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COMMISSION GÉNÉRALE DES PÊCHES POUR LA MÉDITERRANÉE**

DRAFT

INTEGRATION OF SMALL-SCALE FISHING IN MPAs

Thematic session III

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INTRODUCTION

As mentioned in the foreword, this study was conducted relative to the 1st Regional Symposium on Sustainable Small-Scale Fishing in the Mediterranean and the Black Sea and its Thematic Session 3 entitled *Integration of small-scale fishing in MPAs*. The main objectives of this Symposium, taking place from November 27th – 30th, 2013 in Malta, are to: 1) Renew and encourage political commitment in favour of small-scale fishing; 2) Agree on a possible road map for the progressive implementation of operations supporting the sustainable development of small-scale fishing; 3) Examine the instigation of a regional cooperation project for small-scale fishing and; 4) Lay down the foundations for a platform allowing stakeholders to be directly involved and take part in the management of small-scale fishing. The reflections and exchanges taking place during the Symposium come into the more general framework of the *International Guidelines on Securing Sustainable Small-scale Fisheries (SSF Guidelines)*. These voluntary texts (principles, criteria and recommendations), which will be definitely adopted by the FAO in 2014, are complementary to the Code of Conduct for Responsible Fisheries of 1995.

In its technical directives for responsible fisheries, the FAO already laid down the conditions necessary for the sustainable development of fisheries, but without particular focus on the small-scale sector. Even if the definition of small-scale fishing is still vague and the subject of diverging opinions, it is characterized in the Mediterranean by its relatively homogenous and highly predominant nature (80% of fishing units). Its main characteristics can be described as follows in order of priority: predominant coastal fishing, with a daily scope of action generally limited to 5 nautical miles, using boats of less than 12 metres; polyvalent fishing conditioned by spatio-temporal referents (zones, periods, etc.); a historically community-oriented organisation of the sector with regards regulations concerning access and fishing effort whether individual or collective and; these fisheries maintain a marked cultural and sometimes traditional dimension, together with a structuring role in coastal economies.

Directives 4 on fishing development (FAO, 1999), 4.2 on the systemic approach (FAO, 2003) and 4.4 on MPAs and fishing (FAO, 2011) underline *"the necessity to maintain ecosystems and productivity in a good state, or improve them, so that fisheries can be maintained and strengthened for the current and future generations"* (FAO, 2002, p.11). Directive 4.4 reminds us that *"MPAs and MPA networks can constitute an important management tool, especially for achieving both biodiversity conservation and direct fisheries management objectives. However, there are many management options in addition to MPAs that may produce better effects. The management context needs to be understood and combinations of appropriate measures implemented accordingly"* (FAO, 2011, p. 37).

In the light of global and theoretical reflections on fishery management, *the spatial-based approach to fisheries management* forms part of the tools and methods intended to contribute to the systemic management of fisheries. Indeed, consideration of the interactions between resources and the ecosystem can be optimized through an improved spatio-temporal management of fishing activities in which the MPAs can play a central and pro-active role in favor of small-scale fisheries. When applied to the Mediterranean, this management mode can be defined as follows (Pipitone, 2012): *"Spatial planning aims at reducing or avoiding user-user or user-environment conflicts whenever multiple uses of space and resources occur, which is generally the case in fisheries. Spatial approaches in fisheries management make use*

of a number of initiatives that span from marine reserves to temporal or permanent single-gear restrictions. Mediterranean fisheries, which are multispecies and multi-gear, call definitely for a spatial approach to their management". According to directive 4.2, the spatial dimension incorporates, in particular, the use of "marine protected areas where fishing may be totally banned, or areas intended for multiple uses" (FAO, 2002, p. 34).

To resume, the content of the first points relative to spatialized fisheries management offers a triple dimension: 1) Regulation of access and conflicting uses; 2) Spatial, temporal and/or technical regulation of fishing activities; 3) Assessment of the cost/benefit ratio of spatial restriction measures for fisheries: What effects? What extent? For whom?

Besides their functions and potential benefits for small-scale fishing, what exactly do we mean by Marine Protected Area (MPA)? This notion remains complex in view of the heterogeneous nature of the existing legal categories, amplified by their quasi-exponential global development since the Nineties, albeit sometimes illegible or of relative efficiency. We have didactically chosen to adopt a generic definition of MPAs as regulated areas, employing a spatial form of environmental management. In an institutional and legal sense, we can envisage the MPA as: 1) an "original district" consecrating the principles of territorial specialty and delimitation; 2) inside which regulatory, monitoring and supervisory measures are implemented¹ (special administrative policy and sets of legal standards); 3) by a competent, devoluted or decentralized institution; 4) defined by a legal framework and run under the supervision of central administrations. Other complementary definitions exist, driven by various disciplinary influences, in particular bioecological, economic, socioeconomic and even societal (Cazalet *et al.* 2012).

We will not therefore reiterate the countless political, legal (international, regional and national) and scientific bases relative to the definition, characterization and development of MPAs, this is not the object of the study, or that of the Symposium. MPAs are now considered as a vital means of sustainably preserving and exploiting marine ecosystems that are impacted and threatened by human-induced pressures and global changes. The States have numerous objectives, in particular regarding the Mediterranean, which is home to nearly 10% of global biodiversity (on 1% of the oceans' surface area) and a very high level of endemic species. In support of this observation, MedPAN² encourages States to maintain and develop their MPA policies, in the aim of achieving the targets of the CDB (Rio + 20), relayed by the Barcelona Convention, by 2020, i.e. 10% protected areas.

According to the new MAPAMED³ database, 677 sites have been set up to date in the Mediterranean, distributed as follows: **1)** 161 MPAs with national status⁴; **2)** 9 MPAs with entirely international status; **3)** 507 Natura 2000 marine sites⁵; **4)** 40 MPAs with one or several international statuses, including 32 Specially Protected Areas of Mediterranean Importance (SPAMI), 5 Biosphere reserves and just 2 marine World Heritage sites. Lastly, 55

¹ Exclusively targeting professional fisheries or a set of extractive or non-extractive uses.

² See road map adopted at the 2012 MPA Forum held in Antalya, Turkey:
<http://www.medpan.org/documents/10180/0/Feuille+de+route+pour+les+AMP+de++M%C3%A9diterran%C3%A9/ee15ce4e-20f1-4310-8c40-d69fdb5fdc33>

³ <http://www.medpan.org/mapamed>

⁴ Only 94 sites were identified in 2008 (Simard, UICN, 2008), i.e. the figure has nearly doubled in just 5 years!!

⁵ These MPAs only concern EU member states and are the result of various European directives, transposed and implemented by the States according to their national legal provisions.

MPA projects are in progress. On a Mediterranean Sea scale, MPA spatial coverage nevertheless remains low and largely below the target of 10% protection. Most Mediterranean MPAs are the fruit of State initiatives and are mainly concentrated on the northern shores and in coastal areas.



Figure 1 : MPA 2012 key figures © MedPAN

MPAs development is also marked by a major evolution in their expected functions. Their scope of application no longer relates solely to the strict conservation of an area, according to the founding "no-take" principle. Diversification of the intentions and choices presiding over MPA creation is generating new finalities. MPAs are therefore original and often autonomous tools (integrated approach) for the sustainable management of the marine environment: protection of resources and habitats, maintenance and development of local professional fishing, enhancement of marine touristic activities, recreational fishing, coastal and catchment basin management, etc. These new paradigms necessitate the participation of all stakeholders involved in MPA setup, in the framework of an adapted governance approach. MPAs are no longer a simple means of supporting public policy, but are becoming an end unto themselves, considered as "ideal" targets for efficient governance (Cazalet *et al.* 2007). These various transformations are leading protected site managers and small-scale fisheries to take a more active part in the governance implementation process "in and around" MPAs.

Lastly, let us reiterate the special context of the Mediterranean and its consequences in terms of fishing and MPAs (Galletti *et al.* 2013). On a geographical level, the Mediterranean is an enclave⁶, bordered by several continental landmasses that lend it a semi-closed character. This particularity is also a legal status, defined by article 122 UNCLOS as a gulf, basin or sea bordered by several States and connected to another sea or the ocean by a narrow passage, or composed, entirely or mainly, of territorial waters and the exclusive economic zones of several States. This status incurs (art. 123) obligatory cooperation in various fields (which may include the management and conservation of fish resources) between the States living in such close proximity. But legal constraints are actually small, as they mainly operate on a political level and affect the behaviour of the various States in terms of geo-strategy, diplomacy and their willingness to engage in a real constructive cooperation. This does not exclude tensions and blockages, in particular in terms of marine delimitation⁷, as bilateral or multilateral negotiations have not yet fixed all maritime frontiers between neighbouring States and the open sea. These considerations can sometimes have a strong influence on the development of protection and fishing management policies in the Mediterranean. Lastly, the undetermined character of the various territories is not a permanent state; it is marked by

⁶ From *Mare Medi Terra*, literally meaning "sea in the middle of land".

⁷ Territorial sea, exclusive economic zone (EEZ), continental shelf.

regular evolutions and changes in State spatial claims⁸, in particular for economic reasons (including fishing) or, more recently, ecological reasons. In principle, small-scale fishing appears less concerned by delimitation issues as it is mainly concentrated in coastal areas where frontiers are fairly well-established (territorial waters), except in certain archipelagic areas and in certain contexts of latent conflict.

The purpose of this contribution is to underline MPA capacity to satisfy imperatives regarding the protection of biodiversity, while contributing to the sustainable management and development of small-scale fisheries in the Mediterranean. Without going as far as an exhaustive country-by-country regional-scale analysis, it aims to establish a precise panorama of current MPA relationships with the small-scale fishing sector. Using significant experiences and examples, we aim to determine the most pertinent and efficient models, as well as the respective prospects and expectations of the field players. The various objectives and results intend to be operational, applied and suitable for feeding the exchanges, reflections and proposals put forward at the Regional Symposium in a didactic manner.

I. NATURE AND OBJECTIVES OF MPAs IN THE MEDITERRANEAN

In this first section, we will present the multiple, heterogeneous and changing dimension of MPAs in the Mediterranean. We will therefore give an overall description of the notions used and MPA features and main goals, focusing particularly on their links with spatial planning of small-scale fisheries.

1. Definition, content and legal scope of MPAs

a) *MPA - a polysemous notion*

(1) General conceptual framework

This framework is very much inspired by international typologies, especially that of the IUCN (Dudley, 2008) the initial generic definition⁹ of which establishes six categories of protected area, ranging from a strict nature reserve limited solely to scientific use and forbidden to the public (Ia), to nature parks in which sustainable exploitation of resources is permitted (VI). These “purposive” criteria are mainly based on the type and intensity of protection efforts, determined with regard for the MPA's objectives. Since 2008, the concept of protected area has been more general but also more comprehensive: *“A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or*

⁸ As witnessed by the two very recent, successive and unilateral EEZ declarations by France (Decree n° 2012-1148 of October 12th, 2012) and Spain (Real Decreto 236/2013, April 5th 2013). These political decisions are not devoid of ulterior economic motives (fishing, hydrocarbons, etc) and ecological motives (canyon protection, pollution prevention), but they still come up against major previous differences in terms of calculation of the respective maritime scope and boundaries of the two States. As things stand, the two EEZs partially overlap, creating a partial “dual competence” leading to conflicts in terms of rights and authority between France and Spain. The MPAs and fisheries located in this zone are particularly affected by these new stakes ...

⁹ The definition proposed at the World Conservation Congress (Montreal, Canada, October 1996): “Any area of intertidal or subtidal terrain together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment”.

other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values".

According to the IUCN, this new definition "does ensure a clearer demarcation between conservation focused sites and those where the primary purpose is extractive uses i.e. fisheries management areas" (Dudley, *op. cit.* p.64). An area identified and dedicated solely to the spatial regulation of fisheries areas cannot, therefore, be considered an MPA per se. In essence, the distinction seems fundamentally theoretical and limited to a few specific cases. In most situations, MPA zoning is intended to integrate several uses, including fishing activities, in order to ensure effective conservation or replenishment of stocks. IUCN categories I and II preclude all forms of extractive activities, particularly fishing. The IUCN refers to the "ecological draw-down on resources" seen as incompatible with biodiversity, ecosystems, and more generally environmental protection goals. Apart from category III, which relates little to marine sites, MPAs including fisheries planning and management aspects tend to belong to categories IV ("*seasonal fishing bans*" or sanctuaries), V ("*coastal areas*" aiming for "*the preservation of long-term or sustainable local fishing practices or harvesting*" and VI (measuring the ecological sustainability of authorized extractive activities by "*appropriate metrics*").

(2) Multiple terminologies

a. National

Almost all MPAs in the Mediterranean are solely within the jurisdiction of the coastal States and are established according to national legal and regulatory frameworks. Almost 8% of territorial waters have a protection status, compared to 2.7%¹⁰ for areas under jurisdiction or located on the high seas. The territorial sea is an area under full sovereignty of the coastal State (extending the national territory out at sea) which may not extend beyond 12 nautical miles (six miles for Turkey and Greece). Beyond that stretches the Exclusive Economic Zone (EEZ) up to a maximum distance of 200 nautical miles from the coast. The EEZ gives the State restrictively listed and exclusive rights, particularly as regards biological resource exploitation and conservation. Due to the limited size of marine areas in the Mediterranean, such extension is not possible and few States have hitherto undertaken to establish EEZs within the 200 nautical miles limit. This lack of definition is not really conducive to the development of MPAs by coastal States beyond their territorial waters.

Among the names given to MPAs, certain redundant, even identical terms are often used. The most frequently used terms are "*nature reserve*", "*national park*" and "*nature park*" (Mabile *et al.* 2005, Abdulla *et al.* 2008, Gabrié *et al.* 2012). Needless to say that, depending on the States, use of the same term may refer to substantially different levels of protection, modes of governance and legal statuses. As an example, we can mention certain specific national terms associated with a specific MPA legal status (Gabrié *et al.* 2012): special marine reserve (Croatia), marine nature reserve, regional nature park, marine park, marine nature park, site of the *Conservatoire du littoral* (French coastal protection agency), marine reserve, national refuge and marine fishing reserve (Spain), area of natural interest (Catalonia, Spain), marine protected area and natural marine protected area (Italy), protected area (Monaco, Syria), natural monument (Slovenia), special environmental protected area and nature protection area (Turkey), national marine park (Albania), etc.

¹⁰ Actually, there are 2 MPAs: the Pelagos Sanctuary split between France, Italy and Monaco (2.6%) and the Gulf of Lions Marine Nature Park, France (0.1%).

b. International and regional

Alongside or building on State initiatives, a significant number of MPA categories and names are also established by international or regional instruments, conventions and agreements. Their legal scope is very variable; some are very restrictive, enforceable tools, while others are mere labels or part of regional planning systems for MPA development, driving cooperation and consistency of policies between Mediterranean States. Nevertheless, in most cases, these statuses or forms of recognition are complementary and apply to sites already covered by national protection measures. Below, we provide a list of such tools, without dwelling on their content or distribution in the Mediterranean (see Gabrié *et al.*, 2012):

- World Heritage Sites, resulting from the Paris Convention.
- Wetlands of international importance, under the Ramsar Convention.
- Biosphere reserves under the UNESCO MAB (*Man and Biosphere*) programme.
- The Barcelona Convention and its concept of SPAMIs (Specially Protected Areas of Mediterranean Importance) applicable to marine and coastal areas in their entirety and aiming for region-wide harmonisation. The idea consists of entering sites on the list of SPAMIs based on common identification and management criteria. SPAMIs are State-created MPAs having an efficient, durable legal protection status, while being governed and assessed according to the Protocol's general and special references (Annex I). Reflection is currently underway to establish SPAMIs within international waters. Article 6.g. of the Barcelona Convention specifies that fishing regulation or prohibition is an integral part of SPAMI protection measures. At present, 21 SPAMIs are listed, mainly in the western Mediterranean area (www.rac-spa.org). The institution in charge of the MPA aspect, called RAC/SPA (Regional Activity Centre for Specially Protected Area) was created and set up in Tunis in 1985. In addition to its MPA work, the RAC/SPA also develops action plans for certain species (turtles, cetaceans, cartilaginous fish and seals), whose interactions with fishing activities are frequently brought to light.
- The ACCOBAMS of 24 November 1996 on the conservation of cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area.
- The RAMOGE Agreement for Mediterranean coastal waters protection (France, Monaco and Italy).
- The Pelagos Sanctuary dedicated to the preservation of marine mammals (87,500km²).
- Natura 2000 sites resulting from European law and its latest directive No. 2008/56/EC of 17 June 2008. Natura 2000 works for the development of a network of marine protected areas (MPA) in Member States' waters. The network currently includes 507 sites identified in the Mediterranean.
- The 1968 African Convention on the Conservation of Nature and Natural Resources, revised in 2003 by the Maputo Convention.
- The 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats, which has its own protected area concept named Area of Special Conservation Interest (ASCI).
- The 1973 CITES Convention (Washington) on International Trade in Endangered Species of Wild Fauna and Flora. While this treaty does not directly aim to establish protected areas, the measures prohibiting or restricting international or

regional trade generally involve a reinforcement of exploitation rules and spatial restriction systems.

b) Which definition and which criteria for MPAs in the Mediterranean?

A specific, cartographic database (MAPAMED) using "inclusion criteria" based on the IUCN definition and adapted to the Mediterranean context (Claudet *et al.*, 2011) has been created for the identification and recognition of MPAs in the Mediterranean. An MPA is defined as follows: "any clearly defined marine geographical space – including subtidal, intertidal and supratidal terrain and coastal lakes/lagoons connected permanently or temporarily to the sea, together with its overlying water – that is recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values". According to the authors of the study, MPA selection criteria are based on: 1) the nature of the site; 2) the fact that the site matches the definition of protected area and the definition of a marine protected area; 3) the goals of the MPA (IUCN category); 4) the type of protection; 5) the other criteria (management, time dimension, vertical zoning, etc.). Yet the analysis offers a very broad view of the notion of MPA, including both areas closely related to the sea¹¹, such as beaches or lagoons, and sites that are merely "declared" but which are not officially or legally protected or which are not managed effectively. This latter point is a recurring issue in MPA observation and brings us back to the eternal question of "paper parks" and the frequent difficulties this phenomenon causes: exaggeration of protected surface areas, confusion between establishment and effective management, ineffective protection, loss of credibility of MPA policies, etc.

The MAPAMED database is a Geographic Information System (SIG) jointly developed and managed by the MedPAN association and the RAC/SPA. It is available on: <http://www.mapamed.org/>.

c) MPA as a regulatory area¹²: spatial restriction measures

A marine protected area consists of "a set of legal rules" (Cazalet *et al.* 2012) or a "system of standards", i.e. a whole array of bans, limitations, procedures and controls. This body of rules applies to human activities in connection with marine areas and property. An MPA thus gives rise to restrictions on use and access that restrain the freedom and rights of individuals and groups of users (living, working or recreational space) of the marine area. This is the whole rationale behind any MPA. The Government primarily has jurisdiction to establish and amend the legal organisation of a given perimeter, particularly where this jurisdiction is exercised over marine areas.

