

# Science for MPA management



- Issue 1 - March 2014 -

## ARTISANAL FISHERIES

IN THE MEDITERRANEAN

Artisanal fishermen in the area of Port-Cros National Park © M. Mabari / WWF Mediterranean



### CONTENTS

Highlights.....	p.2
Global context .....	p.3
State of artisanal fisheries.....	p.5
Strengthening the profession in the Mediterranean .....	p.9
Implications for MPA managers .....	p.11
Concluding remarks .....	p.14
References.....	p.15

## EDITORIAL

Welcome to the first edition of '**Science for MPA management**'! It is a new service from MedPAN to its members and partners that provides a scientific overview of a specific topic, presenting the most significant scientific works in a language accessible to all.

This new initiative completes the existing monthly scientific information watch that is published in MedPAN's newsletter and on its website.

The purpose of these services is to help MPA managers keep abreast of the scientific activity taking place in the Mediterranean related to their work and build their capacity to better manage their MPAs and support policy making on a local, regional or national scale.

These services serve the 1st strategic axis of [MedPAN's 2013-2017 general strategy](#) for the network and more specifically its [scientific strategy](#) 1st pillar to help improve management effectiveness at the individual MPA scale.

This first edition focuses on Artisanal Fishing, a key topic for most MPA managers.

Don't hesitate to let us know what you think of this first issue! Happy reading...



[www.medpan.org](http://www.medpan.org)



Artisanal fishers in Torre Guaceto MPA, Italy © TGMPA



## HIGHLIGHTS

- **Artisanal fisheries involve local fishing units, small amounts of capital, small vessels and short coastal trips for commercial or self-consumption purposes;**
- **In many aspects artisanal fisheries are more sustainable than industrial fisheries;**
- **Mediterranean artisanal fishers will increasingly need to adapt to new business opportunities arising mainly from tourism;**
- **Artisanal fishers should be included and properly accounted for in marine protected area designation and management processes;**
- **Marine protected area managers and fishers share the same aim: to sustain healthy and productive seas.**

This special edition of MedPAN Scientific Newsletter was prepared by David Rodriguez Rodriguez for the MedPAN organisation.

© 2014 - MedPAN

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior permission from the copyright holder provided the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

Citation: Rodríguez-Rodríguez, D. 2014. *Artisanal fisheries in the Mediterranean*. MedPAN. Marseille, France. <http://www.medpan.org/documents/10180/0/Science+for+MPA+management+-+Issue+1/b0094022-059a-45ba-8fda-bd2d68766308>.

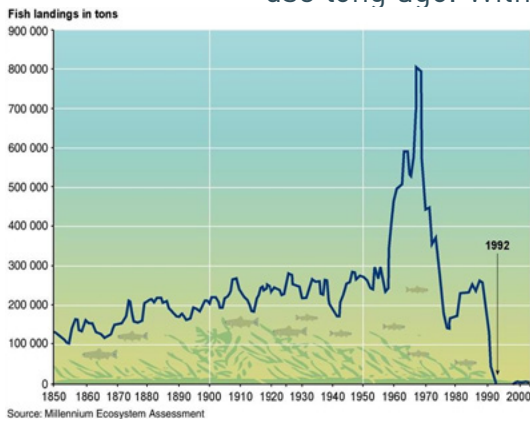
It was made possible by the financial support from:





# GLOBAL CONTEXT

Fishing is a human activity that has gone on for millennia. Nowadays, it remains one of the very few large scale economic activities that is still based on the 'hunting and gathering' of wild biological resources, contrary to agriculture or animal farming, where a few productive species and races were domesticated and grown or bred for human use long ago. With a few exceptions, the sustainability of fishing had



Collapse of Atlantic cod stocks off the East Coast of Newfoundland in 1992, [http://www.qrida.no/graphicslib/detail/collapse-of-atlantic-cod-stocks-off-the-east-coast-of-newfoundland-in-1992\\_11e4#](http://www.qrida.no/graphicslib/detail/collapse-of-atlantic-cod-stocks-off-the-east-coast-of-newfoundland-in-1992_11e4#) © Philippe Rekacewicz, Emmanuelle Bournay, UNEP/GRID-Arendal

been broadly maintained until recent decades, mainly based on small-capacity, shore fleets. Increasing technology and fishing power of industrial vessels since the 1950s resulted in massive increases of catches of the most popular species that often exceeded the *maximum sustainable yield*<sup>1</sup> and led to collapses of some of these species' populations and the fisheries that were dependent upon them. The Grand Bank cod fishery off Canada is a paradigmatic example. Absence of appropriate regulation and enforcement, especially in developing countries and in the open seas, contributed to this.

