

SPATIAL APPROACH TO FISHERIES MANAGEMENT IN THE
MEDITERRANEAN REGION

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THE NEED FOR SPATIAL BASED FISHERIES MANAGEMENT

Spatial planning is needed in order to reduce or avoid user-user or user-environment conflicts whenever multiple uses of space and resources occur. While a spatial approach to the use and management of natural resources is a reality on land, this is not always the case at sea. Sectoral spatial management initiatives do exist in the maritime domain, but multi-sectoral integrated management plans are still very rare and a sector-by-sector approach is more commonly applied (Douvere, 2008; Ehler and Douvère, 2009), as clearly shown by international research projects underway (e.g., MESMA¹).

Due to their complex nature and to the large number of activities and stakeholders involved, fisheries would definitely benefit from spatial management. Ecosystem-based marine spatial management, which takes into account all human activities present in a marine area as well as the ecosystem, is increasingly fostered worldwide as the most promising way to address sustainable use of natural resources (Katsanevakis et al., 2011) and more specifically of fisheries (Curtin and Prellezo, 2010). Spatial approaches to fisheries management make use of a number of initiatives based on limitations of fishing in space and time that span from marine reserves and no-take areas to temporary or permanent single-gear restrictions, which take a variety of names: fishing exclusion zones, fishery reserves, fishing boxes, no-trawl areas, etc. For the purpose of this paper we will use the generic, widely used term of marine protected areas (MPAs) and we will focus on their benefits for fisheries. MPAs have many expected “internal” and “external” benefits (FAO, 2011). “Internal” benefits include habitat protection, settlement or spawning area protection, bigger and older individuals and higher abundance and biomass. “External” benefits include export (“spillover”) of adult biomass due to home range movements and to density-dependent dispersal and export of offspring due to increased reproductive potential (bigger and older females produce much more eggs) (Bohnsack, 1998; Gell and Roberts, 2003). The magnitude and extent of the effects of fishing restrictions depend on a number of factors that include life history and mobility of species, level of exploitation of stocks, hydrographic regime, availability of suitable habitats, size and age of MPA, enforcement, etc. (Claudet et al., 2008; Claudet et al., 2010; Vandeperre et al., 2011). A reliable assessment of such effects relies on a robust sampling design based on temporal and spatial controls (Claudet and Guidetti, 2010). There is growing evidence of fisheries benefits from large

¹ Monitoring and Evaluation of Spatially Managed Areas, EC 7th FP, grant agreement no. 226661: www.mesma.org

offshore as well as small inshore MPAs (Gell and Roberts, 2003; Goñi et al., 2011 *inter alia*), although most of this knowledge comes from non-Mediterranean areas. This paper intends to review briefly the main spatial fisheries management initiatives in the European side of the Mediterranean Sea.

THE MEDITERRANEAN CONTEXT

The complex and fragmented nature of fisheries, the conflicts between trawl and artisanal fishermen, the short distance between ports and the high biological diversity in the Mediterranean region, all call for spatial management initiatives. In the last three decades several different types of MPAs, mainly as trawl exclusions, have been implemented with the purpose of rebuilding depleted resources and enhancing fisheries. Fish abundance and size have also been monitored inside and outside coastal marine reserves which, in an attempt to address socio-economic issues, sometimes include fisheries objectives besides the more obvious conservation objectives in their regulations (Francour et al., 2001). At a higher level, CE Reg. 1967/2006 has imposed stricter spatial restrictions to bottom-towed gears operated in the Mediterranean.

- France

A network of small no-take areas was established along the coast of continental France and Corsica between the late 1970's and early 1980's aimed at rebuilding depleted stocks and providing benefits to adjacent fisheries (Meinesz et al., 1983). Two types of MPAs were enforced: *établissement de pêche* and *cantonement de pêche*, both totally excluded to fishing, the first including artificial reefs. Unlike traditional marine reserves, these French MPAs were created with the sole purpose of benefiting fisheries. Unfortunately, to our knowledge there is no published report of the results obtained. French marine reserves have provided some evidence of short-scale spillover of adult fish to nearby areas (Harmelin Vivien et al., 2008) and potential fisheries benefits (Seytre and Francour, 2008).

In October 2008 an offshore no-take Fisheries Restricted Areas (FRA) on the slope of the eastern Gulf of Lions was proposed to protect what is considered a refugium for spawners of important demersal species including hake, *Merluccius merluccius* (GFCM, 2008). The FRA was only partially accepted by GFCM, which imposed to not exceed the total fishing effort existing in the area in 2008².

- Spain

Some evidence of spillover and consequent fisheries benefit comes from marine reserves along the Mediterranean coast of Spain. In the Columbretes Islands Marine Reserve a net increase in CPUEs of spiny lobster, *Palinurus elephas* (Goñi et al., 2010) and of the whole commercial fish assemblage (Stobart et al., 2009) were recorded out of the reserve boundaries. Similar results were obtained in the Medes Marine Reserve for pandora, *Pagellus erythrinus* and striped mullet, *Mullus surmuletus* (Stelzenmuller et al., 2007). Harmelin Vivien et al. (2008) have provided data on short-scale spillover effect from four Spanish marine reserves.

- Italy

² Recommendation GFCM/33/2009/1 included in the 33rd GFCM Report (2009).