In most countries, environmental protection and fishery enforcement are governed by framework laws whereby governments can prohibit, authorise and adjust the various activities at sea. "Fisheries Codes", "Environmental Codes" or extensively documented laws on these

¹¹ We do not consider this point to run counter to certain approaches to integrate watersheds (or other marine areas) into MPA management. As an example, under the French marine nature park status, the management board may give a mandatory opinion on operations liable to have a significant effect on the park's marine environment. It may therefore decide on administrative authorisations concerning farming or other projects (extraction, etc.) located on adjacent land or marine areas (outside the park perimeter) which could involve risks for the MPA.

¹² In the sense "administrative enforcement or policy": a set of general or specific rules (environment, fishing, waters, nuisance, etc.) aiming to govern and regulate the MPA by means of primarily preventive measures.

matters set forth the rules of access and use, the powers of control and repression, the decision-making and management procedures, individual rights, corporate regimes, and the status of maritime property, etc. Such laws are completed by numerous implementing Ministerial or Governmental documents which control the action of the administrative process.

The institutional organisation supplements the normative process by introducing a competent authority with an organisation chart, responsible for MPA administration, management or governance in a variety of ways determined based on the status, goals, context and available resources. From this perspective, a Government's financial interventions are also vital in MPA management:

- Either by taxing certain activities to discourage or select users,
- Or by introducing fees to access sites or benefit from protection services,
- Or, on the contrary, by subsidising activities regarded as positive in the governance process (particularly scientific activities).

In actual fact, the Government is not alone in establishing and managing an MPA. The formal legitimacy of the management rules naturally always stems from a unilateral state decision, but its development and adoption are henceforth punctuated with consultations and negotiations as part of "*participative governance*".

d) MPA as an area of governance

The concept of governance allows an MPA to be seen as a dynamic, context-dependent system taking account of the complexity of marine areas and the diversity of uses to which it plays host. Today, governance has become a federating term commonly used by policymakers, managers, researchers and stakeholders. The nature of such governance, however, is still rather vague, particularly on a scientific level; the different disciplines thus refer to it in the light of their own methods and representations. This reinforces its polysemous dimension, leading to definitions and content which sometimes differ considerably. Without engaging in theoretical debates, this interdisciplinary haziness should at least be analysed according to the various scientific paradigms, "*failing which, it is but utter confusion in MPA management and administration*" (Cazalet *et al.* 2012). We shall simply recall that governance is a neologism proceeding from sociology and political science. It allows us to describe the manner in which MPAs function as "*a societal set*" combining rules of law, power relationships, behaviours, scientific data, institutional framework, market, users, and professionals from various activities, etc.

According to this study, evaluation of the positive effects of MPAs on small-scale fishing activities is part of the indicators of good marine environment governance and its effectiveness and legitimacy, or to coin a widespread phrase, of its "social acceptability". Such evaluation can be carried out from two main and inseparable angles that we will explain in detail below. First, from the perspective of life sciences, several questions and observations relating to MPAs have allowed theories to be developed and confirmed: reserve effect, movements of fish and connectivity, fish density, biomass spillover, food webs and keystone species, functional diversity, specific wealth, interaction between species, interference with habitats, outstanding, sensitive ecosystems, etc. These lines of research¹³ are backed up by

¹³ For example, many species of Mediterranean fish "*change sex during their lifetime. Initially males, some fish subsequently become females (sea bream, sar, bass, mullet, etc.) or vice versa (wrasse, grouper, etc.)*". Overfishing can thus lead to an

concrete results in terms of fish population growth and improved quality of protected ecosystems. Secondly, from a social and economic angle, by focusing on populations of fishermen, we can see and measure the benefits of MPAs on the fisheries economy and its sustainability. Links between protection and fishing are difficult to isolate given the other internal or external factors that also impact MPAs: natural and climatic variability, global change, pollution, and conflicts of use. Lastly, the objectives/effects of MPAs on the ecosystem and small-scale fishing must not conceal the issues specific to the MPA per se, i.e. the factors on which its everyday operation hinge and which guarantee effective and controlled management of the protected site. This is the third fundamental aspect of MPA governance, particularly in its dealings with small-scale commercial fisheries.

2. Objective-based typology of MPAs

a) *Spatial fisheries management: fisheries-focused MPAs*

Here, we will present models of MPAs exclusively devoted to professional small-scale or other fisheries (Garcia *et al.* 2013). This kind of "*hyper-specialised*" protection is based on rules specific to fisheries law and gives force to the generic notion of "*fishing reserve*" recognized in most Mediterranean countries¹⁴. The GFCM (General Fisheries Commission for the Mediterranean) has initiated work to inventory these fishing reserves in order to pool analysis capacities and the results obtained on a regional scale.

In France, fishing reserves or fishing ¹⁵ are specific legal tools for the establishment of fisheries-focused MPAs, particularly for small-scale fisheries. They are established by the Minister (with delegation to the director of fisheries), and they are monitored by the authorities in cooperation with professional organisations; they are also generally monitored scientifically to assess their effects. In fishing areas, bans concern: 1) either all forms of fishing, whatever method is used; 2) or the use of vessels having a certain tonnage or power; 3) or the use of certain fishing vessels. The most frequent ban is that on any form of fishing.

In the French Mediterranean, the example of the Cap Roux fishing area (450 hectares of no-take area) in the Var County illustrates the novel governance of a site created at the request of small-scale fishermen. The *prud'homie*¹⁶ of St Raphaël, the holder of fishing rights on its territory, was put in charge of the area's management upon its establishment in 2003. In reality, it is responsible for monitoring compliance with the ban by professional fishermen according to two key principles of the *prud'homie*: community discipline and mutual control. The government authority only takes action in support of local fishermen to control recreational and submarine poaching and incursions of professional fishermen external to the *prud'homie*. The MPA's main advantage appears to be its derisory cost (no budget or creation of any management institution) compared to the biomass spillover effect recorded, measured by researchers from Nice University (Seytre *et al.* 2008, Francour *et al.* 2013) and confirmed by professional fishermen.

excessive catch rate of young individuals, which disrupts the balance between sexes and jeopardises breeding (Meinesz, 2008).

¹⁴ Globally, the term "refuge" can sometimes be used (Garcia *et al.* 2013).

¹⁵ Art. L922-2 of the French Rural and Sea Fisheries Code (*Code rural et de la pêche maritime*).

¹⁶ In the French Mediterranean, *Prud'homies* are traditional Professional Institutions that represent and locally manage fisheries, particularly small-scale. Although they have not retained their full competence that was almost exclusive (under Government supervision), they are still the historical foundation of artisanal fisheries in the French Mediterranean.

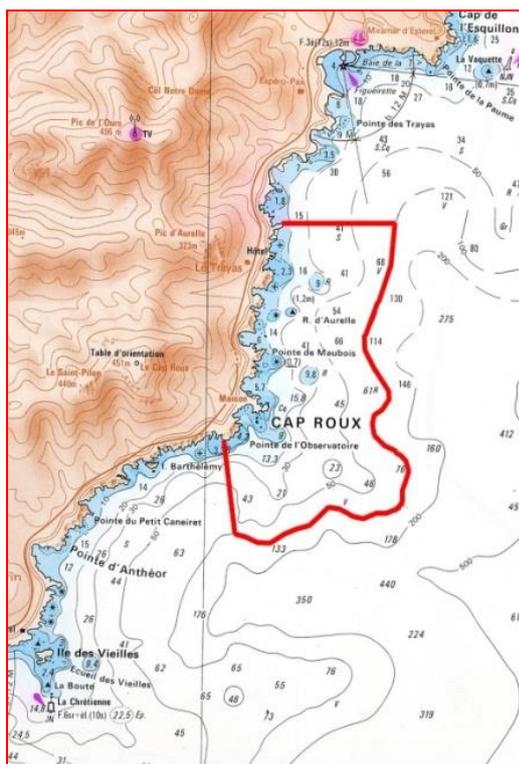


Figure 2 : The fishing reserve (cantonnement) of Cap Roux (base map : SHOM).

In this respect, small-scale fishermen can regard an MPA as a highly legitimate tool and as a factor of efficiency helping to reinforce professional discipline (individual or collective). Some other interesting focuses can also be contemplated in spatial management of artificial reefs. Artisan fishermen often show unanimous interest in these seabed planning and restoration structures. Yet, artificial reefs also perform a great number of recreational, sports and landscape functions for the benefit of other marine environment stakeholders. The multifunctional role of reefs is such that "*à la carte*" immersion strategies (design, sites, depth, target species, etc.) can be considered, with a view to responding to different expectations and fostering better distribution of uses and benefits. In reality, "*post immersion*" management problems are frequent. Reefs sometimes even spark off new conflicts when decision-makers and managers have failed to anticipate the nonetheless material challenges of their governance in a consensus-building and planned framework, integrated or not in an MPA system. Except for Japan, the historical leader in such matters, there is little available data about the governance of artificial reefs in the Mediterranean in an integrated framework, adapted to exclusive or non-exclusive uses (Cazalet 2009, Cazalet *et al.* 2010 & 2011).

In addition to the GFCM's inventory of fishing reserves mentioned above, the other regional initiatives for spatial fisheries planning do not directly or specifically concern small-scale fisheries. For memory, we will mention:

- The 2005 ban on deep trawling (beyond 1,000m)
- The four fishery restricted areas designated in the high sea (beyond territorial waters) by the GFCM, over an area of 17,677km²: 1) Gulf of Lions slopes; 2) Lophelia de Capo Santa Maria di Leuca reefs; 3) Eratosthenes seamount; 4) Cold springs of the Nile Delta

In fact, a draft resolution¹⁷ is currently in progress on "the management of protected areas, including Specially Protected Areas of Mediterranean Importance (SPAMI) in the GFCM competence area". Lastly, at the same session, the GFCM agreed to create a *"Transversal Working Group on Marine Protected Areas, with the following terms of reference:*

- *Review the state of existing Marine Protected Areas in the Mediterranean and Black Sea, including assessment of the state of the ecosystem and human dimension, compliance with resolutions and functioning of the monitoring.*
- *Review the state of existing proposals for new Marine Protected Areas, including advances and requirements for promoting the establishment of protection figures such as FRAs or SPAMIs.*
- *Propose technical solutions to harmonize different criteria for the establishment of MPAs and FRAs, including on the basis of Resolution GFCM/37/2013/1.*
- *Identify potential new Marine Protected Areas, including both ecosystem and socioeconomic analysis and identification of needs for a formal protection proposal. In particular, the WG will assess the benefits of FRAs for protection and recovery of endangered /overexploited stocks in the GFCM area.*
- *Evaluate current monitoring systems for Marine Protected Areas and propose improvements and modifications as needed."*

Closer connections between fishing and MPAs are today put forward as a real political ambition on a regional scale, to improve conditions of cooperation and coherence in spatial planning of Mediterranean fisheries.

b) Preserving the environment and its resources

An MPA primarily aims to produce positive bio-ecological effects for the natural environment and its resources, even if according to Gascuel *et al.* (Garcia *et al.* 2013) there *"are, in reality, only few empirical studies that scientifically prove their efficiency"* (Halpern 2003, Rice *et al.* 2012). The ambition to improve the status of marine ecosystems first stems from the finding that they are impaired to varying degrees and that such impairment must be curbed.

Among the causes of deterioration and loss of biodiversity, fishing, and particularly overfishing, can play a significant but seldom exclusive role, particularly in the context of small-scale coastal fisheries in the Mediterranean. The latter are today merely one component among other high-impact activities, combined with a multitude of other factors: other removal practices (both professional and recreational), excessive visitor numbers (mooring, diving and other practices), global change, pollution, deterioration of the coast and drainage areas, urban development, etc.

¹⁷ See the report of the 37th Session, Split, Croatia, 13-17 May 2013, and Resolution *GFCM/37/2013/1*:
<http://151.1.154.86/GfcmWebSite/docs/Reports/GFCM37-FinalConsolidated-withAnnexes-e.pdf>
http://151.1.154.86/GfcmWebSite/docs/decisions/GFCM-Decision--RES-GFCM_37_2013_1-en.pdf

The bio-ecological effects of an MPA will thus depend on its assigned objectives, its specific situation (ecosystems, demographics, socio-economic activities, etc.), and its resources, size, management methods, etc. To assess the effectiveness that MPAs aim to achieve with respect to the environment and its resources, Gascuel *et al.* (Garcia *et al.* 2013) remind us that *"most studies analyse the bio-ecological effects of strict nature reserves (ban on all activities), but few concern multi-use marine protected areas. This is easily explained as strict nature reserves are an attractive study model; when bans on fishing are complied with, the effects observed are generally very significant and can, almost certainly, be attributed to the ban. Conversely, multi-use areas are complex systems in which numerous activities interact, rendering all evaluation of the effects of the protection area difficult"*.

From this point of view, the importance of science is vital in marine protected area governance (Cazalet *et al.* 2012). It is no doubt the most stimulating factor in protection policy development. Scientific expertise provides the best input to political conservation paradigms and their results: it justifies the harshest restraints on individual and collective freedoms. Scientific officials have a decisive influence on the functioning of marine areas. Scientists often also have privileged access rights allowing research teams to carry out numerous "dispensatory" practices in the areas of navigation, scuba diving, and withdrawal of marine resources or materials: such rights are based both on "monitoring" the status of the protected environment, but also on furthering knowledge of natural marine phenomena. Conservation can have knock-on economic effects on certain activities, including artisanal fishing, but this is not the founding aim of projects to create "conservationist" MPAs.

The active involvement of local fishermen in scientific governance of MPAs appears as a major objective, to contribute significantly to the observation, monitoring and evaluation of protective measures in relation with extractives activities and spatial management. The historical sustainability, sometimes millennium, and the adaptability of coastal fisheries to their environment shows a strong accumulation and transmission of empirical and vernacular knowledge essential to the daily exercise of fishing practices : knowledge of environments, species, their behavior and their distributions, consideration and integration of changes (positive or negative), sometimes explained (spillover effect) or unexplained, but immediately recognized and assimilated by fishermen, etc. In the context of intense scientific research in MPAs, the contribution of fishermen, as sources and eyewitnesses of the state of the environment and resources, can be very valuable for researchers and managers.

However, the spirit of cooperation and mutual integration efforts between fishermen and scientists are not always effective or systematic. In the Mediterranean, the fishermen have a natural distrust of outsiders wanting to know, to deepen their practices, knowledge (sometimes secretly kept...), their observations and perceptions. Multiple and seasonal nature of fishing activity is complex to understand, providing to the fisherman many adaptation means and relative freedom in the daily exercise of its different technical and strategic approaches. Still very attached to the versatility (diversity, polyvalent) dimension which structure its behavior, the fisherman may be considered "too risky" to reveal objectively all its activities, knowledge, strategies and results. Fearing that it might turn against him and interfere with his multi-skilled capabilities in case of a negative scientific assessment, ultimately judging that its practices are too impactful, too much predatory or too little regulated against expectations of an MPA or a broader protection policy. This reasoning

applies in particular for monitoring catches¹⁸ and evaluation of fishing effort individually or collectively. This reluctance and these "a priori" are not automatic, but all the more justified the need to establish trust relationships between fishermen and scientists. These are also equally concerned with the openness and cooperation effort they need to engage and maintain with small-scale fishing. Indeed, science and fisheries are governed, rather paradoxically, for many certainties and assumptions (postulate) that do not always promote mutual rapprochement. Now, these two worlds have much interest in working together to remove uncertainties and indeterminacies surrounding their activities. MPAs manager's role seems important here in its intermediary function, close to fishermen due to its permanent presence, it is also narrow linked to scientific research and its networks, which he is himself often derived.

Scientifically, MPAs have followed quite a similar path to fisheries development. During the period of fisheries industrialisation, Governments established scientific organisations reporting to them and responsible for gathering scientific data about fish resources. They were also responsible for promoting the exploitation of such resources by disseminating industrial production techniques, in line with the productivist farming model. These administrative organisations are now required to design and monitor marine area conservation measures. In most cases, these organisations enjoy a legal status that recognizes a certain degree of autonomy¹⁹ and they are designated by names inspired by academic institutions, i.e. institutes, laboratories, boards, research centres, etc. However, they are still mostly responsible for collecting biological information and promoting industrial fish production techniques. They are more of an "engineering science" under the governance of their Minister than veritable independent research centres.

c) *Management and protection of multi-use areas*

We saw above that the bio-ecological effects of MPAs are mainly assessed scientifically in no-take zones, provided they are efficiently preserved. No-take zones are the yardstick of absolute protection, exclusively devoted to scientific access and monitoring, and enabling effects both inside and outside the MPA to be compared in optimal conditions. Yet, the creation of strict nature reserves is a basic premise, a determined choice inevitably made via a rather "*directive*" (or authoritarian) process giving priority to nature to the detriment of human activities. This unilateral choice, which may be prompted by the urgent need for protection, often gives rise to contention and objection, especially from fishermen when they are excluded from their working areas. The expected benefits of a strict nature reserve demand a minimum amount of time to materialise. Therefore, spatial exclusion by establishing no-take zones can immediately engender losses (very often without any compensation) for fishermen. Such a decision is never easy to justify, particularly when it challenges a pre-existing model of socio-economic operation. An MPA cannot therefore be conceived solely through isolation or exclusion, but also favours more "moderate" methods, so that the economic and social dimension is integrated when developing a protection project.

In this configuration, MPAs have other functions and aims, generally complementary to protection, but their implementation demands a long-term, integrated vision of the MPA's

¹⁸ Note that some countries impose now to small-scale fishermen to record consistently their catches and landings daily through logbooks (species, number, size, weight). These data are then recorded and processed by the authorities of fisheries management and scientific monitoring.

¹⁹ Examples: IFREMER in France, Albert 1st Foundation in Monaco, Spanish Institute of Oceanography, Italian Thalassographic Committee, National Fishery Office of Morocco, etc.

management. Uses of the marine and coastal area are improved in order to achieve an optimal balance between protection and the continuation or development of economic activities, including small-scale fishing.

In more concrete terms, MPA governance will be characterized by spatialised modulation of access rights between the various stakeholders and users. Marine areas are common property, the management and administration of which are vested in Governments which must manage them on behalf of the populations they represent. In theory, Governments must therefore manage these assets in the general interest and keep them in a satisfactory condition for future generations. Management and conservation policies thus lead States to define categories of users and to grant them different access rights based on their status. MPAs illustrate these "*discriminatory*" policies (positive or negative depending on the stance adopted): fishermen, researchers, local populations, certain tourism industry agents, etc. have particular access rights that differ from ordinary users.