As a result of the previous processes, 75% of the world's commercial fisheries are currently overexploited (Schorr, 2005) and global fishing effort needs to be reduced. In contrast, many developing countries still have room to develop a sensible exploitation of the biological resources beyond their *territorial waters*<sup>2</sup> for the benefit of their coastal communities.

**75% of the world's commercial fisheries are currently overexploited (Schorr, 2005) and global fishing effort needs to be reduced**

Realisation of the unsustainability of business-as-usual commercial fishing has resulted in a number of recent approaches (*Ecosystem Approach to Fisheries*<sup>3</sup>; Garcia *et al.*, 2003) and initiatives to increase the sustainability of marine and coastal activities: the EU Marine Strategy Framework Directive (2008), the EU Blue Growth initiative (2012), the UNEP EcAp-MED Initiative (2012) and the EU Marine Spatial Planning and Integrated Coastal Zone Management initiative (2013). The latest reform of the Common Fisheries Policy has also taken steps towards ensuring more sustainable fishing activities by EU fleets, embracing the ecosystem approach and the *precautionary principle*<sup>4</sup> to fisheries.

1. The maximum level at which a biological natural resource can be routinely exploited without long-term depletion.

2. Area of the sea immediately adjacent to the shores of a state up to 12 nm (22km) seaward and subject to the territorial jurisdiction of that state.

3. Approach to fisheries fostered by the FAO. It is centered on the principles of sustainable development: ecosystem's limits, long-term management of marine resources, precautionary principle, reduction of fishing impacts, protection of endangered species, human wellbeing and culture.

4. The precautionary principle enables rapid response by authorities in the face of a possible danger to human health or the environment even in absence of sound scientific evidence.

Artisanal fisheries are defined by the Food and Agriculture Organisation of the United Nations (FAO) as 'traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amounts of capital and energy, relatively small fishing vessels

**FAO defines artisanal fisheries as:**

*Traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amounts of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption*

(if any), making short fishing trips, close to shore, mainly for local consumption. In practice, definition varies between countries, e.g. from gleaning or a one-man canoe in poor developing countries, to more than 20-m. trawlers, seiners, or long-liners in developed ones. Artisanal fisheries can be subsistence or commercial fisheries, providing for local consumption or export. They are sometimes referred to as small-scale fisheries' (FAO, 2005). In Europe, an operational definition of artisanal fisheries based on an overall length of vessels of up to 12 m has been proposed by Guyader *et al.* (2013).

As opposed to industrial fisheries, small scale artisanal fisheries are thought to have broader positive effects on coastal communities and less impact on the marine environment than their industrial counterparts, blamed largely for the worrying depletion of the world's seas and oceans. As a result, artisanal fisheries are not regularly monitored by national or local administrations, which could result in damage from these activities going unnoticed or downplayed. Being closer to the Ecosystem Approach to Fisheries concept, artisanal fisheries are increasingly regarded as a sustainable and culturally-rich means of living for thriving coastal communities around the world.

But are they so?



Artisanal fishing boat in Galeria, France © M.Mabari/WWF Mediterranean



# STATE OF ARTISANAL FISHERIES

## IN THE WORLD

Artisanal fishing activities are very different depending on the environmental, social, economic and historical contexts in which fishers live. Some 28.5 million people are directly employed by the marine fishing sector (both industrial and artisanal) across the globe, 95% of them in Asia, Africa and Latin America (DuBois & Zografos, 2012). Tens of millions more (many of them women involved in fish processing) are indirectly employed. Of these figures, artisanal fishing comprises 90% of all fishing jobs worldwide, approximately 45% of the world's fisheries, and nearly a quarter of the world catch (Schorr, 2005). In some developing countries like Senegal, catches by artisanal fishers can make up to 80% of the total catch figures (DuBois & Zografos, 2012). In the 20 EU coastal member states, 81% of the fishing fleets are made up of coastal vessels less than 12 m (Maynou *et al.*, 2013).