Twelve Zones of Biological Protection have been established in areas deemed critical for the reproduction and/or growth of commercial species, where fishing is strictly regulated and permitted only to set gears. The four oldest such zones were created in 1998 and span from 50 to 2226 sqkm; other areas followed a few years later.

Three areas along the Sicilian coast have been closed to trawlers and all other bottom-towed gears since 1990. One of the areas, the Gulf of Castellammare, has displayed an average 8-fold increase of demersal fish biomass on the continental shelf since the ban (Badalamenti et al., 2008; Pipitone et al., 2000) and a change in reproduction and recruitment pattern of red mullet, *Mullus barbatus* (Fiorentino et al., 2008). Socio-economic surveys carried out in the Gulf showed that (1) artisanal fishermen operating inside the no-trawl area experienced higher returns than before the ban, (2) they would quit the fishery in case the ban is lifted, (3) artisanal fishermen operating outside the no-trawl area experienced higher expenses and harsher conflict with trawlers (Whitmarsh et al., 2003; Whitmarsh et al., 2002). Stefanoni et al. (2008) showed that financial compensation to excluded trawlers was crucial in ensuring the observance of the ban, while frequent infringement was observed after the cessation of the compensation. It is interesting to note that a trawling ban had already been imposed in the coastal waters of NW Sicily in the late 19th century (Lentini, 2010).

Some evidence of moderate spillover from marine reserves was recorded for spiny lobster in western Sardinia (Follesa et al., 2011) and for seabreams *Diplodus* spp. in Liguria (La Mesa et al., 2011). Guidetti and Claudet (2009) showed that strict enforcement and a participative approach may lead to positive results in terms of higher CPUEs for artisanal fishermen even in small coastal MPAs.

- Greece

Like in Italy, the Greek government has imposed a trawl ban over a few coastal areas in the Aegean Sea (Vassilopoulou and Papaconstantinou, 1999). These areas, which included year-round and seasonal trawl bans, were surveyed in the late 1980's. Greater biomass of fish inside the untrawled areas was recorded, but no data on commercial CPUEs were collected from adjacent fishing grounds.

Tserpes et al. (2011) pointed out that the application of the 1.5 miles limit to trawlers in areas with narrow continental shelf, like the southern Aegean Sea, risks to increase dramatically the fishing effort on the slope.

- Malta

Maltese waters are subject to a complex scheme of spatial management based on a 25-mile Fishery Management Zone (FMZ), which derives from a pre-existing exclusive fishing zone created in 1971 (Camilleri, 2007; Dimech et al., 2008). The Maltese FMZ aims at maintaining a sustainable level of fishing pressure through a zoning scheme which sets the maximum vessel size into the 3-, 12- and 25-mile distance from the coast. One of the strongest points in support of the FMZ was that fish biomass inside the FMZ was as much as double that outside, and that the demersal fisheries operated within MSY and close to MEY (Camilleri, 2007). Only Maltese vessels are allowed within the FMZ in an attempt to safeguard the catches and incomes of the national artisanal fishing fleet. Despite the healthy stocks and the ban to foreign vessels inside the FMZ, Maltese fishermen did not perceive any benefit from the Maltese management scheme (Dimech et al., 2009).

CONCLUSION

MPAs are not a fisheries panacea and they do have detractors who highlight their weak points and foster more traditional management approaches (Jones, 2007; Kaiser, 2005; Tupper et al., 2002). Some major points raised by critics are that (1) MPAs rarely have clear fisheries-oriented objectives, (2) poorly designed monitoring programs (which often lack temporal or spatial controls) do not offer strong evidence of benefits for fisheries, (3) MPAs are effective only with non-mobile species, (4) well enforced traditional methods of fishing effort control may have greater overall fisheries and conservation benefits (Kaiser, 2005). Despite the many examples of increased biomass and size of fish inside MPAs, spillover to adjacent fishing grounds has been observed only at small scale and for a few species, and there is still poor evidence of benefits to nearby fisheries. Clear management objectives associated with careful zoning design and reliable monitoring programs (Claudet and Guidetti, 2010; Guidetti and Claudet, 2009) may help to overcome these criticisms.

Consideration of societal issues is crucial to the success of spatial management initiatives. MPAs are often unpopular with fishermen, who dislike reductions of their traditional fishing grounds and do not trust promises of long-term benefits. Carefully planned financial compensation, co-management initiatives and concession of user rights, all may prove useful in meeting management objectives.

There are lessons to be learned from the analysis of spatial fishery restrictions in the Mediterranean:

- insufficient effort has been put into the assessment and evaluation of MPAs;
- data collection at sea should be increased and coupled to socio-economic surveys on land;
- some sort of compensation may be necessary to overcome hostility from fishermen towards fishery restrictions;
- co-management may lead to better outcomes and higher acceptability;
- fishing effort displacement and/or concentration at MPA's borders should be taken into account in the design phase.

Most Mediterranean fish stocks, although fully- or overexploited, have shown remarkable resilience to fishing even though almost no coordinated management measures have been created, due to lack of good historical data, to highly diverse multispecies fisheries and to a complex and fragmented geopolitical framework (FAO, 2005). In this peculiar situation, carefully planned and well managed MPAs have great potential as fisheries management tools. Much biological and socio-economic research is needed however, in order to assist planners and managers to optimize costs and benefits and to couple fisheries and conservation objectives.

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