Most often, these access rights are defined by the regulations that accompany the creation of MPAs. Such regulations set out the different rights based on the profession, origins or activities of the various groups of people. Fishermen have a particularly emblematic status in this regulatory situation. In Mediterranean countries, there are some significant disparities in the conditions of access to the fishing profession, which is more or less clearly defined, restricted or otherwise, particularly for small-scale fishing. Most countries recognise a "people of the sea" status and especially that of fishermen defined as "*the legal and administrative regime applicable to individuals effectively carrying on the profession of fisherman*". This regime is a manner of limiting access to resources to a regulated profession. It firstly comprises a list of conditions to be met in order to be covered by the special regime²⁰. Ultimately, the status of fisherman grants special access rights with entitlement to use certain equipment to catch fish: ships, special vessels, etc. For marine area managers, the status and classification of fisheries is a method of control in conservation policy implementation.

In addition to access rights based on individual status or category, modulation of occupancy rights, particularly via concessions, is also a means of controlling exploitation of public assets²¹. The marine areas sector is particularly affected by the concession system which constitutes a means of adapting private activities on protected public areas and resources. A concession may be granted to an individual, a group of individuals, a commercial or industrial undertaking, a public or private organisation, a trade union, a cooperative, a local authority, a corporation, a village, and so on and so forth. It aims to facilitate sustainable management of the resource through "private", but supervised and controlled ownership of the area²². The permits granted by the State are a widespread means of controlling access to MPAs in the form of concessions of areas, services, resources or regulatory powers.

²⁰ Very often the composition of crews organises *maritime categories* defined on the basis of seniority, qualification, and specialisation in a type of fishing or navigation. This status also includes a maritime social security scheme and professional duties. In most countries, the public authorities have a classification by type of fishing, thus enabling them to adjust access rights, often in a rather arbitrary fashion: artisanal, industrial, coastal, canoe, traditional, deep-sea fishing, etc. Similarly, the organisation into specialised fisheries segments the profession to better control access to and exploitation of resources.

²¹ "*a concession is the contract whereby the Government authorises an individual to exploit common resources, on its behalf, or to occupy public areas, or to do work or provide public services on behalf of the authorities*". It is the best documented legal form of "public-private partnerships" (Féral, 2012).

²² Due to its characteristics, the concession system does not therefore offer the guarantees of land ownership and is most often based on temporary, unilateral, revocable authorisations, without granting the concession holders any rights in rem in or

The example of fishing licences is a good illustration of this method: by administrative decision, a limited number of people are authorised to fish a certain amount of resources. A concession may also encompass all or part of the Government's service or enforcement activities to improve protected area governance. Systems of public facility concessions and delegations of public services also allow private resources to be involved in the administration of marine areas and fees to be levied to pay for conservation-related services: use of environmentally-friendly mooring facilities, landing stages, car parks, compulsory use of public transport to visit protected sites, retail outlets and museums adjoining protection areas, etc.

d) MPA planning and networking

The preparation and development of maritime policies fosters the creation of international expertise networks capable of providing objective data for MPA management. The scientific bodies of Government departments are not the only ones to take an interest in knowledge of the sea. Universities, institutions, private foundations and networks of individuals are involved in monitoring and assessing the status of the seas and oceans. This effort has particularly gained in amplitude since the signing of the Rio agreements in 1992 (particularly the biodiversity aspect). National and international scientific networks have thus formed to pool their experience and databases and to partake in scientific cooperation programmes. In universities, the depth and extent of marine environment issues have led to the creation of research units and programmes and to the emergence of new scientific themes. These networks are scientific, but also have an advocacy focus, the scientific community being very much in favour of conservation measures. "Non bureaucratic" public research and private research thus participate increasingly in the administration and governance of marine areas, due to their expertise and socially responsible initiatives.

Scientific emulation around MPAs contributes to the development of planning tools on a regional scale, the main examples of which include:

- The identification of EBSA (ecologically and biologically significant areas) by the RAC/SPA (SPAMI Protocol of the Barcelona Convention). This extensive work helps improve the representativeness and clarity of Mediterranean MPAs (Hoyt and Notarbartolo di Sciara, 2008, UNEP/Map-RAC/SPA, 2010);
- Integrated coastal zone management (ICZM Protocol of the Barcelona Convention) Art. 4-3e: "*(...) promote the integrated management of the coastal zones, taking into account the protection of areas of ecological and landscape interest and the rational use of natural resources*";
- The Marine Strategy Framework Directive (MSFD – European Union) seeking to achieve "good environmental status" by 2020, gives marine protected areas a key role in coordination with Natura 2000 in the marine environment.

Scientific cooperation also articulates with the development of the network of MPA managers initiated and led by MedPAN association. The experience of different exchanges made in MedPAN programs has helped the strategy of creating some MPAs and developing

to the fishing resources or areas. This legal situation naturally raises the question of the precariousness of the companies' operating rights, the question of capital structure, and of amortisation and return on investments.

their management plan (Bonifacio, Scandola, Port Cros, projects in Croatia, Algeria Tunisia Libya, etc.). Around "9 founding members, 43 members and 27 partners from 18 Mediterranean countries" (<http://www.medpan.org/membres-et-partenaires>) MedPAN encourages: 1) the exchange of experience between managers Mediterranean protected areas, 2) the development of management tools. Three strategic focuses direct its action for the 2013-2017 period:

- Be a network for knowledge, information, anticipation and synthesis;
- Reinforce the vitality of the network, interactivity between members and build their capacity for effective management of MPAs with stakeholders;
- Reinforce the MedPAN network's sustainability, prominence, governance and resources.

Relations with small-scale fishermen and their representatives are therefore ongoing, and even increasingly close and mutually enhancing with the development of the MedPAN network. Small-scale fishing is often a structuring activity in or around an MPA, especially in Mediterranean coastal areas. We will see below that networks specific to fisheries policies and stakeholders also exist and are developing alongside those of MPAs. These organisation and cooperation processes aim to consolidate the bases of small-scale fisheries, to support them in their sustainable management goals and their aim to maintain the wealth and diversity of their fishing activities, often overlooked or even contested in their own living and working environments. Several recent sub-regional projects and initiatives will illustrate this situation in the Mediterranean.

3. MPA distribution, design and surface areas

The question of MPA design is at the heart of conservation objectives regarding fisheries resources and sustainability. The term can be considered to encompass both the size and the position (map) of the MPA, and the possible interconnection of the various zones it comprises. This first choice is decisive for the results and expected benefits of the MPA.

a) *Territorial basis of MPAs*

The biological and ecological considerations mentioned above are materialised geographically: in what kind of outstanding or priority environment should an MPA be established? The examples of protection below clearly illustrate (among others) the wealth and diversity of sites in the Mediterranean: **1)** bays (Cabrera National Park in Spain, Al Hoceima National Park in Morocco); **2)** gulfs (Gulf of Castellammare fishing reserve, Italy); **3)** deep sea zones featuring canyons and sea mounts: projects, studies and proposals in Catalonia, Gulf of Lions, the Ionian Sea, the Balearics, Crete, the Aegean Sea, Liguria, the Nile Delta, etc. (see GFCM, reports of the 32nd and 33rd Sessions, 2008/2009, Rome); **4)** nursery, breeding and exportation sites (Spanish marine reserves, Zakynthos marine nature park in Greece); **5)** Posidonia grass beds (Côte Bleue marine park, Cap d'Agde Natura 2000 site, France) and other shelter environments (red coral reserve and Larvotto marine reserve in Monaco); **6)** symbolic and threatened species: cetaceans (Pelagos international sanctuary), groupers (Cerbère Banyuls nature reserve in France, Secche Di Tor Paterno MPA in Italy), seals, turtles (Fanar Ibn Hani, Om Al Tayour and Rass El Bassit in Syria); **7)** migration

corridors²³: studies and proposals in progress for bluefin tuna (sanctuary, Monaco), for anadromous species (salmon, sturgeon) and catadromous species (European eel); **8**) around non-inhabited or little anthropised islands and islets (Medes Islands marine reserve in Spain, Port Cros National Park in France, Maddalena archipelago, Tuscany archipelago National Park and Isole Ciclopi MPA in Italy, Galite Islands nature reserve, Zembra and Zembretta National Park in Tunisia); **9**) straits (international marine park between Corsica and Sardinia, France and Italy, strait of Sicily as part of MEDSUDMED); **10**) capes (Cape Madona natural monument in Slovenia; **11**) lagoons (Ain Gazala, El Burdi, Ain Ziyana and Farwa in Libya) and most wetlands of international importance (Ramsar sites), etc.

As we mentioned above, scientific criteria are not the only decisive criteria, as they are very often weighted by socio-economic requirements and objectives: typology, spatial and temporal distribution of fishing activities, fishing effort and capacity, catch monitoring and trends, stock assessment, overall social and economic situation of the fishing sector, etc. The economic weight of the profession, its organisation, its representativeness, and its ability to “pressurize” are extremely important in the decision-making process leading to the delimitation and creation of an MPA. In this respect, the example of Spain emerges as significant. Along its Mediterranean coastline, there are no less than seven MPAs with status as marine reserves “of importance for fishing”²⁴. The oldest of them were established almost 25 years ago (Tabarca Island marine reserve in 1986), and the fisheries authorities are responsible for their management in close connection with the decentralised authorities (autonomous communities) and professional organisations of fishermen who are mainly artisans (*Cofradias*). The reserves are delimited based on uses and “traditional” fishing sites. Spain is the third largest producer in the Mediterranean (number one in the EU for fishing and aquaculture) and its fisheries economy has always been a national priority, even before attentions turned to environmental concerns during the 1990s and before other MPA categories developed. As one thing possibly explains another, integration between MPA and fishing emerges as functional and constructive.

b) MPA zoning

Regarding fisheries, the zoning chosen for an MPA is often indicative of intense preliminary negotiations, which may be formal or informal and more or less based on consensus. They lead to differentiated regulations supposed to justify the design and spatial breakdown of the MPA. Recognition of a central no-take zone is a key feature, including guaranteeing its long-term effects on biomass spillover and an increase in fish stocks for the benefit of local fishermen. Beyond this zone, classic expansions of the zone expand into neighbouring areas (buffer zones and transition areas) which allow extractive activities and intrusions to be gradually better regulated and controlled. Like the Spanish system, French and especially Italian models reveal a long-standing interest in fisheries MPAs in the legal form of fishing areas (France, 1852 decree and 1963 by-law) and “biological protection zones” (Italy, 1965 law and 1968 decree). The establishment of “non-fishing” perimeters substantially simplifies the zoning problem, very often limited to one or two protection “strata”, reflecting the objective pursued and the target stakeholder group²⁵. The opening of

²³ The corridors argument is also raised in respect of marine biotopes to improve the interconnection between “patches of similar habitats or within a habitat strip” (inside and outside MPAs) and thus enable a better “spill of individuals into local fisheries” (Ramos Espla, *in* MedPAN 2006).

²⁴ Resulting from a 1980 decree on “fish restocking areas”.

²⁵ There are many examples of fishing preserves that are subsequently expanded and re-qualified as “traditional” multi-functional MPAs by creating new adjacent areas.

the coastline to recreational, contemplative, pleasure boating and mass tourism activities has greatly changed perceptions of zoning. Even though it still expresses the scientific credibility of the MPA as a conservation tool, zoning is now a tool used in the management of conflicting access and uses.

Designing the geographic and regulatory structure of an MPA is an increasingly lengthy, complex and “political” operation. The steady expansion of marine protected areas inevitably creates increased resistance or opposition and even conflicts on the part of professional fishermen. In other words, people and their divergences must be managed before managing the fish. In addition, with the concept of joint participation in decision making or participative governance between the State, public services, local authorities, NGOs and all the stakeholders, purely biological aspects are of relative importance in MPA creation and management. The multiplication of functions within a single MPA can weaken its normative influence and responsibilities and confine managers to a role of arbiter without any real capacity or efficiency in the institution's overall management. For these reasons, the principles of fishing reserves which are specifically designed “for” fishermen and that are agreed with them (with zoning to foster restocking) therefore remains a good way of paying special attention to fishing activities and the people whose livelihood depends on the exploitation of a natural wild resource. In the Mediterranean, the Spanish and Italian models and, to a lesser extent, French models reinforce this analysis. The efficiency of existing systems must however now be effectively assessed.

c) *MPA dimension*

Owing to the uncertainty and controversy that still surrounds the question of optimal MPA size, specialists adopt a “pragmatic” attitude and advocate a minimum surface area of 1,000 hectares, without any real maximum limit (Ramos-Esplà, *in* MedPAN 2006 - Tisdell *et al.*, 1989).

Type	Adult phase	Embryonic and/or juvenile phase	Examples	MPA size (ha)
A	fixed or territorial	direct development	Syngnathidae	<1,000
B	fixed or site dependent	planktonic larvae	Serranidae, lobsters	10 ³ -10 ⁴
C	adult territory ± diffused (demersal or pelagic spp.)	direct development(egg-laying zones)	Cephalopoda	10 ³ -10 ⁴
D	adult territory ± diffused (gregarious demersal spp.)	planktonic larvae	Merluccidae, Mullidae	10 ⁴ -10 ⁵
E	large adult territory (gregarious pelagic spp.)	nursery and/or spawning areas	Thunnidae	10 ⁵ -10 ⁶
F	large adult territory (solitary pelagic spp.)	planktonic larvae or direct development	Xiphiidae, pelagic sharks	> 10 ⁶

Figure 3 : Relationship between spatial scale of the site-related or dependent phases of the adult and embryonic stage relative to the minimum size of MPAs (modified from Kenchington, 1990) (Ramos-Esplà, in MedPAN 2006).

Once again, this aspect must be correlated with zoning, particularly to determine the appropriate size of the no-take zone, from 10-20% (Ramos-Esplà, *in* MedPAN 2006) up to 35-40% of the MPA's total surface area and ideally of the oceans and regional seas.

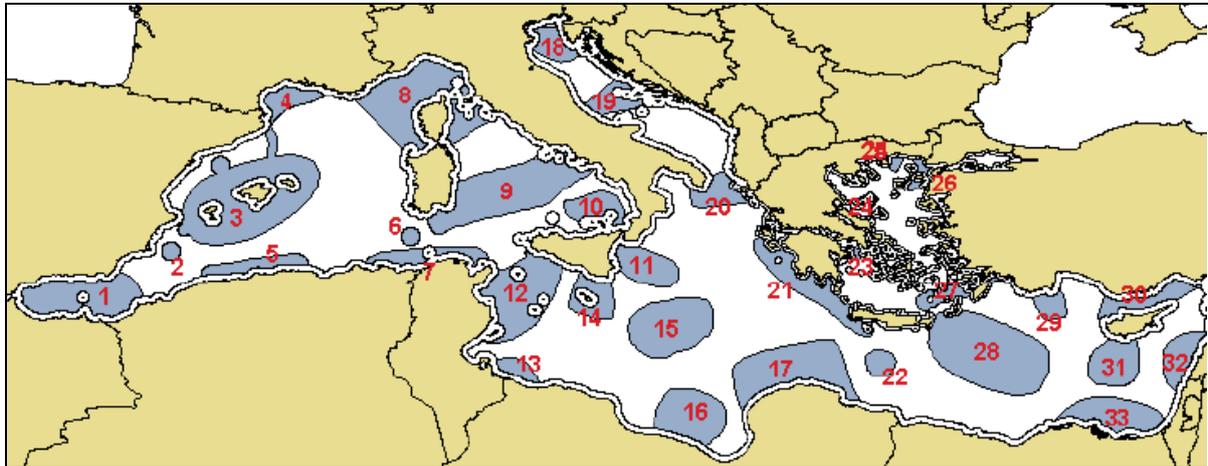


Figure 4 : A proposal by Greenpeace (2006) for the protection of 33 Mediterranean sites.

Choosing between one large MPA or several small MPAs is also a subject of great debate²⁶. A single MPA implies that it be relatively “autonomous”, capable of achieving several aims and coherently performing a maximum number of functions, including on the land/sea interface. The largest examples include: 226,500 hectares for the Alonissos-Vories Sporades National Marine Park (Greece); 76,300 hectares for the Datça-Bozburun specially protected area (Turkey); and 53,993 hectares for the Isole Egadi MPA (Italy). The multiplication of small-scale MPAs is more in line with a networking process aiming for a “high likelihood of connectivity” (Ramos-Esplà, *in* MedPAN 2006), between sites and better protection against environmental factors that are difficult to predict or control, particularly those relating to climate change.

In the Mediterranean, the predominance of small MPAs can be explained more by social and human reasons. The high degree of coastal urbanization, tourist numbers (permanent or seasonal) and growing economic stakes are all forms of localized pressure unwilling to take major environmental constraints into account. Regarding fishing activities, the prior existence of fishing areas spread between the coastal communities on the Mediterranean can be an obstacle to the establishment of an MPA. An MPA leads to a reconfiguration of the marine area liable to be seen as a factor of imbalance between neighbouring groups of fishermen, by penalizing the economy of some for the benefit of others. Furthermore, entrusting decentralised institutions with the management of marine areas applies more naturally to small MPAs as they are adjacent to the land areas over which the local authorities have jurisdiction. Such authorities prefer to have one or more small

²⁶ We also refer to SLOSS controversy: *Single Large Or Several Small*.

MPAs that they will effectively govern, rather than be incorporated into regional or national technocratic “superstructures”, where burdensome decision procedures lead central Government to make *de facto* decisions and manage with authority (Féral *et al.* 2012 and 2013).

II. MPA EFFECTS ON SMALL-SCALE FISHING IN THE MEDITERANEAN

The analysis of the effects of MPAs on small-scale fishing in the Mediterranean *per se* is provided in sections 2 and after. The proposed elements are mainly the result of recently-published or ongoing/in publication synthesis works (Garcia *et al.*, 2013, Boncoeur *et al.* 2013, Gascuel *et al.* 2013, Francour *et al.* 2013). Salient results from the complex methods for bioecological and bioeconomic analyses (mathematical calculations, modelling, indicators, etc.) are also aimed at being captured. The focus will thus be on theoretical approaches using concrete examples and field assessments likely to feed reflections on the effects of MPAs on small-scale fishing. The first section was added as a foreword and reminder of the main characteristics of small-scale fisheries in the Mediterranean, their current evolutions with regards to MPA policies.

1. Characteristics and situation of small-scale fisheries in the Mediterranean: a spatial dimension intrinsic to professional activity

a) General considerations

This summarized presentation of Mediterranean small-scale fisheries aims to recap the main elements characterizing them as complex and multiple activities²⁷. Although they represent around 80% of active vessels, data available on this sector remains fragmented (monitoring, statistics, etc.), in particular with regards to other industrial or semi-industrial fisheries. Existing data is general (Farrugio 1991, Sacchi 2011, Ifremer, 2008) and mainly technical (fleet, vessels, tonnage, power, etc.) and offers little information on economic, macro-economic or sociological aspects. This may appear paradoxical at first sight, but it can be partially explained by the very specific structure of these fishing firms and their organisation and functioning, which is sometimes hard to comprehend and gain access to. Moreover, for several decades, public interventionism has given priority to the industrialization and economic concentration of the fishing industry, with only secondary focus on small-scale activities (Féral, 2004).