Artisanal fishing =  
**90%**  
of fishing jobs  
worldwide

Artisanal fisheries provide critical income and edible protein to hundreds of millions and contribute to poverty alleviation and sustainable development in many coastal areas of the world. Artisanal fishers operate in some of the biologically richest and most sensitive waters of the planet, where interactions with coastal and marine activities introduce complex interdependencies. Conflicts between artisanal fishers over fishing rights are common everywhere. So are conflicts between artisanal fishers and industrial fishers, their main competitors, over fishing rights, piracy, over-exploitation of resources by highly efficient industrial vessels, and damage to artisanal fishing gears (mainly static) by towed gears from industrial vessels. These conflicts are more common and more serious in developing countries with limited capacity to police their waters. They are a difficult management problem as stakeholders' views and interests are often mutually exclusive. Artisanal fishers' rights risk being overshadowed by those of the fishing industry, usually a much more powerful actor in terms of economic input and political influence. Conflicts are also common between fishers and conservationists, managers and policy makers when it comes to designating new marine protected areas or modifying (*i.e.* restricting) fishing rights in existing marine protected areas. Due to fishers' enormous influence on the conservation status of



Fishing harbour of Korcula, Croatia © M. Mabari / WWF Med.

marine resources, their views and concerns must be taken into account and dealt with appropriately if effective management and conservation of coastal and marine resources is to be achieved, both inside and outside marine protected areas.

Some of the environmentally positive aspects of artisanal fisheries when compared with industrial fisheries have to do with the lower volume of catches and the wider range of target species (5.5% of the world's marine fauna globally; Battaglia *et al.*, 2010), which reduces impact on the composition of biological communities when compared with the same volume of catches from a lower number of species. Some positive economic aspects lie on the following facts: artisanal fisheries are not generally subject to fishing quotas; they usually occur throughout the whole year (by seasonally adapting gears to different target species) resulting in continuous revenues; they do not rely on subsidies as frequently as several industrial fisheries do; and they are less dependent on oil prices and external markets to sell their products. Finally, there are a number of common characteristics about artisanal fisheries that make them also more socially sustainable than their industrial counterparts: they normally take place using owner-operated vessels thus reducing job conflicts; they involve shorter trips (of usually one day or less) making the occupation more tolerable and family-friendly; and they engage substantial numbers of members from coastal communities sharing economic, social and cultural interests.



Women involved with fishing in Turkey © SAD-AFAG

Although most of the artisanal fishing activity is done by men, women play a significant role in some types of artisanal fisheries, such as shellfisheries by hand, as well as in other commercial or household-related activities essential to the maintenance of vibrant coastal communities, such as the cleaning, preparation and selling of catches or the upbringing of children.

## IN THE MEDITERRANEAN

Artisanal fisheries in the Mediterranean Sea reflect the rich social, economic, biological and cultural differences of the coastal communities inhabiting the *Mare Nostrum*. They represent roughly 86% of the approximately 42 000 fishing boats existing in the Mediterranean (Maynou *et al.*, 2013). Although in decline and not properly accounted for either scientifically or politically, they are still highly relevant, even for EU countries. Artisanal fisheries comprise 80% of all fishing vessels in the EU Mediterranean countries and provide around 100 000 direct jobs in the EU alone (Maynou *et al.*, 2013).

**86%**  
of fishing boats  
in the Med belong  
to artisanal  
fishers

Characterisation of Mediterranean artisanal fisheries is still poor, with a few recent sub-regional studies (Colloca *et al.*, 2003; Coppola, 2006; Griffiths *et al.* 2007; Pinello *et al.*, 2013) resulting from some projects led by the FAO and the General Fisheries Commission for the Mediterranean (GFCM):

#### Projects that led to a better characterisation of artisanal fisheries

- **ADRIAMED (Adriatic)**  
[www.faoadriamed.org](http://www.faoadriamed.org)  
Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea
- **COPEMED II (Western and Central Mediterranean)**  
[www.faocopemed.org](http://www.faocopemed.org)  
Coordination to Support Fisheries Management in the Western and Central Mediterranean (including on artisanal fisheries)
- **MEDSUDMED (Central Mediterranean)**  
[www.faomedsudmed.org](http://www.faomedsudmed.org)  
Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily
- **ArtFiMed (Morocco and Tunisia)**  
[www.faoartfimed.org](http://www.faoartfimed.org)  
Développement durable de la pêche artisanale Méditerranéenne au Maroc et en Tunisie.
- **EastMed (Eastern Mediterranean)**  
[www.faoeastmed.org](http://www.faoeastmed.org)  
Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean

Some additional local studies have been carried out. From these, a study carried out in the Aeolian Islands north of Sicily (Italy; Battaglia *et al.*, 2010) shows that all artisanal fishers are men with an average age of 45 years, and that most of them belong to cooperatives. Another study on the island of Majorca (Spain; Maynou *et al.*, 2013) shows a fishers' average age of 47 years helming old vessels of 27.5 years on average (with a significant proportion of them older than their 30 year useful life). It also shows low levels of recruitment and moderate-to-low and decreasing revenues that may compromise the future of the activity.

