to enable fisheries-dependent people to act as environmental stewards in order to actively support food security, poverty reduction and the sustainable management of aquatic resources. This strategy seeks to make fishing activity more economically efficient for fishers while also improving the long-term economic viability and environmental sustainability of the activity.

Likewise, while recognising the importance of SSF in the Mediterranean, the GFCM has taken steps to promote the sustainable development and Blue Growth strategies for this sector. To this end, the GFCM organised, in collaboration with the FAO Fisheries Department, the FAO regional projects, WWF, MedPAN and the CIHEAM,

a “First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea” held in Malta from the 27-30 November 2013 gathering over 170 participants, including members from international organisations, NGOs, fishermen associations, stakeholders and civil society. This symposium was an opportunity to gather valuable information about a sector for which the data available is quite poor. Following the success of this Symposium, a follow-up Regional Conference entitled “Building a future for sustainable small-scale fisheries in the Mediterranean and the Black Sea” was held in Algiers, Algeria from the 7-10 March 2016. An important part of this conference was dedicated to adapting the aforementioned FAO Voluntary Guidelines on Securing Sustainable Small-Scale Fisheries to the specific circumstances of the Mediterranean region. The current challenge is to translate the lessons learned from these important events into future action to support SSF and SSF fishermen.

Better address regional variations through a Sub-regional approach

While recognising the sub-regional differences in ecology, socio-economics, development and fisheries management, the GFCM has sought to re-evaluate its approach to the management of stocks in the region. In line with the GFCM Agreement adopted in 2014, which stresses a sub-regional approach to fisheries management and aquaculture development in order to better address the specificities of the region,²⁸ a reorganisation of the subsidiary bodies of the GFCM Scientific Advisory Committee on Fisheries has been proposed at the 39th Session of the Commission.

This reorganisation would shift the SAC’s subsidiary bodies from a thematic approach to a sub-regional approach in order to better address the specific realities of stock management within the sub-regions of the GFCM competence area. Under this proposal, the SAC subsidiary bodies would consist of sub-regional working groups from the Western, Central, Adriatic, and Eastern Mediterranean. It is hoped that such a reorganisation will allow the subsidiary bodies to better address the particular fishery management needs of each sub-region, applying an ecosystems approach by integrating, rather than isolating, thematic areas such as socio-economics and stock assessments.

It is with dedication to these crucial challenges that strides can be made to improve scientific and socio-economic knowledge, better monitor and enforce management measures, reduce waste and ensure the future sustainable use of Mediterranean fisheries for those whose livelihoods depend on them.

28 - GFCM:ES/2014/2(Rev.1) amended GFCM Agreement.

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