Lastly, we will once again touch briefly on the debate of “artisanal” or “small scale” fisheries regarding language and associated contents. This will mainly concern considerations relating to legal and ‘sector’ definitions etc., and the interpretation which varies according to regions, country and administration. The FAO recognizes this lack of unanimity regarding artisanal or small-scale fishing. These two expressions differ in terms of criteria: 1) “artisanal” refers mainly to the structure of the fishing firm (limited capital, know-how, owner on board, etc.) whereas; 2) “small-scale” introduces the notion of a geographical limit (distance, duration of trips) and technological limit (small boats). The artisan and his firm have a generic meaning (in a legal and economic sense, etc.), but their definition remains ineffective and illegible in national legislation. Therefore, the term “artisanal fishing” had been generalized

²⁷ See in particular the results of the POLYPÊCHE project (Fondation de France, N° Engt. 00021935) 2012-2013, *Pêcheurs Côtiers Polyvalents de Méditerranée française : Gestion et Territoires Halieutiques Durables*. CERTAP EA 4216, Université de Perpignan Via Domitia (UPVD) et EME (UMR 212) Institut de Recherche pour le Développement (IRD), Sète.

for practical reasons, to differentiate it from industrial fishing, but the term is not pertinent and may refer to very diverse realities. Small-scale fishing may appear more precise, but it is also more limiting than the "artisan" notion. Many opinions now converge on the definition of small-scale fishing according to 2 or 3 major criteria: 1) vessels measuring less than 12m; 2) trips limited to 12 or 24 h maximum; 3) absence of trawling. For example, the definition of small-scale fishing has legal pull in European law and, as a result, on member States. Artisan fishing encompasses a wider approach, in which boat size and techniques alone are not discriminatory. Boats of over 12 metres and trawling can absolutely be used for artisan fishing on a limited scope in the economic, social and legal sense. The frontiers between the various categories are not sealed and we should avoid scheduling these fisheries too strictly.

The criteria for small-scale fishing, and their evolution, also have a major ecological and political dimension. As a coastal activity, small-scale fishing often takes place in rich and fragile environments impacted by other activities (industrial pollution, mass tourism, coastal planning, etc.), but essential to natural cycles and biodiversity. For these reasons, it is important to ensure fisheries have a well-managed and balanced impact on ecosystems. Moreover, the Mediterranean represents renewed efforts for the development of coastal MPAs, in or around which the integration of small-scale fisheries ought to be ensured in order to secure the benefits that ensue from the protective measures.

b) Profile of Mediterranean small-scale fisheries

(1) Fleets and professional activity

Mediterranean fisheries are mainly small-scale and multi-specific. This type of fishing, categorized in France as "*petits métiers*" (*artes menores* in Spain, *piccola pesca* in Italy, etc.), is characterized by boat length (length < 12m, limited tonnage and engine size²⁸), a low level of specialization and the use of various catching techniques according to the season, site and sought-after species (Sacchi, 2011, 2008). However, the polyvalent nature of the boats can take several forms and cover various "*workmanship*"²⁹, e.g. net, encircling net, creel, fyke net, line, longline, basket, dredging, shore fishing, diving etc. For example, some fishermen may be exclusively drift-netters and considered as "specialized" whereas they actually use several netting techniques (trammel, gill net, combined net, drift nets, etc.) with different meshes, targeting different species according to the spatio-temporal conditions of their activity. This polyvalent character can therefore equally refer to the diversity of fish or techniques. Small-scale fishermen may sometimes appear as specialized in a near-exclusive species or technique³⁰. However, the uncertainties inherent to all professional fishing activities encourage small-scale fishermen to maintain a certain degree of polyvalence, and avoid being entirely dependent on a single technique or species³¹. The main advantage³² of

²⁸ Small-scale fishing uses little fuel and generally benefits from tax-free professional prices, but the regular increases in energy costs are now impacting this category and contributing to the progressive rise in their overheads.

²⁹ 45 types of techniques have been recorded in the Mediterranean.

³⁰ In the Sixties, the development and cost-effectiveness of eel fishing in Mediterranean lagoons (France, Italy, Corsica, Maghreb, etc.) led certain fishermen to specialize in this species (green or silver eel) using a particularly efficient catching technique (creel and fyke nets) specific to eels, but also capable of catching other fish and shellfish. Stock depletion and the CITES classification of this species (international sales ban) largely weakened this activity, coupled with very restrictive management/replenishment plans (spatio-temporal restrictions), and even certain financial aids to encourage stoppage through the paid destruction of boats (as in France).

³¹ Specialization is generally a term used for industry and its mass catches: a single technique (trawling, purse seine nets, long line) and/or a single species or group of species (blue fish, red tuna, anchovy, sardine, etc.)

polyvalence is that it allows great flexibility and daily adaptation to natural conditions, species present and even certain market demands.

The professional opportunism of small-scale fishermen is not therefore void of a commercial and economic strategy. Professional fishermen always primarily target species with high added value (bass, gilthead bream, sole, whiting, murex, red mullet, striped sea bream, spiny lobster, bonito, etc.), likely to maximize the results of their efforts. Nevertheless, many other species that are less interesting from an economic viewpoint, or "chance" species, are also captured and sold, sometimes at very low prices (mullet, Mediterranean bream, bogue, mackerel, etc.). One of the main difficulties with fishing is managing a "basket" of species of varying economic interest every day. Moreover, the fisherman is confronted throughout the year with imbalances caused by variations in species abundance, in particular between those with high added value and those of mediocre interest. With these fluctuations, periods of good catches alternate with slack periods or even shortages. Variations in abundance have a substantial effect on prices and on the capacity to absorb local demand, especially in terms of wholesale and retail wholesale (auction, merchants, cooperatives, etc.) and at certain times of year. For private small-scale companies with limited volumes, problems relating to irregular prices can be particularly penalizing.

On a commercial level, *"small-scale production mostly targets nearby markets and fresh, varied produce sold directly to consumers. Some may, however, contribute to the export market in a significant manner (eel and octopus fisheries, etc.)"* (Sacchi, 2011). The question of the economic performance (product marketing / promotion) of small-scale fisheries is particularly essential in that it offers a very varied supply (nearly 100 demersal species and many pelagic species – Sacchi, 2011). However, the public is unfamiliar with many of these species (eating habits) and they are therefore difficult to promote beyond local markets and direct sales. Similarly, the importance of marketing can also be considered upstream within the spatial management of individual fishing effort. This aspect often seems to be set aside, while an improvement in averaging selling prices is likely to reduce the fishing pressure as the saying goes "fishing less, but sell better." The role of MPAs may appear here important in their ability to support self-regulation efforts by small-scale fishermen by providing a significant capital gain in the valuation (labeling, traceability, infrastructure, etc.) of the products coming from the MPA or its effects and its contribution to a sustainable use of the marine environment. Fishing firms have an individual profile with an on-board owner (boss), sometimes shouldered by one or two permanent or seasonal sailors. For around 70,000 fishing vessels, there are around 200,000 small-scale fishermen in the Mediterranean, not counting part-time fishermen or associated jobs ashore (Oliver *et al.* 2005, source EUROSTAT, Sacchi, 2008).

To improve fleet identification and monitoring, the General Fisheries Commission for the Mediterranean (GFCM) has drawn up the following classification using a *boat/gear length or technique use* ratio. As the criteria are not absolute, polyvalent boats can be observed in the 12m - 18m category. This trend even seems to be developing in various Mediterranean regions.

³² This advantage becomes a disadvantage when weather conditions (wind, swell, temperatures, etc.) restrict or prevent all fishing activities. From this point of view, small-scale fishing boats are more sensitive to natural conditions than larger units and may be subject to long periods of idleness.

SEGMENT TABLE				
Groups	< 6 metres	6-12 metres	12-24 metres	More than 24 metres
1. Polyvalent Small-scale vessels without engine	A			
2. Polyvalent Small-scale vessels with engine	B	C		
3. Trawlers		D	E	F
4. Purse Seiners		G		H
5. Long Liners		I		
6. Pelagic Trawlers			J	
7. Tuna Seiners				K
8. Dredgers		L		
9. Polyvalent vessels				M

Figure 5 : (Rec. GFCM/33/2009/3 (Annex 1) Implementation of the GFCM Task 1 Statistical Matrix repealing Resolution GFCM/31/2007/1).

(2) The territorial base of small-scale fisheries

Small-scale fishing fleets operate in coastal areas, within the limits of a very narrow continental shelf and mostly fish for demersal species, small pelagic species and certain highly migratory species. We can also note the exploitation of lagoon environments (especially in France, Spain, Italy and the Maghreb), as well as the occasional presence of fish and shellfish farms that can be associated with small-scale fishing.

The territorial base is a common trait of all the techniques and practises recorded in polyvalent coastal fisheries. The progressive development of a multitude of catching methods is, in itself, based on the need to work efficiently and flexibly in a restricted and non-expandable area. Let us also reiterate that the Mediterranean has a rich biodiversity but a small biomass. Fish species are numerous, but the stocks are shared and lack abundance. These natural parameters have led fishermen to perfect their techniques in order to distribute the fishing effort over as many commercial species as possible. In other words, polyvalence is the expression of an optimized harmony between Mediterranean fishing and biodiversity. This type of fishery is also considered as being the most sustainable as it has the least ecological impact (as it is theoretically better distributed) on resources and environments. Adaptation to these constraints has led fishermen to acquire extensive empiric and vernacular knowledge of natural environments and fish behaviour patterns. The accumulation/transmission of this knowledge has resulted in spatialised and seasonal fishing calendars.

Moreover, the operational capability of vessels measuring less than 12 metres is generally limited for legal and/or material reasons, to territorial waters (12 nautical miles and often below 5 nautical miles), although some units occasionally operate in more distant and deeper waters (red tuna and highly migratory species by small-scale long liners). In many Mediterranean countries, bottom and pelagic trawling is banned on coasts; this technique is

dematerialized by definition as it is far more mobile and covers far greater distances than small-scale fishing. These bans are not always respected, monitored and sanctioned by the administration. Conflicts between small-scale fisheries (passive craft) and trawlers are sometimes frequent (equipment removal, habitat destruction, competition over certain species, etc.) and justify a spatial and effective distribution of access to these different trades. In this respect, the instigation of an MPA can help guarantee small-scale fishing in coastal areas and its enforceability with regards to other non-compatible practises.

But coastal areas are also increasingly coveted for other, mainly recreational purposes, such as yachting, scuba diving and snorkelling, spearfishing, power sports, jet skiing, recreational fishing, etc. Generally speaking, the scope of action of polyvalent coastal fishing is decreasing, in particular in areas near the shore and during summer. This trend is exacerbating conflicts of interest between fishing professionals and other marine environment stakeholders. The spatial regulation of coastal activities according to class interests and in respect of the principles for the use of marine areas (public) is becoming increasingly difficult to implement in an efficient and consensual manner. This is even more apparent with the development of ambitious objectives in terms of protecting biodiversity and marine ecosystems. Numerous initiatives, including conservation projects (MPAs) and restoration projects (artificial reefs) regularly modify the spatial referent of polyvalent coastal fishermen in terms of constraints (prohibited or limited zones) and benefits (fishing reserves and biomass production sites, artificial reefs). The articulation of protective/management measures raises many questions and prospects for cooperation between small-scale fisheries and MPAs. The situation and strategies of small-scale fishermen in the framework of these integrated policies and their priority expectations (economic dependency with regards to natural renewable resources) must be taken into account and incorporated in management methods, especially in terms of sustainability.

(3) Organisation and representativity

From a historic and sociological viewpoint, the original organisation of small-scale fisheries is based on the "communitisation" of the spatial limits of a territory (fishing "territory") and the knowledge necessary for its use (Féral, 2004). The instigation of community disciplinary rules makes the practical application of this pooling effort possible, by guaranteeing a balanced share-out of riches (access and use). From the Sixties onwards, the legal, institutional and economic evolution of the fishing industry rapidly modified these traditional, autonomous management patterns. Currently, community structures and the spatial referent still exist on a scale of ports, fishermen's villages and various specific institutions (fisherman's tribunal, *cofradias*, cooperation, consortium, etc.). However, the dynamics of these models is tending to weaken with the atomization of fishing communities, reinforced by the more general crisis affecting the profession and its attractiveness. In addition, the professional fishing industry is often very bureaucratic and technocratic (e.g. on a EU and member State level), hence incurring increasingly heavy and costly constraints (capture monitoring, catches, safety, controls, equipment, etc.) on individual, family-run and self-directed businesses.

Small-scale fisheries have the advantage of bringing together the largest number of vessels and fishermen, but their diversity leads to many problems, already evoked here:

- An explosion of activities and practises due to multiple trades;
- The individualistic and opportunistic strategies of professional fishermen;

- A strong territorial identity on a port and village scale, with a daily scope of action that restricts fishing practises and their objectives to "one's own living space".

These various factors point to the emergence of a relatively isolated profession, which is indeed very well distributed throughout the Mediterranean but lacks solidarity and a suitable organisation for defending rights and economic interests. In terms of representation in professional organizations, specialized fishing units (semi-industrial and industrial) are generally grouped in structures with category-based interests (unions, producer organisations, owners, cooperatives, federations, etc.), whereas small-scale fishing is greatly lagging behind on a Mediterranean and national scale³³. Few small-scale fisheries are involved in professional instances with a representative and participative vocation as regards decision-making, regulations and the elaboration of fishing policies. However, long-term representation is vital for gaining credibility with regards to public authorities, being listened to and heard, and influencing the dialectic relationship that leads to decisions and regulatory measures. This major question is little-envisaged in existing research and could be the subject of observations and comparative analyses of Mediterranean States.

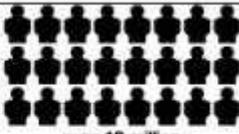
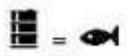
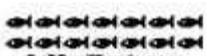
FISHERY	LARGE SCALE 	SMALL SCALE 
BENEFITS		
Subsidies	\$\$\$\$\$ 25-27 billion	\$ 5-7 billion
Number of fishers employed	 about 1/2 million	 over 12 million
Annual catch for human consumption	 about 30 million t	 same: about 30 million t
Annual catch reduced to fishmeal and oils	  35 million t	 Almost none
Annual fuel oil consumption	 about 37 million t	 about 5 million t
Catch per tonne of fuel consumed	 1-2 t	 4-8 t
Fish and other sealife discarded at sea	 8-20 million tonnes	 Very little

Figure 6: Comparative approach of the characteristics of industrial and small-scale fishing on a global scale (Guidetti, 2012, from Piante, 2012)

³³ In particular in the EU context, where the progressive transfer of state skills to European institutions (Commission, Council, Parliament) has contributed to shifting decision centres to a supranational level. The common fisheries policy is symptomatic of this technocratic centralization process which is often poorly understood and perceived by fishermen. Small-scale fishing stakeholders also refer to a feeling of inaccessibility and even cutting off (physical, political and social) with regards to power and decision circles. Lobbyist and professional setups must now incorporate these increasingly complex components which prevail over the definition, adoption and implementation of standards.

(4) The issue of traditional fishing

So-called "traditional" fishing, practised in various Mediterranean regions, is sometimes listed in the small-scale fishing category. Although considered as part of a historic and cultural legacy³⁴, this practise remains, most of time, a regulated commercial and professional activity. Traditional fishing suffers from a lack of precise legal definition in national legislation³⁵. As many small-scale fishing techniques have a traditional origin, it is often hard to distinguish between them. In fact, the main qualifying criteria are the demands made by the people who use these techniques and claim special protection for them *via* the application of special legal regimes. What stands out most is the highly local or regional character of this type of fishing, used "here and nowhere else". Secondly, traditional fishing takes place in a community context, conveyed by the "traditions" and vernacular know-how of a clearly-identified group of fishermen. Lastly, these fisheries are often seasonal, hence reinforcing their inherent geographical dimension. When they host scientifically-proven negative effects (poor selectivity, over-exploitation of stocks or impacts on the natural environment, traditional fisheries may be restricted or banned by the States and their organisations (e.g. European Union). In this case, the "traditional fishing" status is not enough to protect the technique and guarantee it an *ad hoc* regime. A number of practises that were unable to demonstrate their legitimacy³⁶ in historic, cultural or heritage terms, have therefore been questioned.

c) *A regional-scale structuring process*

(1) A favourable political and legal context for small-scale fishing

Small-scale fishing is currently the object of increasingly significant and positive "political" attention. The Mediterranean fishing crises is affecting the entire industry³⁷ (Sacchi, 2011), even if industrial and semi-industrial activities are "quoted" more often due to their impact in terms of over-exploitation, overcapacity and habitat destruction. But small-scale fishing has not been spared either and the number of fishermen is dropping regularly. The more-or-less marked deterioration of fisheries primarily underlines the fragile nature of ultra-specialized activities, whose profitability relies on mass catches using power-dependent

³⁴ We can quote tuna nets (traps or *madraques*), which are very widespread in the Mediterranean and have been used since Greek times to catch tuna. The coastal fishing technique using fixed nets is still found in Sicily (Italy) referred to as the *Tonara*, in Spain referred to as the *Almadraba*, in the Maghreb regions.

³⁵ The term is often employed in developing countries to designate food fishing practised by coastal communities according to essentially customary procedures and laws. However, this conception is too restrictive to be applied to the Mediterranean, with the exception of certain fisheries in the Southern Mediterranean (Morocco, Algeria, Tunisia, Libya, Egypt).

³⁶ Mediterranean uproar over *thonaille* fishing (drift net for tuna and other pelagic species) accused of non-selectivity and incurring too many accessory catches (dolphins) and the *gangui* (small-scale trawler) used in coastal habitats (posidonia beds). These practises have both progressively lost their special regime and are now banned.

³⁷ Data reveals a global decreasing trend in the number of catches and working units, but these are relative as they cannot be applied throughout the Mediterranean. Trends in the Eastern and Western Mediterranean are, in particular, fairly different, including with regards to small-scale fishing (Sacchi 2011). On a national scale, public policy sometimes has totally different orientations; the European States in the Northern Mediterranean have implemented policies to reduce capacity (paid fleet decommissioning and aids to stop building), improve selectivity and protect areas/resources, whereas other countries are committed to public and private support for the development of the fishing industry (Turkey, Cyprus, Malta, Albania, Algeria, etc.).

techniques³⁸. The opinions and conclusions of the Scientific Advisory Committee (SAC) of the GFCM, presented at the 35th annual session (documents CGPM:XXXV/2011/4 et GFCM:XXXV/2011/Inf.5) reiterate the following: "*according to the Subcommittee of Stock Assessment (SSA), the majority (91%) of the demersal stocks and part (18%) of the pelagic stocks assessed were considered as fully or over-exploited, with catches comprising mainly youngsters*" (FAO, 2012)³⁹. Around fifty priority-rated species are currently being monitored and supervised more closely by the Scientific Advisory Committee (SAC) of the General Fisheries Committee for the Mediterranean (GFCM, FAO FIEL/R890). In addition to highly migratory fish, the following species account for the majority of Mediterranean production: hake, red mullet, sole, shrimp, sardine, sardinelle, anchovy, sprat, scallop.