In some countries of the northern shores, fishers have historically organised in associations recognised by the State (*Prud'hommes* in France, *Cofradías* in Spain and *Cooperative* in Italy) that represent their economic interests and serve as consultative and cooperation bodies with fishing and marine authorities. Countries on the southern shores have more recently shown some dynamism in setting up associations of fishermen. These social groups represent a specific perspective on the use of 'common space', with an underlining concept of traditional marine tenure and the will



to self-regulate fishing activities within this social group. These self-established regulations may include fishing gears, quotas, seasons, targets and restricted areas (such as voluntary fisheries reserves and *cantonnements de pêche* in France). Further to local and national initiatives, the recently set up Mediterranean Platform of Artisanal Fishers, with a regional membership and scope, now provides a united and stronger voice for small scale fisheries, namely at the level of the GFCM, the FAO and the EU (MedArtNet, 2014).



Fisher in Lastovo, Croatia © Nika Stagic

The most widely-used gear types used by artisanal fisheries in the Mediterranean include trammel nets, gill nets, long lines (drifting and bottom), pound nets, hand-gig lines and basket traps. Of these, the most widely used artisanal gear in the Mediterranean is the trammel net, which ensures the capture of many valuable species such as scorpion fishes (*Scorpaena sp.*), striped red mullets (*Mullus surmuletus*), cuttlefishes (*Sepia sp.*) or common spiny lobsters (*Palinurus elephas*). Seasonal rotation of fishing gears is common practice across the Mediterranean and represents the ability of fishers to adapt to changing environmental conditions and presence of resources to optimize yields. One study on artisanal fisheries in north-eastern Spain (Cap de Creus Natural Park; Lloret *et al.*, 2012) showed 37 species caught from a total of 71 species occurring in this north-western Mediterranean marine protected area.

Adverse impacts of artisanal fisheries have been reported on different Mediterranean coastal fish species showing sex reversal with age, especially the protogynous<sup>5</sup> ones such as zebra seabream (*Diplodus cervinus*) and dusky grouper (*Epinephelus marginatus*), by fishing much higher numbers of individuals of one sex than the other. Involuntary selective catch of individuals of the same sex may hamper reproduction and thus reduce fishing stocks. Artisanal fisheries may also have an important impact on species with complex mating systems like nest building strategies for some sparids, labrids and scorpaenids. Black seabream (*Spondyliosoma cantharus*), five-spotted wrasse (*Symphodus roissali*), east Atlantic peacock wrasse (*Symphodus tinca*), blotched picarel (*Spicara maena*), brown wrasse (*Labrus merula*) and green wrasse (*Labrus viridis*) are examples of such group of species in the Mediterranean. Some additional impacts from artisanal fisheries in the Mediterranean relate to: catches below the minimum landing size, thus preventing individuals to reach maturity and reproduce; the use of unspecific driftnets; or the punctual killing of, or harassment to, some unwanted competitors like cetaceans, seals and other marine predators. It should be noticed, though, that most of these impacts occur as well, and at a larger scale, in industrial fisheries (especially

5. Protogyny is the most common form of hermaphroditism in fishes in nature. It refers to organisms that are born as females and change sex to males at some point of their life cycles.

those using trawling gears or drift nets) which in addition have to deal with huge numbers of by-catches, discards and accidental catches caused by lost gears (ghost fishing).



## STRENGTHENING THE PROFESSION IN THE MEDITERRANEAN

A number of issues are worth considering when looking at Mediterranean artisanal fisheries from the fishers' perspective: strengthening fishers' stakeholder position, reducing their environmental impacts, focusing on quality and direct commercialisation of landings, adapting and profiting from new business opportunities, and guaranteeing adequate revenues and replacement of crews to ensure an enduring future. We will look at these issues in more detail.



Signature of an agreement between northern and southern fishermen at the GFCM symposium on artisanal fishing ©FAO/GFCM

An adequate legal framework that recognizes and legitimates the role, rights and responsibilities of artisanal fishers needs to be developed and implemented at a Mediterranean scale. The FAO General Fisheries Commission for the Mediterranean, the UNEP-Mediterranean Action Plan and the EU seem to be adequate organisations to help manage fishers' interests and conservation targets from an ecosystem, regional perspective. Some positive developments for artisanal fisheries have taken place in this regard lately. The FAO-GFCM has taken the first step towards integration

of artisanal fisheries in the region by organising the 'First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea' in Malta last November (GFCM, 2013). For this event, MedPAN and the GFCM prepared a background document on the integration of small-scale fishing in MPA management (Cazalet, in press). The FAO-GFCM has also recently created the 'Working Group on Marine Protected Areas' that convened for the first time in February 2014. Additionally, some measures for artisanal fisheries have been proposed in the latest reform of the EU's Common Fisheries Policy, such as extending to 2022 the right for Member States to restrict fishing in their territorial waters, the exemption from the transferable fishing concessions scheme, some financial measures aimed at helping local economies adapt to changes and, especially, the establishment of co-management committees of marine resources whereby fishers could

decide on the management of stocks on an equal basis as politicians and scientists. Joining in cooperatives, federations or associations can be a good opportunity for artisanal fishers to garner higher influence as coastal and marine stakeholders in processes at different scales: local, regional, national and international. The Mediterranean Platform of Artisanal Fishermen is a good example of such associations with an international membership and scope ([www.medartnet.org/EN/](http://www.medartnet.org/EN/)).



Most Mediterranean fishing stocks are currently overexploited: 82% of them, according to the European Commission (European Commission, 2012) and 79% of 23 demersal<sup>6</sup> stocks assessed, according to the GFCM (Caddy, 2012). Thus, more effort should be done to minimise the environmental impacts of Mediterranean artisanal fisheries and, for this purpose, regulations relating to gears (including trawling bans), seasons, quotas and marine managed spaces may entail sensible fishing management options. These managed spaces can take the form of fisheries reserves, marine protected areas or Fisheries Restricted Areas (FRAs of the GFCM). Moreover, artisanal fishers could use some existing initiatives such as the EU's 'Blue Growth Initiative' to realise how they can also benefit from such management tools in terms of sustainable fishing and local development. This realisation should help them to gradually change their views to start seeing marine protected area managers consistently as allies in their common goal of achieving healthy, enduring and productive seas. For this to happen, integrative, trustworthy participation of fishers in marine protected area planning, designation and management as well as transparent information are fundamental (Pérez de Oliveira, 2013).

Fishers could make the most of carrying out their activities in marine protected areas by certifying their products on the basis of quality and sustainability (Q&S) practices. Q&S-certificated sea products could result in increased revenue by fishers and increased confidence and recognition by consumers. Free quality and sustainability hallmarks could be awarded by marine protected areas' administrations or by fishers' associations to fishers who abide by protected area regulations.

Some artisanal fishers are failing to diversify and profit from complementary sources of income from new sea-related activities such as fishing tourism or wildlife watching. Some complain about the limited space and the costly safety modifications needed to carry tourists on board that regulations impose. Some do not like to modify their customs and traditions. Nevertheless, in many cases the



Pescatourism boat in Bonifacio, France © M. Lang / MedPAN

<sup>6</sup>. Demersal fish live on or near the sea bottom

integration of tourism activities could result not only in higher income for fishers, but also in wider recognition of their culture. To help fishers with this transition, more flexible regulations may need to be developed in order to allow fishers to take tourists on board under adequate safety conditions, something which is not always possible at the moment in some countries around the basin.

Finally, whereas unemployment is rising across the Mediterranean and youth unemployment is top-rocketing in some countries around the basin, replacement for retiring artisanal fishing crews is an issue in some Mediterranean countries and regions, especially on the northern shores. For some youngsters becoming fishers may be a way out of the severe social and economic crises hitting harshly most countries across the basin.



## IMPLICATIONS FOR MPA MANAGERS

Mediterranean artisanal fishers seem to be mostly opposed to the establishment of new marine protected areas on the grounds of the possible loss of revenues as a result of new fishing restrictions, such as quotas or no-take areas. However, attitudes towards marine protected areas are expected to vary among different groups of fishers depending on the resulting or perceived degree of limitation or benefit from fishing regulations. Static gear fishers are usually more in favour of new marine protected areas than mobile gear fishers, as they are less affected by prohibitions and even benefit from reduced competition once towed fishing has been removed from the area. Other sociological variables that are likely to influence fishers' attitudes towards marine protected areas are: their education level (the higher the level, the better the attitude towards marine protected areas), the type of marine protected area (the more tolerant with fishing, the better the attitude), and their perceived degree of compliance with rules (the less perceived compliance with rules by fishers themselves, the better the attitude towards marine protected areas; [Pita \*et al.\*, 2013](#)).

The recovery of fish stocks following a temporary or long-term closure and the spill-over effect this may result in have been key arguments to overcome fisher's initial scepticism. Formal and informal discussion



Scientists and fishermen study red striped mullet caught outside Torre Guaceto marine reserve, Italy. © P. Guidetti

forums on good practices and experience sharing between fishers and managers have worked well to help overcome wariness and mistrust (Piante, 2012).