The industrialization of fishing launched in the Fifties/Sixties has always been encouraged by national and European bodies on a political, structural and financial level. Current evolutions relating to the fishing crisis are having a re-balancing effect in certain Mediterranean regions to the advantage of small-scale fishing catches⁴⁰. In this context, the persistence of small-scale fishing can be seen to be an indicator of a better sustainability of this sector, its technical adaptability (polyvalence, selectivity) to natural environments (lagoon, coastal and marine) and its structuring role in the coastal economy. The changes to the fishing industry and positive signals associated with these fisheries appear to favour the evolution process on a political and legal level.

a. The European Union

The reform of the Common Fisheries Policy (CFP), implemented by the European instances, contains concrete orientations in favour of the small-scale sector and its sustainable development. To resume: 1) it encourages States to envisage preferential or exclusive access for small-scale fishermen along the coast, underlining the selectivity and low impact of the techniques employed; 2) fishing opportunities will not only be allocated according to precedent but also on the basis of environmental and social criteria, e.g. the impact of fishing on the environment, or the creation of local economic spinoffs. Beyond this essentially favourable legal content, many questions remain as to how these provisions will be implemented from 2014 onwards. Similarly, the outcome of public support/financing has not yet been decided and serious questions remain regarding the *in fine* criteria for aid and participation that will truly assist small-scale fishing⁴¹.

These European criteria confirm the need for a spatio-temporal adaptation of small-scale fishing and recognition of its strong environmental and socioeconomic dimension. However, they necessitate a clear definition of the considered sector and the instigation of

³⁸ The huge increase in production costs (fuel prices), in particular for trawlers, has been the main factor of weakening, coupled with the rarefaction of resources.

³⁹ Report available at: <http://151.1.154.86/GfcmWebSite/docs/Reports/GFCM35f.pdf>

⁴⁰ Even if situations vary according to the country, trawlers still account for a vast majority of catches. Their unloading and wholesale networks (auctions, wholesalers) facilitate statistical monitoring by competent organisations.

⁴¹ The European Parliamentary has vote the future text relative to the European Maritime and Fisheries Fund (EMFF) on October 22nd, 2013. Small-scale fishery representatives had already expressed their concern with regards to the attenuation of small-scale fishing criteria, allowing a larger number of boats to benefit from the aids granted to this sector. The main risk would be a failure to take into account the time spent at sea (24h maximum) in order to enter into the small-scale fishing category and benefit from the associated subsidies...finally, the vote will maintain the distinction existing in favor of small-scale fisheries, may access certain forms of public subsidies due to the sustainability of this segment and its better integration of environmental practices.

regulatory measures relating to the possible ensuing transfer of fishing activities to the coast. We consider this latter point as essential, in that favouring the coastline incurs a significant risk of reinforcing its imbalance and disturbances if the proposed measures do not guarantee the management of load capacity and factors of production in Mediterranean coastal environments. European legislation⁴² favours an approach based on "fishery reconstruction plans", "improvement of the state of conservation of ecosystems" and the "establishment of areas and/or periods of fishing bans or limitations, including for the protection of spawning and nursery zones" (art. 4.g.ii) in order to contribute to the reinforcement of stocks and stabilization of captures. On a financial level, the European Fisheries Fund⁴³ (EFF, future EMFF) focuses on supporting (*Priority axis 2*) the development of Natura 2000 marine areas (art. 30.2.d). From a more environmental perspective, the directive of June 17th, 2008⁴⁴ mobilizes States "to achieve or maintain a good ecological status of the marine environment by 2020 at the latest" (art. 1^{er}). The *Marine Environment Strategy* largely evokes recourse to MPAs in the form of Natura 2000 or other sites qualified as "protected marine areas" to achieve ecosystem rehabilitation and restoration (points 5, 6, 7 and 21). The integration of environmental concerns in the fishing management policy is also a priority and confirms the usefulness of spatial protection measures (art. 13.4), such as closed areas (point 39), in re-establishing the "integrity, structure and functioning of ecosystems and, if necessary, protecting hatching, nursery and rearing zones". The EU underlines the fact that the Strategy is based on the commitments it made at the Johannesburg Summit for the constitution of a representative global network of MPAs by 2012 (point 18). Lastly, a progress report on protected areas should be published by the European Commission (executive body) in 2014.

Lastly, and although these various provisions only concern EU member States, the weight and influence of the European system in the Mediterranean context should not be underestimated. The EU remains a predominant stakeholder and leader on a political, economic and environmental level, in particular with regards to its action in the fields of the fishing industry and marine environment governance. However, it should conduct similar research and analysis to the scale of all the Mediterranean countries. The European case was presented for illustrative purposes and many other initiatives exist elsewhere in the Mediterranean. Terms of policy integration of fisheries and coastal/marine environmental policy remain unevenly distributed, especially on the south shore where better coordination and sub-regional coherence could be sought (Maghreb, Levantine basin of the Middle East, Hellenic arc, Union for the Mediterranean, etc.).

b. The General Fisheries Commission for the Mediterranean

On a regional level, the GFCM's main asset resides in its macroscopic approach to a semi-closed sea and to the management and conservation of essentially shared stocks. Moreover, its mandate targets the management of all species and stocks within its scope of competence, without prior distinctions between fish exploitation types. The successive

⁴² Regulation (EC) n° 2371/2002 of the Committee meeting of December 20th, 2002 relative to the conservation and sustainable exploitation of fishing resources in the framework of the common fisheries policy. Amended by Regulation (EC) n° 865/2007 of the Committee meeting of July 10th, 2007. Regulations have a direct effect, i.e. they must be automatically applied by member States, contrary to more flexible directives that require adaptation for integration in national law (law, decree, by-law, etc.).

⁴³The EFF (future EMFF) replaced the FIG (Financial Instrument for Fisheries Guidance) in 2006. See Regulation (EC) N° 1198/2006 of the Committee meeting of July 27th, 2006 relative to the European Fisheries Fund.

⁴⁴ Directive 2008/56/CE of the European Parliament and Committee meeting of June 17th, 2008 establishing a framework for community action regarding the marine environment policy ("marine environment strategy" framework directive).

reinforcement of its powers⁴⁵ has allowed this institution to increase its legitimacy and scope of action. Article 3 of the GFCM statutes reiterates its main functions in terms of "*conservation and rational use of resources... :*

- *Regulate fishing methods and vessels;*
- *Set a minimum size for individuals of a defined species;*
- *Establish periods or areas where fishing is authorized or banned;*
- *Regulate the total volume of captures and fishing efforts and share them between members".*

The legal impact of the measures taken by the GFCM can be qualified as relative (Beer-Gabel *et al.* 2003); the elaboration of its recommendations obeys a precise process, detailed in article 5 of its statutes. The adoption of a text requires a majority two-thirds vote before it is enforced on member States. The relativity of these decisions is witnessed by the fact that any member can oppose, expressly and within various deadlines (art. 5.3), the application of the associated recommendations. Objections are characteristically put forward by regional fishing management organisations (RFMOs) of which the GFCM is a part. The GFCM is not a supranational instance; it is an interstate organisation in which each State is considered in an identical fashion and protected in the exercise of its sovereign functions as recognized by international law and the UNCLOS convention. However, this faculty must be considered in terms of the special context of regional relationships, obligations born out of the ratification of treaties⁴⁶ and the special status of a semi-closed sea. Therefore, the will to reach a consensus, and even unanimity, instigates the notion of shared will, mutual recognition, regional coherency and respect of one's obligations.

RFMO initiatives only make sense if the States comprising them give themselves the means to achieve their objectives and individually undertake to respect their common commitments. Their functioning and efficiency relies on members acting in compliance with the spirit and content of the texts. Upstream, members must guarantee a certain degree of reciprocity as, downstream, there is no way of enforcing or engaging the liability (sanction) of a State that refuses to apply a binding provision. The role of the "*compliance committees*" takes this reciprocity into account and assesses and publicly issues (to the other States and civil society) the efforts made to implement recommendations, in order to highlight who is "playing along" and who isn't. From this viewpoint, an appropriate use of *compliance committees* can be dissuasive and encourage the State to respect the law if it does not want to "have the finger pointed at it" like a naughty schoolchild, and be seen countering regional interests and its own commitments.

Fundamentally, GFCM focus on small-scale fishing was most recently prompted by the *FAO International Guidelines on Securing Sustainable, Small-Scale Fisheries* published in 2012⁴⁷ (GFCM, 2013), which established a clear link between marine protected areas defined as "*all marine geographical areas benefiting from greater protection than the surrounding waters to conserve biodiversity or manage fisheries development*". These

⁴⁵ Reforms undertaken in 1997 and 2003 (Venice conference) mainly relating to: 1) the integration of the European Union and Japan; 2) the election of an Executive Secretary by the Commission member countries; 3) allocation of a dedicated head office; 4) acquisition of functional semi-autonomy with regards to the FAO and the transfer of financial contributions to the member States in force since 2004 (independent budget); 5) special measures to counter illegal, unreported and unregulated fishing, including a whitelist for vessels of over 15 m authorized to fish in zones governed by the GFCM.

⁴⁶ The *pacta sunt servanda* rule obliges signatory States to execute treaties in an objective manner and with goodwill.

⁴⁷ ftp://ftp.fao.org/FI/DOCUMENT/ssf/SSF_guidelines/ZeroDraftSSFGuidelines_MAY2012_fr.pdf

guidelines reiterate the importance of associating small-scale fishing communities with MPA design, planning, delimitation and management processes, but we will examine these aspects further in the section on governance.

Finally, we discuss the role of "observers" in the GFCM. Although the ability to sit on the commission is reserved for Member States, it remains open to non-governmental institutions that represent the interests of civil society in relation to the mandate of the organization. These observers have no specific legal competence, apart from the simple ability to make observations and opinions in order to inform the Member States, to warn about certain situations and / or encourage them to react accordingly. This indirect participation in decision making is certainly limited, but still has two important advantages:

- Allow a rebalancing in favor of the democratic participation of civil society
- Providing better trading conditions between policy makers, their administrations and some state representatives, both professional (economics) that activists (environment).

(2) The Euro-Mediterranean platform for small-scale fishing: MedArtNet⁴⁸

Created in February 2011 (www.medartnet.org), this platform brings together small-scale fishing representatives from 4 Mediterranean EU member countries: Spain, France, Italy and Greece. The representativeness of this initiative is clearly Euro-Mediterranean and not regional as a whole. Its results will be presented as a specific project involved in the European political model, without being able to apply to other Mediterranean areas. Around a common vision and objective, the founding members wish to sustainably secure their activity by giving professional fishermen back a predominant role in the elaboration, implementation and monitoring of fish resource management measures in coastal areas.

This institution highlights various characteristics and expectations:

- The exclusive dependency of these communities (jobs and lifestyle) on local fishing areas and fish stocks;
- The capacity to assume responsibilities with regards to areas/resources ("guardians" of resources), to guarantee the activity is in a good state and sustainable: favour a local approach to management and adapt/fine tune regulations, including reinforcement of constraints;
- The use of selective and polyvalent gears that respect marine ecosystems and especially habitats (no trawling) and fish sizes;
- The activity's artisan character: on-board owners, trips <24h, limited-size boats (low energy consumption), etc. ;
- The will to uphold the economic, social and demographic dynamism of fishing communities and coastal communities in general, weakened by the transformation of coastal areas, multiplication of anthropic pressures and global changes and their effects on the natural marine environment;

⁴⁸ We will not go into details on this as Session 5 of the Symposium is specifically dedicated to these issues; MedArtNet will be partially leading the symposium. We can also identify some emerging initiatives in the area of North Africa (Libya, Tunisia, Algeria, Morocco and Mauritania): See the results of the *Sub-regional workshop for strengthening professional organizations of artisanal fisheries* in the countries of north Africa, Bizerte, Tunisia, 24-26 September 2013.

- The inadequate representativeness of this sector, despite its ultra-majority representation: nearly 80% of the European fleet and up to 65% of full time sea jobs in some countries.

For the above reasons, several priority demands have been addressed to EU representatives in the context of the CFP reform to: 1) guarantee preferential or priority access to professionals practising sustainable fishing that is integrated in their environment (economic, social and environmental performance); 2) put an end to certain destructive fishing practises in particular in Mediterranean coastal areas (protect biodiversity and habitats); 3) guarantee/restore the health of seas and oceans; 4) recognize/preserve fish resources as a public good that cannot be appropriated privately.

Regarding the idea of a public space and common heritage, subjected to a multitude of human-induced pressures, the platform considers that public authority should not systematically apply the principle of commercial deregulation, open competition and economic concentration to the marine environment (and its resources). Professional fishing is the ultimate activity relying on the exploitation of a renewable wild resource. This specificity means States and the EU have special responsibilities in terms of the implementation of effective policies for managing fishing efforts and long term integration. Alas, the allocation of quotas (where necessary) and rights of access must reward sustainable fishing methods that preserve the balance of ecosystems, especially coastal. The effort to manage fishing capacities must favour a transition to fisheries with a lower impact thus not solely taking into account the fishing capacity with the number of working vessels (size and engine power). Fishing capacity is also determined by the fishing means (equipment and performance) of each unit. A drop in the number of boats does not therefore necessarily mean a drop in fishing. Unfortunately, there are numerous examples of boat destruction policies (using public subsidies) that have led to fleet renewal (also subsidised) whereby the boats are in smaller number, but more efficient, modern and predatory than their predecessors.

Concerns with regards to the future CFP relate to the risk of a harsh reduction policy in fishing capacity mainly targeting the largest number, i.e. small-scale fisherman, despite the fact that they obviously represent very low individual fishing capacities (ratio between the number of vessels/ volumes landed). A fishing community can only survive if it has an adequate number of professional players and boats. Fewer boats invariably means fewer fishermen and hence even weaker fisheries. The stakes of the future CFP and its financial instruments therefore consist of maintaining this dynamism and even reinforcing it, to develop and renew coastal communities by encouraging young fishermen to set up there.

Finally, clear parallels can be drawn between the last point and the MPA issue, as it aims to maintain and restore the health of the marine environment. To achieve this, European fishery management must focus on "local" and return the small-scale sector to its rightful place:

- Take different geographic realities into account; gain inspiration from the experience and knowledge of the relevant fisheries considering the fishermen as a source of information on the environment, resources and practices;
- Enhance local know-how, in cooperation with scientists and fishermen;

- Develop concerted management systems to allow the various players to jointly define rules for the sustainable management of areas/resources and other activities taking place in the small-scale fishing area;
- Reinforce research on the state of fish reserves and measures to rebuild species and their habitats.

The creation of marine reserves is one of the possible tools for the protection/management of the environment with regards to fishing practises and other human activities. Like other conservation and management methods, it requires consulting the various stakeholders in an appropriate manner and consideration of the needs of small-scale fishermen. Failing this, MPAs are often perceived as an additional, unrecompensed spatial constraint, at least in the short to medium term. In principle, fishermen are not always convinced of the positive effects of MPAs, as they first and foremost (and justifiably) consider the economic consequences of the losses (territory and restrictions) incurred by MPA creation, before looking ahead to its long-term benefits⁴⁹.

Generally speaking, this organisation process improves the legibility and representativeness of small-scale fisheries in the Mediterranean and should, as far as possible, continue to develop. For the time being, this type of movement remains local, national⁵⁰ or limited to a few countries in the Mediterranean basin. The evolution of federative approaches and their capacity to extend and favour the adhesion of other fishermen or groups of fishermen, and the results obtained, will be decisive for the future of small-scale fishing.

2. MPA biological effects

What effects of MPAs can we measure on resources exploited by fishing in general and by small-scale fishing in particular? These effects are the subject of numerous studies, analyses, monitoring campaigns, follow-ups, assessments and scientific indicators. The biological/ecological results of MPA policies are variable and often very different from one site to the next (sizes, protection levels, status, management modes, etc.). According to Halpern (2003) and Rice (2012), the number of empiric studies proving the efficiency of MPAs nonetheless remains fairly limited (Gascuel et al, 2013, Francour *et al.* 2013).

⁴⁹ This phenomenon may be exacerbated by institutional (ministries) and administrative compartmentalization between fishing and the environment. Differences in ministerial authority are lessening but remain frequent (fishing attached to agriculture or transport and MPA to ecology/the environment), especially in southern countries. This may maintain upstream suspicion and administrative competition and jeopardize the downstream adhesion of fishing communities and their representatives.

⁵⁰ Another example of a recent initiative is the French small-scale fishing platform bringing together the various Mediterranean coasts: <http://www.plateforme-petite-peche.fr/>

a) *What are the effects of small-scale fishing on ecosystems?*

We find this question very complex in view of fishery practises, which are often difficult to ascertain globally and, moreover, little or less monitored than other industrial or semi-industrial sectors. This observation is reinforced by the Mediterranean coastal context, which is subject to growing anthropic pressures that multiply factors of mortality and deterioration other than fishing. In the previous section, we saw that the fish stock situation in the Mediterranean is delicate to say the least. However, small-scale fishing is not considered as the main cause of the over-exploitation or deterioration of habitats related to fishing practises⁵¹. This does not mean that small-scale fishing is devoid of excessive behaviour and negative effects on ecosystems. Overfishing can affect all professional sectors and the absence of regulations and fishing effort management can very rapidly incur imbalances and stock collapse.

One of the main characteristics of small-scale fishing remains its polyvalence and tendency to target a multitude of species. This situation is conditioned by maintaining a relatively precarious balance (which is unstable by definition) within a fragile and rich environment marked by a high interdependency of captured species. For these reasons, small-scale fish management cannot be reconciled with an approach restricted to a single species or groups of species. Multidisciplinary management only makes sense if it is part of a spatial, ecosystemic framework, taking into account territorial fishing activities and their possible interactions with neighbouring environments and species. Moreover, "*the impacts of fishing not only concern targeted species but the structure and productivity of ecosystems as a whole*" (Gascuel *et al.* 2013). For the above reasons, the effects of small-scale fishing on exploited populations and/or habitats must be examined by means of local, empirical studies, weighted by external elements also likely to influence the state of environments and their resources. In return, the biological effects of MPAs on the biomass targeted by small-scale fishing as a whole in the Mediterranean coastal context will obviously also be vaguer and harder to measure than the effects of certain specific conservation efforts targeting a symbolic species⁵².

b) *Effects of no-take zones*

(1) Effects within the boundaries of no-take zones

Most of the effects described in the scientific literature relate "*mainly to the biomass, density, diversity and size of species*" (Gascuel *et al.*, 2013). The method employed is

⁵¹ 80 to 90% of catches are still from industrial or semi-industrial trawling.