Fishermen collaborate with Marine Protected Area authorities in the Bonifacio Strait Nature Reserve, France © J.M. Culioli/RNBB

Fisher-led processes for marine protected area establishment and co-management have resulted in examples of successful coexistence between fishing and conservation interests such as in Torre Guacetto Marine Protected Area (Italy; Guidetti *et al.*, 2010) or Bonifacio Strait Nature Reserve (France; MedPAN Forum, 2012). Wider participation of fishers since the beginning of the marine protected area designation process, a social approach based on stakeholders' interests, consideration of fishers' ecological knowledge, careful wording to avoid excessive 'conservation connotations',

and clear, agreed conservation and management objectives are seen to contribute to a general sense of 'ownership' among the stakeholders and thus to the effectiveness of marine protected areas (Pérez de Oliveira, 2013). A study on the degree of involvement of artisanal fishers in the management of MPAs is underway by WWF France in collaboration with Port-Cros National Park and the University of Nice. It includes 25 case studies in the Mediterranean and shows that the management efficiency of fisheries in an MPA is linked to the implication level of fishers (Di Franco *et al.*, 2014, In press)

Other management options to overcome fishers' initial opposition to marine protected areas include: improved legal structures aimed at guaranteeing fishers a fair share of the future benefits from seafood stocks' recovery, the buying-out of part or the whole fishing effort in the area, or temporal subsidies to compensate for the loss of revenues as a result of the partial or total closure of the area to fishing. Different types of public and private sponsorships can also be sought to finance these punctual measures (Sala *et al.*, 2013).

Artisanal fishers must be made fully aware of the range of benefits and new opportunities brought about by the implementation of marine protected areas, so they can balance them against the possible economic losses from reduced catches or displacement. These benefits may include: bigger and more abundant catches, higher prices via product certification, broader visibility and recognition of their cultural practices, and increased tourism and related economic opportunities from fishing tourism, accommodation, wildlife watching, catering, etc.

Some studies in the Mediterranean have suggested that the economic benefits from increased tourism to new marine protected areas (including scuba diving, recreational fishing and wildlife watching) largely exceed the revenues from fishing and the short-term losses

of fishers just a few years after a fishing closure is implemented (Merino *et al.*, 2009; Sala *et al.*, 2013). These studies did not consider reduced fishing effort in the areas surrounding marine protected areas as a result of their spill-over effect or wider benefits from other *ecosystem services*<sup>7</sup>. These results argue for a mixed fishing-tourism approach to marine protected area management that makes both activities compatible and well regulated to ensure sustainable fishing and visitation levels. Appropriate zoning of the marine protected area could serve both purposes.

Fishers can also be persuaded to participate either voluntarily (making the most of their routine activities at sea) or under some form of compensation (such as training, fees or help to modernize vessels) in some management activities for the marine protected area, such as the monitoring of biological resources or the surveillance of regulation compliance.

Conflicts among artisanal fishers, between artisanal fishers and recreational fishers and, especially, between artisanal fishers and industrial fishers must be considered seriously and dealt with tactfully through careful mediation by relevant and respected authorities. All stakeholders' rights must be given fair consideration when it comes to settling disputes and regulating activities in a certain area. Again, appropriate marine protected area zoning may help deal with these issues.

Other issues of mutual concern for artisanal fishers and marine protected area managers alike arise namely from water quality, invasive species, and the occupation of coastal and inshore areas by new uses, such as energy-production or aquaculture facilities. Most of these issues can be effectively dealt with through participatory integrated coastal zone management and marine spatial planning processes. These processes must take into account the close dependence of artisanal fishers on local resources and thus their high sensitivity to ecosystem's alterations and to displacement due to their limited mobility.



Some management measures to reduce the impacts of artisanal fisheries on local resources may include: the establishment of minimum and maximum landing sizes (especially for sex-changing species), the reduction of the fishing effort in some areas or during certain periods (for instance, during the spawning season), the enlargement of existing marine protected areas, the creation of new no-take areas, the legal protection of some species with complex

7. Ecosystem services are the benefits people obtain from ecosystems. They are classified as: provisioning (e.g. fisheries), regulating (e.g. carbon sequestration), cultural (e.g. tourism) and supporting (e.g. nutrient cycle).

reproductive systems, and increased research on sustainable fishing based on mating systems, life cycles and populations' connectivity (Lloret *et al.*, 2012).



## CONCLUDING REMARKS

Fishing regulations imposed by marine protected areas or other related schemes are needed if negative impacts from subsidies or from free markets (arising from states' or consumers' willingness to pay increasingly higher prices for progressively scarcer resources, e.g., red tuna), are to be addressed to prevent the depletion and the eventual collapse of biological populations and related seafood stocks.

Marine protected area managers and fishers need to realise that both groups must work together if they are to attain their common ultimate aim: the conservation of healthy, productive and plentiful seas for securing the future of nature and the well-being of coastal communities.



Fishermen collaborate with Marine Protected Area authorities in Scandola, France © M. Mabari/WWF Mediterranean

# REFERENCES<sup>1</sup>

- Battaglia, P.; Romeo, T.; Consoli, P.; *et al.* 2010. Characterization of the artisanal fishery and its socio-economic aspects in the central Mediterranean Sea (Aeolian Islands, Italy). *Fisheries Research*, 102: 87-97.
- Cadiou, G.; Boudouresque, C.F.; Bonhomme, P. *et al.* 2009. The management of artisanal fishing within the Marine Protected Area of the Port-Cros National Park (northwest Mediterranean Sea): a success story? *ICES Journal of Marine Science*, 66(1): 41-49.
- Caddy, J.F. 2012. *The role of GFCM in regional fisheries management*. Directorate General for Internal Policies. European Parliament. Available online from: [http://www.europarl.europa.eu/meetdocs/2009\\_2014/documents/pech/dv/study/study\\_4.pdf](http://www.europarl.europa.eu/meetdocs/2009_2014/documents/pech/dv/study/study_4.pdf)
- Cazalet, B. In press. *Integration of small-scale fishing in MPAs. Basic document–Thematic Session III*. MedPAN & GFCM.
- Colloca, F., Crespi, V., Coppola, R.. *et al.* 2003. *Artisanal fishery communities in the Mediterranean. Two case studies: evolution of the artisanal fishery in Cilento, Italy. Pêche artisanale dans la lagune de Nador: exploitation et aspects socio-économiques*. Informes y Estudios COPEMED No 10. FAO. Rome. 104 p. Available online from: <http://www.fao.org/docrep/FIELD/003/AD486B/AD486B00.HTM>
- Coppola, S.R. 2006. *Inventory of artisanal fishery communities in the Central and Western Mediterranean. Studies and Reviews, No 77. General Fisheries Commission for the Mediterranean*. FAO. Rome. 82 p. Available online from: <ftp://ftp.fao.org/docrep/fao/009/a0824e/a0824e00.pdf>
- De Juan, S.; Moranta, J.; Hinz, H.; *et al.* 2012. A regional network of sustainable managed areas as the way forward for the implementation of an Ecosystem-Based Fisheries Management in the Mediterranean. *Ocean & Coastal Management*, 65: 51-58.
- Di Franco A., Bodilis P., Piante C., Thiriez P., Francour P., Guidetti P., 2014. In Press. *Fishermen engagement, a key element to the success of artisanal fisheries management in Mediterranean marine protected areas*
- DuBois, C. & Zografos, C. 2012. Conflicts at sea between artisanal and industrial fishers: Inter-sectoral interactions and dispute resolutions in Senegal. *Marine Policy*, 36: 1211-1220.

<sup>1</sup> This is not intended to be a comprehensive list of references on artisanal fisheries. It just comprises some of the most relevant recent references used for writing of the article.

European Commission. 2012. *Blue Growth. Opportunities for marine and maritime sustainable growth. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions COM(2012) 494 final*. Available online from: [http://ec.europa.eu/maritimeaffairs/documentation/publications/documents/blue-growth\\_en.pdf](http://ec.europa.eu/maritimeaffairs/documentation/publications/documents/blue-growth_en.pdf)

European Commission. 2012. *Fisheries. Reform of the Common Fisheries Policy*. Available online from: [http://ec.europa.eu/fisheries/reform/faq/index\\_en.htm](http://ec.europa.eu/fisheries/reform/faq/index_en.htm)

European Commission. 2013. *Integrated Coastal Management*. Available online from: <http://ec.europa.eu/environment/iczm/>

EU. European Union. 2008. *Marine Strategy Framework Directive*. Available online from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:pdf>

FAO, Food and Agriculture Organization of the United Nations. 2005. *Fisheries and Aquaculture. Small-scale and artisanal fisheries*. FAO Fisheries and Aquaculture Department. Rome. Available online from : <http://www.fao.org/fishery/topic/14753/en>

García, S.M.; Zerbi, A.; Aliaume, C.; *et al.* 2003. *The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook*. FAO Fisheries Technical Paper. No. 443. FAO. Rome. 71 p. Available online from: <ftp://ftp.fao.org/docrep/fao/006/y4773e/y4773e00.pdf>

GFCM. General Fisheries Commission for the Mediterranean. 2013. *First Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea*. Available online from: <http://www.ssf-symposium.org/SitePages/WelcomePage.aspx>

Goñi, R.; Adlerstein, S.; D. Alvarez-Berastegui, D. *et al.* 2008. Spillover from six western Mediterranean marine protected areas: evidence from artisanal fisheries. *Marine Ecology Progress Series*, 366: 159-174.