⁵² Two examples come to mind:

- In the Mediterranean, from the Eighties onwards, several successive moratoriums for the protection of the Mediterranean dusky grouper (*Epinephelus marginatus*), as well as other symbolic species, led to the stoppage of certain mainly recreational and competitive fishing techniques (underwater hunting, angling). The results, monitored inside and outside MPAs, have been sometimes spectacular and relatively rapid, see the activity reports of the Groupe d'Etude du Mérou (Grouper Study Group) : <http://www.gemlemerou.org/cms>

- From mid-2000 onwards, the industrial overfishing of red tuna (*Thunnus thynnus*), which had been uncontrolled for many years, led to the implementation of drastic measures to reduce fishing efforts and progressively eliminate illegal, unreported and unregulated fishing (IUU). Two key measures adopted by the member States of the ICCAT enabled a fairly rapid and scientifically proven replenishment of Mediterranean stocks: 1) reduction in the total admissible catch (quota); 2) limitation of authorized fishing periods to 1 month for tuna seiners (90% of quotas) and 5 months for industrial long liners. On the latter point, and despite the lack of a scientific basis, French Mediterranean small-scale fishermen are partially blaming the significant rise in the biomass of young red tuna on the Gulf of Lyons coast (confirmed by IFREMER, Fromentin, 2012) for the negative consequences on the abundance of forage species stocks targeted by small-scale fishing.

relatively simple and is generally based on the establishment of a "zero" state⁵³, together with "in-out" comparative analyses. Moreover, the "zero" state enables the theoretical result expected from the MPA to be set (its protection "ideal") and gradually held up against field reality and the observed, progressive effects of protective measures. Lastly, some effects that are considered as "positive" may be accompanied by other negative, opposite or unexpected effects, hence confirming the high variability of MPA responses (Lester et al, 2009).

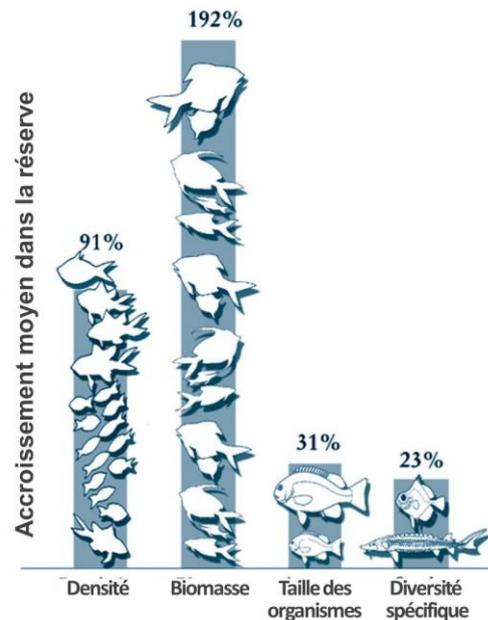


Figure 7 : Average rises in densities, biomasses and size of organisms and the diversity of species within reserves (study based on 69 reserves. Courtesy of FAO, 2011)

Other effects are also highlighted in terms of population resilience. No-takes contribute to rebalancing the age structure of populations (Berkeley *et al.* 2004, Gell & Roberts 2002), which can be particularly beneficial for slow-ageing species. Therefore, *"the rise in the proportion of old individuals helps raise the reproductive potential of protected populations: large fish are more fertile and produce more eggs over a longer spawning period"* (Gascuel *et al.* 2013).

The same authors (Gascuel *et al.* 2013) also state that *"genetic diversity is significantly higher in reserves than in fishing zones. A study on five Mediterranean reserves (Tarbaca, Cabo de Palos, Cerbère-Banyuls, Elbe and Giglo marine reserves) analyzed the effects of protection on the genetic structure of populations of white seabream (Diplodus sargus), targeted by local fisheries. The results showed that on average, gene frequency was significantly higher in reserves than in fishing zones (Pérez-Ruzafa et al. 2006)"*.

The presence of a reserve is also of interest to migratory species, which travel through the MPA during their lifecycle. Moreover, a model developed in the Mediterranean by Apostolaki *et al.* (2002) for hake, demonstrates that *"reserves contribute to preserving stocks (increased yield and resilience)"* if the MPA includes spawning and/or nursery zones.

⁵³A sort of scientific "state of the art", which is normally performed when the reserve is created (before it produces the expected effects), but not systematically. Therefore, numerous MPAs suffer from a lack of initial references in terms of a "zero" state.

In addition to their direct effects on the protection of species and groups of species, reserves also improve the protection and quality of the natural environment. No-take zones help maintain/restore habitat diversity and their continuous and sustainable protection against destructive practises (fishing and other).

(2) Outside no-take zones

These are less systematic and, as a result, harder to pinpoint. The best-known effect is spillover: when population density inside the MPA reaches a certain level, various (more or less foreseeable or random) processes trigger fish propagation outside the zone (Planes *et al.* 2006), with all the positive consequences that implies for fishing activities in the vicinity.

Spillover is of particular interest in terms of the biomass of adult individuals of economic worth to small-scale fishermen. In some cases, it can lead to a rise in catches by professional fisheries (total catches and catches per unit of effort – Francour *et al.* 2013) and non-professional fisheries alike. In our opinion, this direct benefit for fisherman is key to promoting the positive effects of MPAs. There are many reasons for these exportations: rise in spatial competitiveness (food, shelter reproduction), migratory periods of certain species, etc. However, a study conducted in the Mediterranean revealed the limited spatial scope of this phenomenon, whereby *"fish biomass declined in a linear fashion versus distance from the reserve. On average, this effect was no longer detectable beyond 500 metres"* (Harmelin-Vivien *et al.* 2008). Also in the Mediterranean, *"the work of Valls et al. (2012) on the Port-Cros reserve tends to show that exports are limited (potentially 100 metric tons/year for this 13 km² reserve) and could not have a significant effect on the neighbouring area"* (Gascuel *et al.* 2013).

According to Gascuel *et al.* (2013) again, a scientific study on catches *"in six marine protected areas in the Mediterranean (including areas closed to fishing) conducted for over eight years (Cerbère-Banyuls, Carry-le-Rouet, Medes, Cabrera, Tabarca and Cabo de Palos) has highlighted a rise in fishing efforts and production at the frontiers of these reserves, across all fishing techniques practised by local, small-scale fishing fleets (Goñi et al. 2008. (...) This advantageous zone pans out 700 to 2 500 m for small reserves and dwindles with distance"*.

The rise in catches due to biomass export therefore benefits fishermen working in close proximity to MPAs. This deadweight effect can mean the edges of protected sites become excessively attractive, leading to a rise in fishing pressure in areas close to no-take zones and perhaps eventually limiting their positive effects (Mora *et al.* 2006). In this respect, questions relative to buffer zones intended to graduate activities and guarantee the increasingly efficient management of anthropic pressures (fishing and other) are of even greater importance in terms of regulating the attractiveness of no-take zones.

Spillover can also lead to egg and larvae export, but this has little or no direct and immediate effect on small-scale fishing. However, medium and long-term effects (recruitment and yield) are obvious on a scientific level (Hart, 2006), even if stakeholders with daily requirements in terms of catches and profitability are little-convinced, especially when the constraints and losses incurred by the reserve are extensive.

c) Effects of multi-use MPAs

As we evoked earlier, the biological/ecological effects of this type of MPA are much less obvious, known and studied. This is due to the complexities involved in the approach and biological/ecological observation of an area that is ecologically protected but also managed with a view to economic sustainability, where regulations prevail over bans. The indecisions and even contradictions inherent to the principle of sustainable development are very visible in this type of MPA: how can we reconcile protection and development, while allowing everyone to contribute positively to their respective expectations?

We have also seen that the characteristics and inclinations of applied scientific research are naturally more suited to the observation of sites devoid of extractive activities, which can be used as benchmarks for protective measures and the comparative analysis of their external effects. In actual fact, these MPAs do not seek to produce a particular effect; their ambition is rather to perfect the use of areas/resources to avoid excesses (prevention/precaution) and maintain an "acceptable" and sustainable balance. In France, the legal status of natural marine park corresponds to this vision of polyvalent MPAs. It is not solely intended for the strict protection of given species, but rather seeks to offer sustained protection in a negotiated and evolutionary framework (Cazalet et al, 2013).

These MPAs are structured around a zoning system, which intends to provide graduated levels of protection and use-management according to the vocation of each zone. With regards to fishing, this model tends to favour activities with a lesser impact on the environment and resources, hence spurring an interest in, and even encouraging, respectful, integrated practises giving access to the MPA. For example, legal provisions may include advantages or waivers in favour of traditional fishing activities (commercial or non-commercial) practised by local populations, also involving a heritage or folklore aspect. From this point of view, the MPA can contribute to maintaining certain practises or techniques that are tending to die out or be challenged by the predominant activities – in particular recreational - of polyvalent MPAs. This model is of definite interest with regards to the multiple small-scale fishing practises encountered in the Mediterranean.

d) Coherence and network protection

The MPA network notion is widely referred to in public policies and has the following key objectives:

- Reinforce horizontal coherency and cooperation between the various categories of MPA and the multitude of legal statuses in force;
- Ensure better vertical legibility of MPA policies on a local, national and international level. The idea is to encourage the coordination of protective measures in order to establish representative networks in various regions throughout the globe;
- Favour MPA manager, expert and scientist networking. The benefits of networking are also expressed in terms of knowledge and sharing of experiences on the use of small-scale fishing in the MPA.

But the network idea also has a real scientific dimension, highlighting the potential reach of MPAs with regards to the outside world, as well as in terms of mutual ties. The IUCN defines them as a "*collection of MPAs or reserves operating in cooperation and synergy on a variety of spatial scales and with a range of protection levels designed to*

achieve objectives that cannot be achieved by a single reserve " (IUCN-WCPA 2008). The idea of ecological connectivity highlights the complexity of the spatial interactions between environments and their resources. Knowledge of these interactions (ecological functions) and their evolution helps improve MPA complementarity and the capacity of their stakeholders (decision-makers, managers and fishermen) to adapt as well as possible.

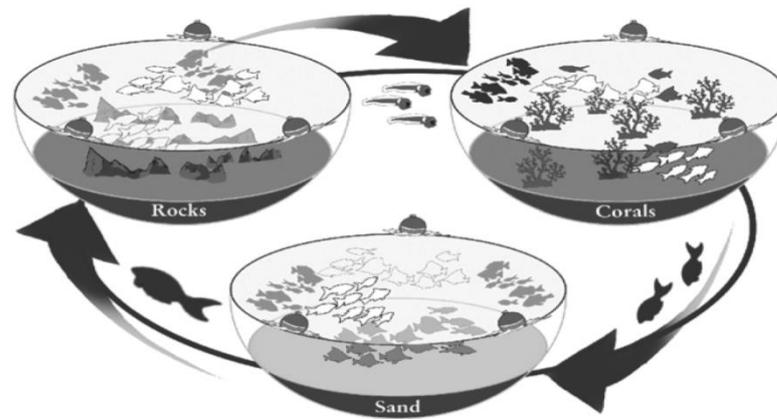


Figure 8: Protecting the various stages of the lifecycle via the MPA network (Courtesy FAO 2011)

The network is a way of optimizing connections, as long as *"the average distance between the various areas is compatible with the biological functions they are supposed to fulfil. (...)* For example, the study conducted by Abdulla *et al.* (2008) shows that the distances separating Mediterranean MPAs is too large to guarantee the larval connectivity of most species present in the reserves; this inter-MPA distance is up to 55 ± 6 km ($n = 93$, excluding Pelagos Sanctuary) and 62 % of MPAs are located over 20 km from the nearest MPA. This 20 km distance is considered too high for the larval dispersion of most non-sessile species or for efficient fish export. Conversely, 92 % of MPAs are situated less than 150 km from at least one other MPA, hence assuring the functional connectivity of highly migratory species with long-living larvae suitable for transport over such distances" (Gascuel *et al.*). The perfection of the MPA networks to the benefit of small-scale fishing could become more of a focus for the relevant authorities. Recommended distances would be 20 to 150 km between MPA sites (Abdulla *et al.* (2008) et Halpern, 2003, Palumbi 2003 et Cowen *et al.* 2006).

A balanced distribution of MPAs would reinforce the benefits of protection, but it should also allow a better distribution of constraints between the various groups of fishermen involved in the network. Economic and political dimensions therefore tend to predominate over scientific considerations in terms of setting up and implementing MPA networks.

3. Socioeconomic effects of MPAs

On an economic level, MPAs comprise an *"investment of society in the preservation of its natural capital"* (Boncoeur *et al.*, 2013). This investment is reflected in the establishment of a protection perimeter, coupled with various measures intended to maintain the capital "in a good state" (a satisfactory level of conservation) and even improve it (improvement of natural conservation conditions). Beyond purely "conservationist" targets (non-use), the investment can have additional, complementary aims linked to sustainable use (commercial or non-

commercial), including commercial fishing in or around the MPA. In the long run, every investment must produce results that can be assessed in terms of costs/benefits and seek an optimal balance between MPA operational efficiency and its social acceptability (equity or legitimacy) through a fair distribution of its positive and negative effects.

a) Principles of MPA cost/benefit analysis

According to the FAO (2011), the main advantages of MPAs (services rendered by marine ecosystems) with regards to fishermen are as follows (Boncoeur *et al.* 2013):

- *"control of mortality induced by fishing sedentary species in a context of information rarity and/or difficulties in controlling the activity using "classic" methods;*
- *assistance in managing multi-specific fisheries;*
- *reduction in accessory catches (undesirable secondary catches);*
- *protection of habitats and biodiversity;*
- *protection against uncertainty (shock-absorption in case of random shock);*
- *delegation of responsibilities and management tasks to local fishing communities in a co-management perspective;*
- *protection of cultural practises and traditional rights of use;*
- *protection and development of the livelihood of local fishermen;*
- *solving conflicts of use."*

We are also tempted to add:

- potential and direct advantages for small-scale fishing firm sales (effects on prices and economic optimization of products) linked to larger catches (in case of biomass export), and/or catch size
- added value of the MPA image and the prospect of alternative, complementary or compensatory activities generated by its creation.

MPA costs are characterized by the regulatory constraints associated with its existence, including technical and spatio-temporal bans, limitations, authorizations, loss of working territory (variable level of dependency), costs relating to MPA monitoring and supervision, smaller catches (at least initially), activity transfer to/concentration in unprotected adjacent areas, etc. Lastly, we should weight the results obtained according to the categories of fishermen targeted by these measures (Boncoeur, 2013); protection policies (or fishing reserves) can, voluntarily or not, favour certain types of fishing (multi-specific, passive gear, selectivity) to the detriment of other sectors (trawling, specialized fisheries, industry, etc.). The following figure shows the articulation of the various stages required to *"establish an MPA socioeconomic score sheet"* (Boncoeur, 2013).

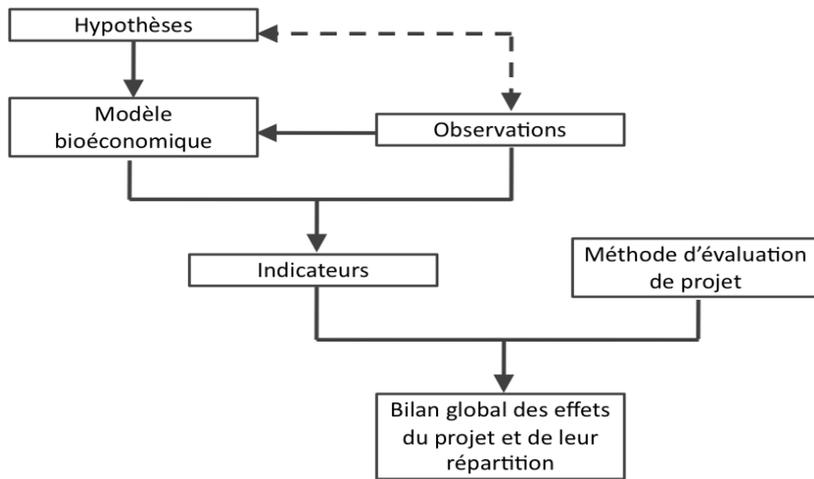


Figure 9 : Articulation of the tools for assessing MPA socioeconomic effects (Boncoeur et al. 2013)

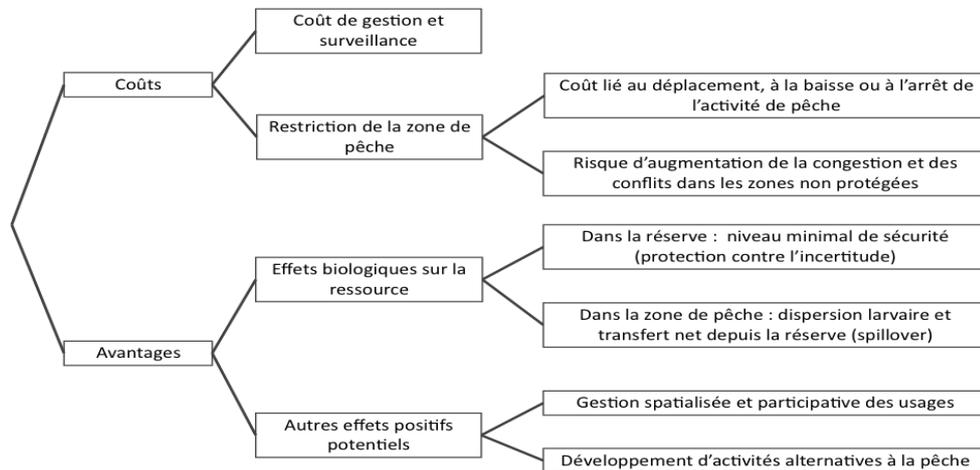


Figure 10 : Expected costs and benefits of MPAs from a fishery development viewpoint (Boncoeur, 2013)

b) MPA cost/benefit assessment tools

(1) Bioeconomic modelling

Bioeconomic modelling aims to represent "biological and economic interactions in a simplified and formalized manner" (Boncoeur et al. 2013). Below are a few schematic illustrations of the various models applicable to fisheries and MPAs.