Griffiths, R.C.; Robles, R.; Coppola, S.R.; *et al.* 2007. *Is there a future for artisanal fisheries in the western Mediterranean?* FAO. Rome. 106p. Available online from: <http://www.fao.org/docrep/010/a1073e/a1073e00.htm>

Guidetti, P.; Bussotti, S.; Pizzolante, F. *et al.*, 2010. Assessing the potential of an artisanal fishing co-management in the Marine Protected Area of Torre Guaceto (southern Adriatic Sea, SE Italy). *Fisheries Research*, 101: 180-187.

Guyader, O.; Berthou, P.; Koutsikopoulos, C.; *et al.* 2013. Small scale fisheries in Europe: A comparative analysis based on a selection of case studies. *Fisheries research*, 140: 1-13.

- Horta e Costa, B.; Batista, M.I.; Gonçalves, L.; *et al.* 2013. Fishers' Behaviour in Response to the Implementation of a Marine Protected Area. *PLoS ONE* 8(6): e65057. doi: 10.1371/journal.pone.0065057
- Lloret, J.; Muñoz, M. & Casadevall, M. 2012. Threats posed by artisanal fisheries to the reproduction of coastal fish species in a Mediterranean marine protected area. *Estuarine, Coastal and Shelf Science*, 113: 133-140.
- Maynou, F.; Morales-Nin, B.; Cabanellas-Reboredo, M.; *et al.* 2013. Small-scale fishery in the Balearic Islands (W Mediterranean): A socio-economic approach. *Fisheries research*, 139: 11-17.
- Mediterranean Platform of Artisanal Fishers (MedArtNet). 2014. *Who we are?* Available online from: <http://www.medartnet.org/EN/notremission.html>
- MedPAN Fórum. 2012. *Marine Protected Areas in action: A few examples around the Mediterranean*. Available online from: [http://www.medmpaforum2012.org/sites/default/files/poster\\_examples\\_in\\_the\\_mediterranean\\_lowres.pdf](http://www.medmpaforum2012.org/sites/default/files/poster_examples_in_the_mediterranean_lowres.pdf)
- Merino, G.; Maynou, F. & Boncoeur, J. 2009. Bioeconomic model for a three-zone Marine Protected Area: a case study of Medes Islands (northwest Mediterranean). *ICES Journal of Marine Science*, 66(1): 147-154.
- Perez de Oliveira, L. 2013. Fishers as advocates of marine protected areas: a case study from Galicia (NW Spain). *Marine policy*, 41: 95-102.
- Piante C. (ed.). 2012. *Final conclusions of the Meeting of Artisan fishermen & Marine Protected Areas of the Mediterranean*. MedPAN North Project. WWF-France. 23 pages. Available online from: <http://www.medpan.org/documents/10180/0/Final+report+meeting+of+artisan+fishermen/fbcde7fe-2b83-4c2a-969c-414d3d2e126b>
- Pinello D., & Dimech M., 2013. *Socio-Economic Analysis of the Lebanese Fishing Fleet*. *EastMed Technical Documents 16*. FAO. Athens, Greece. Available online from: <http://www.fao.org/docrep/018/ar250e/ar250e.pdf>
- Pita, C.; Theodossiou, I. & Pierce, G.J. 2013. The perceptions of Scottish inshore fishers about marine protected areas. *Marine Policy*, 37: 254-263.
- Sala, E.; Costello, C.; Dougherty, D.; *et al.* 2013. A General Business Model for Marine Reserves. *PLoS ONE* 8(4): e58799. doi: 10.1371/journal.pone.0058799.

Schorr, D.K. 2005. *Artisanal Fishing: Promoting Poverty Reduction and Community Development Through New WTO Rules on Fisheries Subsidies. An Issue and Options Paper*. UNEP. Geneva. 50 pages. Available online from: <http://www.unep.ch/etb/events/pdf/AFSchoor.pdf>

UNEP. United Nations Environment Programme. 2012. *EcAp-MED Project Document. Implementation of the Ecosystem Approach (EcAp) in the Mediterranean by the Contracting parties in the context of the Barcelona Convention for the Protection of the Marine Environment and the Coastal region of the Mediterranean and its Protocols. April 2012*. Available online from: [http://ec.europa.eu/environment/marine/pdf/Implementation\\_EcAp.pdf](http://ec.europa.eu/environment/marine/pdf/Implementation_EcAp.pdf)