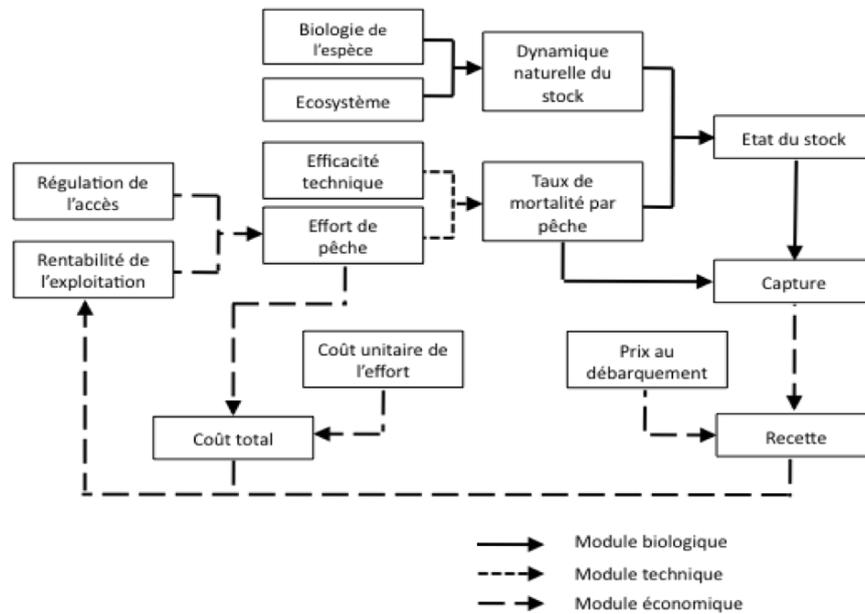


Figure 11 : Schematic view of a fishery bioeconomic model (Boncoeur *et al.* 2013)

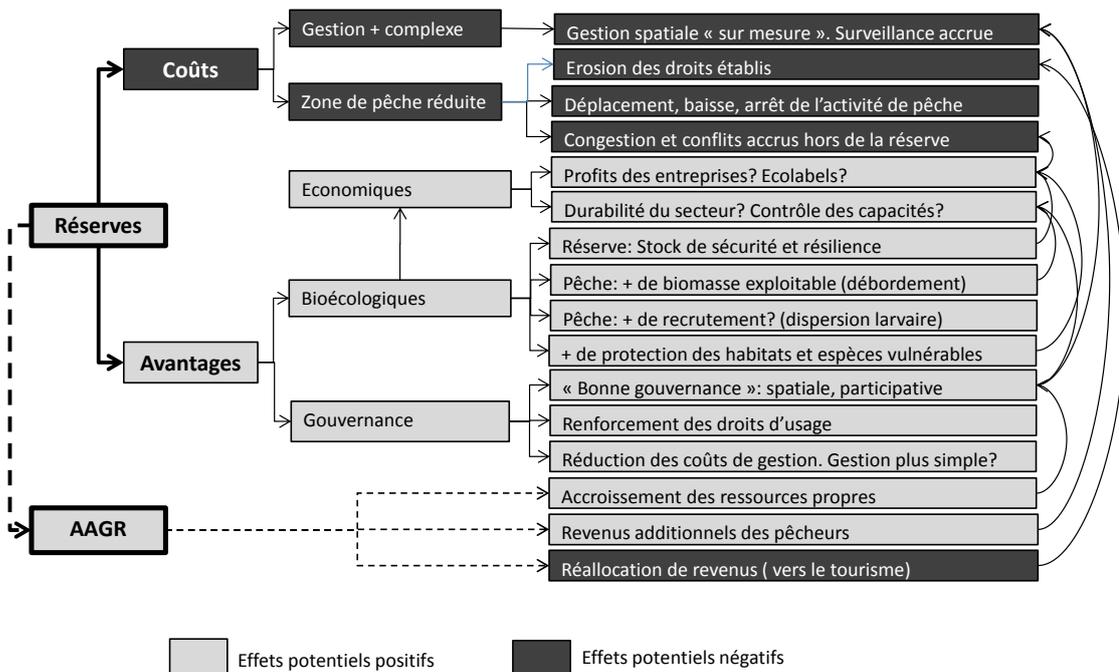


Figure 12 : Potential bioecological and socioeconomic effects of MPAs-reserves.

Negative effects are shown in black. Positive effects are shown in grey. Economic benefits are indirect and a result of biological benefits. Benefits, if any, have retrospective positive or negative effects indicated by the arrows to the far right of the figure (Modified from Boncoeur & Alban, from Garcia *et al.* 2013).

Rapid characterization

Bioeconomic simulation model, dynamic, spatially explicit, multi-specific and multi-activity (fishing and recreational non-extractive activities). BEAMPA is not an ecosystemic model: no trophic relationships between species.

Spatialization	Grid of adjacent cells, characterized by three permanent attributes (see ex. below).
Spatio-temporal dynamics	Partially-structured model in terms of age (juveniles / adults); exogenous recruitment. Redistribution of adult biomass between adjacent cells at the end of each period (if habitat suitable), on the basis of a density-dependent algorithm. Spatial redistribution of fishing efforts at the end of each period from a combination of 2 parameters: "tradition" (tendency to maintain existing location of fishing effort) and profitability (effort redistribution between adjacent cells on the basis of the differences in profitability observed at the end of each period). Evolution of frequentation due to touristic activities: according to ecosystem quality, represented by the biomass of various emblematic species.
Main output variables	For each period and each cell: biomass per species, fishing effort per fleet, catches per species and fleet, benefits per fleet, frequentation for recreational purposes, benefits of recreational service providers.
Feasible scenarios	BEAMPA enables hypotheses to be tested on the spatio-temporal mobility of stocks and fishing efforts, the impact of protective measures on activities and MPA configuration.
Use in ACA framework	Comparison of a scenario 0 (no protection) and scenario 1 (protection of a given type in a given spatial configuration). Benefits taken into account: revenue from fishing and recreational activities. Costs taken into account: MPA management costs.
Application to the Medes islands MPA (Spain)	Fishing reserve (93 ha), buffer zone with special fishing restrictions (418 ha), external zone subject to common law regulations (4989 ha); 6 fish stocks and two small-scale fishing fleets; 2 recreational uses (diving and glass-bottomed boats); grid: 28 × 10 cells of 25ha each.
Main results of the tested scenarios	The benefits for fishing provided by the existing configuration are difficult to detect. Benefits from fishing far from cover the institutional costs of protection; benefits for ecotourism show a positive score sheet. Doubling the size of the MPA will only have moderate effects on fishing but will considerably increase institutional protection costs. Zoning is recommended to separate the various activities.

Figure 13 : BEAMPA model (BioEconomic Analysis of Marine Protected Areas) (Maynou 2008, from Boncoeur *et al.* 2013)

Rapid characterization	Dynamic, multi-specific, spatially explicit, stochastic and individually-focused economic simulation model, aiming to explain the distribution of fishing efforts of a professional fishing fleet per area and targeted species group. Simulation technique applied to a sample of individual catches: discreet choice method, or random utility model (RUM). Case study: dredgers operating in New England fisheries (USA). Analyses based on 39,292 individual catches during the period 1990-1993.
Spatialization	The model takes into account 14 fishing areas and 13 ports or groups of ports.

Spatio-temporal dynamics	For each catch, the vessel, the boat's captain is supposed to choose from a given number of pairs (fishing area / targeted species group). The selected alternative is the one with the highest anticipated utility. The anticipated usefulness of an alternative is a linear function of a set of observable factors and an error term (random factor). Statistically-significant observable factors are as follows:		
	Explanatory factor	Expected effect	Comment
	Travel time	–	Cost elements
	Zone surface area	+	Reduces encumbrance risks
	Previous presence of a vessel in the fishery *	+	Better information on conditions of use in already-frequented zones and/or "tradition" effect.
	Average sales per vessel per day in fishery*	+	Proxy for anticipated sales (hypothesis of extrapolatory anticipations: the future is extrapolated from the recent past)
	Coefficient of variation of sales per vessel per day in the fishery *	– or +	Negative factor if the fisherman is averse to risk, positive if he is attracted to risk.
	Total effort in fishery*	+	Proxy for stock size in the area.
	* in previous 10 days and one year previously.		
Output variables	Monthly aggregated effort per fishery (zone / species group pair).		
Main simulation results	The model has fairly high predictive power, especially with aggregated spatialization. The main explanatory factor with regards to fishing effort allocation per fishery is previous presence in the fishery. Fishermen were shown to be attracted to risk. The other factors had significant but secondary effects, compliant with predictions.		

Figure 14 : RUM model (Random Utility Model) for fishing effort distribution (Holland et Sutinen, 1999, From Boncoeur *et al.*, 2013)

1. Indicators

The use of indicators enables the development of informed measuring instruments for assessing the performance⁵⁴ of MPAs with regards to fisheries and monitoring the effects produced. With regards to socioeconomic aspects, the IUCN puts forward the following graduated classification, ranging from the determination of goals and objectives to the list of selected indicators and methods for collecting the corresponding data (Boncoeur *et al.* 2013):

Goals	Objectives
Improve or maintain food safety	Nutritional requirements of coastal residents satisfied or improved
	Rise in the availability of local seafood intended for local consumption
Improve or maintain	Improve the economic status and relative wealth of coastal

⁵⁴ This is not limited to socioeconomic aspects; it also integrates MPA bioecological results and management modes (governance indicators) (Pomeroy *et al.* 2006).

subsistence means	A	residents and/or resource users
	B	Stabilize or diversify professional structures and household incomes by reducing dependency on marine resources
	C	Enhance local access to markets and capital
	D	Improve the health of coastal residents and/or resource users
Improve or maintain non-monetary benefits to society	A	Improve or maintain visual aspect
	B	Improve or maintain value of existence
	C	Improve or maintain value of the wild natural environment
	D	Improve or maintain leisure opportunities
	E	Improve or maintain cultural value
	F	Improve or maintain values of environmental services
Fair distribution of MPA benefits	A	Fair distribution of monetary benefits by and between coastal communities
	B	Fair distribution of non-monetary benefits by and between coastal communities
	C	Improve equity within social structures and between social groups
Maximize compatibility between management and local culture	A	Prevent or minimize negative on traditional practises and relationships, or on social systems
	B	Protect cultural characteristics or historic sites and monuments associated with coastal resources
Promote awareness and knowledge of the environment	A	Promote respect and/or understanding of local knowledge
	B	Improve public understanding regarding environmental and social "sustainability"
	C	Increase the public's scientific knowledge
	D	Improve scientific knowledge thanks to research and monitoring efforts

Figure 15 : Socioeconomic goals and objectives of MPAs (Pomeroy *et al.*, 2006 ; Courtesy of IUCN)

	Name	Additional description	Type	Data collection
1	Local patterns of use of marine resources	Manner in which populations use coastal and marine resources and impact their state	Factual	Existing data (statistics, reports, etc.), Semi-structured interviews,

			observations
2	Local values and beliefs regarding marine resources	Perceived	Survey on local populations
3	Level of understanding of human impact on resources	Perceived	Survey on local populations
4	Perceptions of seafood availability	Opinion of local consumers on the availability of foodstuffs from fishing	Perceived Survey on local populations
5	Perceptions of the abundance of local catches	Opinion of fishermen on the abundance of local resources (main target species)	Perceived Survey on local fishermen
6	Perceptions of non-commercial values (use and non-use)	Perceived	Survey on local populations
7	Material lifestyle of local populations	Housing characteristics	Factual Survey on local populations
8	Quality of human health	Nutrition, access to health services, child mortality	Factual Statistic data, observations, survey on key informants
9	Distribution of household incomes per source		Factual Survey on local populations
10	Structure of household activities	Distribution of productive activities in the community (per age, sex and social group)	Factual Statistical data, survey on local populations
11	Community infrastructures and shops	Hospitals, schools, sanitation and systems, shops, etc...	Factual Statistical data, observations, survey on key informants
12	Market number and type	Seafood market from MPAs and vicinity	Factual Statistical data, observations, survey on key informants, fishermen and shopkeepers
13	Stakeholder knowledge of natural history	Non-scientific knowledge of local populations on the natural environment and impact of human activities	Perceived Survey on local populations
14	Publication of official knowledge in local communities	Degree of information of local populations with regards to scientific knowledge on the natural environment and impact of human activities	Perceived Survey on local populations
15	Proportion of members	Positions of responsibility of related to MPA management	Factual Administrative data, survey on key

stakeholder groups holding positions of responsibility		informants
16 Change in the state of ancestral and historic sites and monuments	Factual	Historic data, observation, survey on key informants

Figure 16 : Socioeconomic indicators of MPA performance (Pomeroy *et al.*, 2006; Courtesy of IUCN)

4. State of the art of regional Mediterranean research programmes on MPA effects on fishing

a) *BIOMEX project*

A relatively old project, BIOMEX⁵⁵ was based on MPA capacity to spur the biomass export of 1) adult fish, by measuring and comparing abundance gradients inside and outside the MPA; 2) fish eggs and larvae (similar technique), to assess the pelagic potential produced by the MPA; 3) adult fish contributing directly to commercial fishing activities. The latter objective was calculated by means of experimental fisheries, monitoring professional fishermen and analyzing the spatial distribution of fishing efforts according to the MPA (zoning, regulation). Backed by European funding, the project was led on 6 case studies in the North-Western Mediterranean⁵⁶. The summarized restitution of the results obtained showed a decreasingly intense fishing effort according to distance from the MPA boundaries (regular drop in catches per unit of effort and surface unit). The global export of the biomass and its positive effects were confirmed, although high variations remained in terms of species and their distribution. Lastly, biomass export beyond the limits of the MPA was mostly expressed over short distances (around 1 km).

b) *EMPAFISH project*

EMPAFISH⁵⁷ was a logical follow-on from BIOMEX; it aimed to look at certain questions in more depth and put forward ways of assessing MPAs as components of public policies (fishing and conservation). EMPAFISH included 20 case studies, 16 of which were in the Mediterranean⁵⁸. The basic idea was to assess MPA effects on ecosystems, fishing and other economic activities. This project would then allow operational indicators of MPA impact to be refined and drawn up in order to create functional, adaptable and weightable models (bioeconomic) according to MPA contexts and locations. The methodologies employed were based on the analysis of the protective regimes applied to MPAs, together with field surveys and observations to assess MPA performance with regards to the

⁵⁵ Assessment of biomass export from marine protected areas and its impacts on fishing in the Western Mediterranean (2003-2005).

⁵⁶ France (Carré le Rouet and Cerbère Banyuls) and Spain (Medes, Tabarca, Cabo de Palos, Cabrera).

⁵⁷ European Marine Protected Areas as tools for fisheries management and conservation (2005-2008).

⁵⁸ Spain (Cabo de Palos, Tabarca, San Antonio, Serra Genanta e Islotes de Benidorm, Anti-trawling zones, Columbretes and Medes), France (Cerbère Banyuls, Bouches de Bonifacio and Côte Bleue), Italy (Tuscany Archipelago, Ustica, Sinis Mal di Ventre and Golfo di Castellamare trawl ban area) and Malta (Zone de Conservation de la Pêche and RDUM Majjiesa/RAS IR-RAHEB MPA).

environment and fisheries. The project was completed in February 2008, but the final results continued thereafter and concrete proposals were put forward in the form of guidelines and assessment tools: optimal MPA size and zoning configuration, central role of no-take areas (percentage), distance and MPA interconnectivity.

In view of their "European" character, these projects were both conducted mainly in the western and central areas of the Mediterranean. Naturally, we cannot detail the multiple national initiatives led by the Mediterranean States here. However, in addition to political enthusiasm for marine environmental protection, they reflect great scientific, legal and institutional dynamism with regards to MPAs, the analysis of their governance and the effects they incur on general usages and on fisheries in particular⁵⁹.

5. Regional cooperation/fish research programmes and their links with MPAs

We will rapidly quote the technical and scientific cooperations led under the aegis of the FAO and directly related to GFCM objectives. These programmes, financed by the Mediterranean States and European Union, are geographically defined and lend significant importance to the role of MPAs in fisheries management.

a) *COPEMED project*

Launched in 1996, COPEMED (Advice, Technical Support and Establishment of Cooperation Networks to Facilitate Coordination to Support Fisheries Management in the Western and Central Mediterranean) brings together 8 countries from the western and central Mediterranean (Morocco, Tunisia, Algeria, Spain, France, Italy, Libya and Malta). The work of the COPEMED network, which covers around 7 existing MPAs (2003 figures) includes a component referred to as "MPAs as a management tool for Mediterranean fisheries". The project partners reiterate the harmful effects of overfishing on the environment and re-asserts the role of MPAs in reducing fishing-related mortality, rebuilding the demographic structure of exploited species, protecting spawning/nursery zones, raising the reproductive biomass, maintaining genetic diversity and reducing conflicts between fishermen (Ramos-Esplà et al, FAO-COPEMED, 2004). The exhaustive and comparative analysis of various protection models in force in the relevant States has enabled results comparison and inspiration to be gained from successes, together with fine-tuning of the spatial approach, size optimization and functions destined for MPA zoning (conservation, logistics and development) and improved monitoring and supervision efficiency, taking into consideration the obvious time lag between site protection and benefits to fishermen (around 3 to 5 years), etc.

⁵⁹ As an example and in reference to France only, we can mention the following ongoing research projects involving Mediterranean MPAs :

- GAIUS (MPA governance for the sustainable management of biodiversity and coastal uses), ANR (National Research Agency) programme, length 3 years (2008-2010). 3 case studies: Cerbère Banyuls, Bouches de Bonifacio and Côte Bleue.
- PAMPA (Indicators of MPA performance for the management of coastal ecosystems, resources and their uses), LITEAU III programme by MEEDDAT (Department of Ecology, Energy, Sustainable Development and Spatial Planning), length 3 years (2008-2010). 4 case studies: 3 identical to GAIUS, plus the Cap Roux fishing zone.
- AMPHORE (MCAs and Fisheries Management through Optimisation of Resources and Ecosystems), ANR programme, length 4 years (2008-2011). Case study: Bouches de Bonifacio.
- LINDA (Limits of negative interaction between dolphins and human activities), LIFE (Financial Instrument for the Environment) European Programme, length 5 years (2003-2007). Applied to the Corsican coast, it aims to reduce conflicts between dolphins and fishermen thanks, in particular, to the existing MPA network (nature reserves Natura 2000 sites).
- GRAMP (Governance of large MPAs), LITEAU III programme by MEEDDAT, length 3 years (2009-2011). Analysis of the Study Mission for the creation of a marine nature reserve on the Vermillion coast (preparatory phase of a Franco-Spanish transborder project) set up by the French MPA Agency.

b) ADRIAMED project

Launched in 1999, ADRIAMED (Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea) brings together Albania, Croatia, Italy, Slovenia and Montenegro. The geographic particularity of the Adriatic means that all of its commercial fish stocks are shared. For this reason, the border States decided to instigate a multilateral co-management approach to fishing activities. Specialist working groups were set up to assess the state of stocks (demersal and pelagic), the impact of the various catching techniques used, fishing capacity (operational units) and legal, sociological and trade aspects. The Adriatic is a closed-in sea, predisposed to inter-State conflicts with regards to the demarcation of marine areas under jurisdiction. The various demands and unilateral declarations (on the pretext of fishing management and environmental protection) are not properly enforceable with regards to neighbouring border States. Although several MPAs exist in the Adriatic (Miramare, Isole Tremiti and Torre Guaceto for Italy) or are in the project stage, these areas are not explicitly mentioned in the work conducted by ADRIAMED. However, the predominance of the guiding principles of the Code of Conduct (see above) reiterates the need for the spatial regulation of fishing practises and the identification and protection of strategic areas to preserve resources and the sustainability of fishing activities.

c) MEDSUDMED project

Instigated in early 2000, MEDSUDMED (Assessment and Monitoring of the Fishery Resources and the Ecosystems in the Straits of Sicily) focuses on the Mediterranean's largest fishing zone (see diagram below), with particular attention to demersal species and small pelagic species.

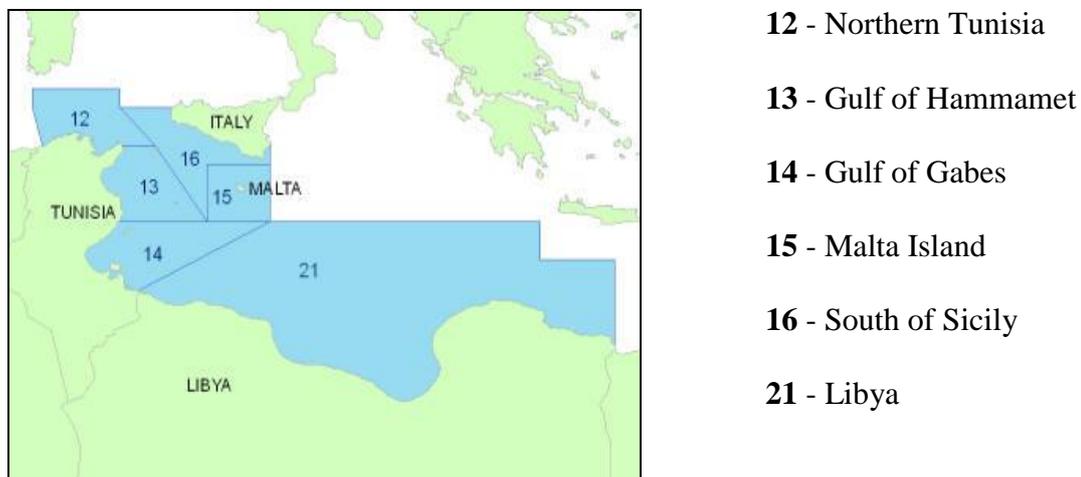


Fig. 17: MEDSUDMED area scope

The role of MPAs in fishing development is one of the themes common to the involved countries (Italy, Tunisia, Malta and Libya). In 2003, a large-scale scientific consultation⁶⁰ allowed numerous specialists to unveil and compare the experiments led or scheduled by the MEDSUSMED States and throughout the Mediterranean, in particular with regards to the COPEMED project (Spain). The results of this initiative highlighted the

⁶⁰ MEDSUDMED, GCP/RER/010/ITA, "Report of the MedSudMed Expert Consultation on Marine Protected Areas and Fisheries Management", Salammbô, Tunisia, 14-16 April 2003, Rome 2007, 106 p.

following points: 1) the importance of preliminary studies and targets allocated to MPAs on a scientific and biological level (habitats and species); 2) the efficiency of MPAs in reducing overfishing and illegal coastal fishing; 3) recourse to artificial reefs to reinforce the physical protection of certain areas (trawlers, seines); 4) consideration of the social and cultural acceptability of MPAs and the economic effects of protection processes; 5) the pertinence of the legal framework and regulations.

Lastly, and still in the same spirit, we would like to mention the EASTMED⁶¹, ARTFIMED⁶² and MED-LME⁶³ projects. The first two became entirely operational in 2009. The MED-LME project comes into the framework of the Barcelona Convention, via RAC/SPA (Regional Activity Centre for Specially Protected Areas) and the strategic action plans for the Conservation of Biological Diversity and Fight Against Pollution due to Terrestrial Activities. This project brings together the following 12 countries: Albania, Algeria, Bosnia, Croatia, Egypt, Lebanon, Libya, Morocco, Montenegro, Syria, Tunisia, Turkey and the Palestinian Authority. Component n° 3 (conservation of biodiversity) encourages the development of an MPA network in the Mediterranean and the application of ecosystemic management for the sustainable use of fish resources (reduction of accessory catches and other irresponsible fishing practises).

III. INTEGRATION OF SMALL-SCALE FISHERIES IN MPA GOVERNANCE: FROM PARTICIPATION TO CO-MANAGEMENT

Considering the analyses carried out above, assessing and confirming the positive impacts of MPAs on small-scale fisheries can help demonstrate good governance of the marine environment, its efficiency, legitimacy, and the fishermen's positive perception. Such evaluation can be conducted focusing on two main inseparable aspects that we have just considered: observations/evaluations (including fishermen participation) of the biological/ecological and socio-economic effects of MPAs on fisheries. However, the dynamic links between MPAs and small-scale fisheries (synergies and conflicts) remain a complex and excessively contextual issue that needs to be addressed in this third section. MPA functioning and management therefore need to be analysed with regard to small-scale fisheries (organisation and action system). Which relevant types of governance can be characterized? What are the MPA capacities to integrate the challenges of fishing economy and the actors' specific expectations? From this perspective, it has to be regarded as a search for synergy between MPAs and fisheries, and this question often goes beyond the mere framework of professional fisheries, as we have seen, especially in multi-use MPAs and in Mediterranean coastal contexts.

1. Conceptual framework and content of MPA and fisheries governance

a) Definitions and general action framework

⁶¹ Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean.

⁶² Sustainable development of Mediterranean artisanal fisheries in Morocco and Tunisia.

⁶³ Strategic Partnership for the Mediterranean Large Marine Ecosystem – Regional Component: Implementation of agreed actions for the protection of the environmental resources of the Mediterranean Sea and its coastal areas.

The term governance can have different meanings that vary according to the disciplinary approach, but all converge around major principles. For a legal expert, governance of a marine protected area is first defined through the institutional and legal framework set by the States to ensure the conservation of all or part of the marine biodiversity. Other social standards and legal institutions are included in this framework according to the principles and conditions adopted by the governments (Féral, 2011, Cazalet et al, 2012). Thus, governance of a MPA can be regarded as a “societal whole” which includes legal rules, power relations, behaviours, scientific data, the institutional framework, the market, the users, different activity professionals, such as small-scale fishers... In short, governance relates to complex and uncertain systems (e.g. see diagram below on the multi-disciplinary and comparative approach of the governance of French Mediterranean and overseas MPAs).

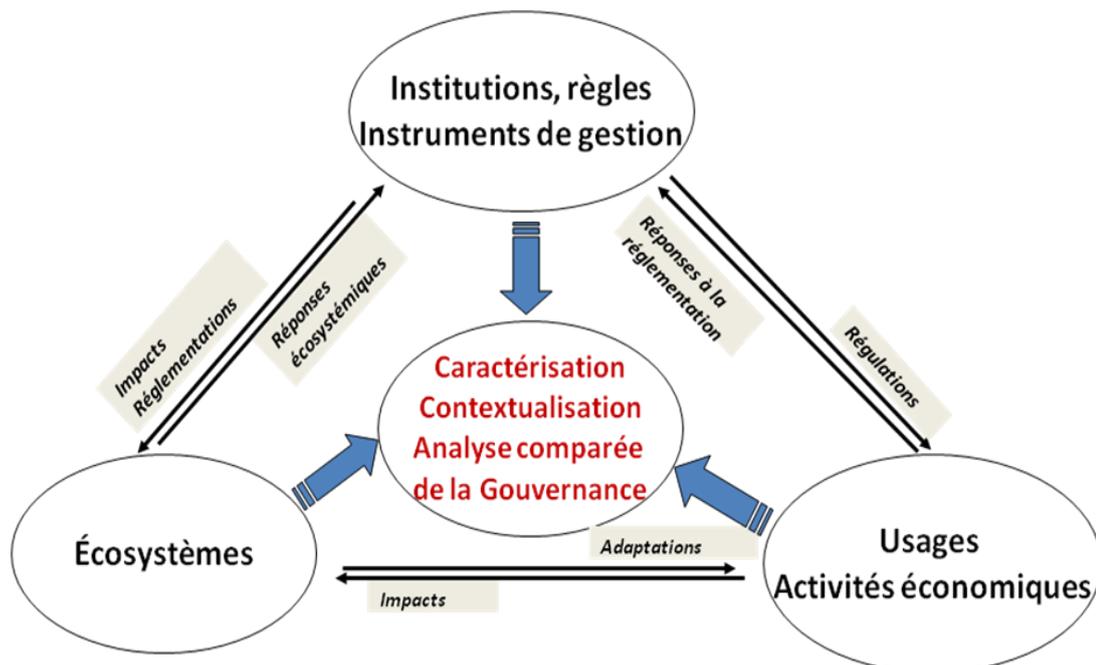


Figure 17 : multi-disciplinary and integrated approach of GAIUS project (Cazalet et al. 2008)

Garcia *et al.* (2013) remind us that one of the “major characteristics of modern fishery governance and MPA management is acknowledging the uncertainty resulting from the great complexity of the socio-ecological systems involved and the possible consequences in terms of: spatiotemporal differences between actions and responses; system sensitivity to external inputs; amplification or absorption of system responses to stimuli; interconnection between space and time scales; self-organization and endogenous change capacity; difficulty in spreading experiences; non-linearity and ambiguity in cause-and-effect relationships; low impact reversibility; different actors’ perceptions; and inevitable reduction of prediction and control capacities”. Fisheries governance and MPA governance have long been ignoring one another, and were sometimes even conflicting, but we now need to consider their complementarity and search for synergies in integrating small-scale fisheries in MPA policies.

This link was internationally embodied during the WSSD in Johannesburg, South Africa, in September 2002, with many relevant planning actions for fisheries and MPAs (Source: WSSD Report (Johannesburg, South Africa, 26 August-4 September 2002) :

- Encourage the application by 2010 of the ecosystem-based approach, (Para 30 d);
- Promote integrated, multidisciplinary and multi-sectorial management (Para 30 e);
- Strengthen cooperation and coordination between the relevant regional organizations (Para 30 f);
- Maintain or restore fish stocks to levels that can produce the maximum sustainable yield ... not later than 2015 (Para 31 a);
- Develop and facilitate the use of ... the ecosystem-based approach, the elimination of destructive fishing practices, the establishment of marine protected areas... including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors (Para 32 c)
- Promote coherent and coordinated approaches to institutional frameworks for sustainable development (Para 162 a);
- Strengthen governmental institutions... promoting transparency, accountability and fair administrative and judicial institutions (Para 163).
- Promote public participation, including through measures that provide access to information regarding legislation, regulations, activities, policies and programmes. Foster full public participation in sustainable development policy formulation and implementation. (Para 164).
- Further promote the establishment or enhancement of sustainable development councils and/or coordination structures at the national level, including at the local level. In that context, multi-stakeholder participation should be promoted.

b) Content and changes

Generically speaking, the governance of fisheries has evolved alongside that of MPAs. Initial methods were based on a strict conservationist approach (artificial preservation of spaces/emblematic species) or single-species approach (management per stocks or groups of stocks exploited by industrial fleets). In both cases, governance was rather authoritative, centralised and reductive in its objectives. Progressively, from being “*paternalistic (top-down), commanding, controlling and penalising, both governance shifted towards hybrid practices (top-down and bottom-up), giving a more important role to actors and other non-governmental stakeholders in decision-making processes*” (Garcia *et al.* 2013). Therefore, for ideological and practical reasons, they turned into more dynamic and participatory systems of governance. This change strongly contributed to the mutual understanding between fishing and environmental governance, especially regarding the CBD requirements (art. 11), the implementation of the ecosystem-based approach and the precautionary principle.

However, the most radical methods remain somehow effective, especially in emergency situations or imminent/proven danger (for the environment or the resource), when the need for action driven by a strong will and appropriate means prevails over the negotiation time and languid consensus. Lastly, the natural seclusion of sites or the low social and economic relevance of a fishery may provide ideal ground for an authoritarian approach. However, in most cases and contexts, limits would soon appear. When the unilateral rules set – even when they are ecologically justified – are not accepted⁶⁴ socially and economically, it will inevitably lead to conflicts between actors and decision-makers and/or non-compliance

⁶⁴ Legally, we would refer to the lacking legitimacy of the standards and/or the institutions responsible for their enforcement.

with the rules. In such conditions, there is no point in chasing fishers or attempting to close the borders of the MPA, since – unless “bringing out the big guns” – such actions would be doomed to failure. There are numerous examples of this kind of systems and their equally counterproductive consequences for the ecosystems and the populations (Weigel et al, 2007). *In fine*, “joint planning of MPAs and fisheries management in a region or ecosystem, to reduce their respective negative impacts and optimise synergies, is an attractive and necessary perspective. The alternative consisting in operating separately has already showed its limits.” Garcia et al. (2013).

Therefore, participatory governance appears as the art of the possible, as an obligation of means for an often-hypothetical result. As the best is the enemy of the good, it is continuously developed, adapted and reassessed, since it is only a complex strategy of behaviour, organization and implementation of management and decision-making processes. The role of NGOs (facilitator and / or host) and MPA managers’ network is of utmost importance in this shift towards new forms of governance. From this point of view, the implementation of “good” governance however seems very hard to determine (what is it?), except in a strictly contextual, ideological or theoretical way: a form of protest – in a broad sense – against the State apparatus and its centralized administrations (locally transposable) in view of the will to rebalance the implementation of public policies and decision-making powers (Féral, 2007). Governance takes us back to the dialectics between the State and the civil society, the interactions between public and private sectors, and the complex integration of all the often-conflicting interests of the stakeholders: how is the power exercised, following which paradigms, what responsibilities for which results?

Topic	As it was: protected areas were ...	As it is becoming: protected areas are ...
Objectives	<input type="checkbox"/> Set aside for conservation <input type="checkbox"/> Established mainly for spectacular wildlife and scenic protection <input type="checkbox"/> Managed mainly for visitors and tourists <input type="checkbox"/> Valued as wilderness <input type="checkbox"/> About protection	<input type="checkbox"/> Run also with social and economic objectives <input type="checkbox"/> Often set up for scientific, economic and cultural reasons <input type="checkbox"/> Managed with local people more in mind <input type="checkbox"/> Valued for the cultural importance of so-called “wilderness” <input type="checkbox"/> Also about restoration and rehabilitation
Governance	<input type="checkbox"/> Run by central government	<input type="checkbox"/> Run by many partners and involve an array of stakeholders
Local people	<input type="checkbox"/> Planned and managed against people <input type="checkbox"/> Managed without regard to local opinions	<input type="checkbox"/> Run with, for, and in some cases by local people <input type="checkbox"/> Managed to meet the needs of local people
Wider context	<input type="checkbox"/> Developed separately <input type="checkbox"/> Managed as ‘islands’	<input type="checkbox"/> Planned as part of national, regional and international systems <input type="checkbox"/> Developed as ‘networks’ (strictly protected areas, buffered and linked by green corridors)
Perceptions	<input type="checkbox"/> Viewed primarily as a national asset	<input type="checkbox"/> Viewed also as a community asset <input type="checkbox"/> Viewed also as an international

	<input type="checkbox"/> <input type="checkbox"/> Viewed only as a national concern	concern
Management techniques	<input type="checkbox"/> <input type="checkbox"/> Managed reactively within a short timescale <input type="checkbox"/> <input type="checkbox"/> Managed in a technocratic way	<input type="checkbox"/> <input type="checkbox"/> Managed adaptively in a long term perspective <input type="checkbox"/> <input type="checkbox"/> Managed with political considerations
Finance	<input type="checkbox"/> <input type="checkbox"/> Paid for by taxpayer	<input type="checkbox"/> <input type="checkbox"/> Paid for from many sources
Management skills	<input type="checkbox"/> <input type="checkbox"/> Managed by scientists and natural resource experts	<input type="checkbox"/> <input type="checkbox"/> Managed by multi-skilled individuals drawing on local knowledge

Figure 18: Development of the MPA dominant paradigm (Phillips, 2003 from Thomas et Middleton 2011) From Garcia *et al.* 2013

Characterizing the different forms of governance was the subject of numerous analyses and typologies; here are some schematic representations:

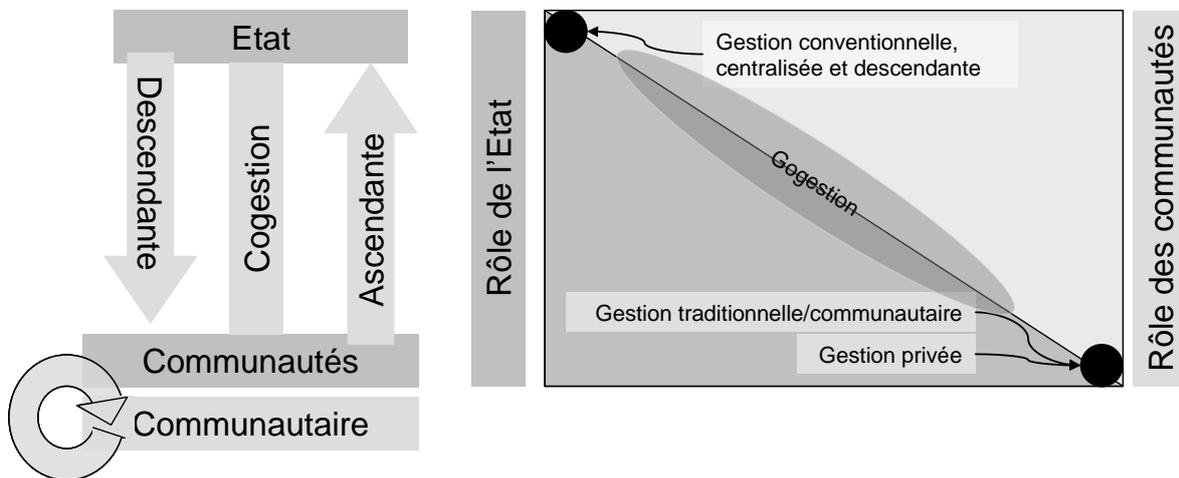


Figure 19 : Representation of the types of governance (Garcia *et al.* 2013)

<i>State-owned MPA</i> ⁶⁵	<i>Participatory MPA</i> ⁶⁶	<i>Traditional MPA</i> ⁶⁷
Centralisation	Co-management	
Decentralisation		

⁶⁵ Classic centralised and bureaucratic model of State or certain local authorities having significant marine skills.

⁶⁶ Corresponds for instance to the French model of “Marine Natural Park” where a forum of users and local representatives (including professional fishers) directs management. The expression “Sea Parliament” is therefore often used to describe its functioning. The State (and its representatives) voluntarily appears as a minority, while keeping its regulatory and executive functions in consensus-based decisions.

⁶⁷ Localised models, often strengthened by geographic seclusion and/or prevailing and recognized traditional village structure. This model does not seem, in principle, representative in the Mediterranean (or it is at least in decline), except for a few coastal and fishers’ communities likely to claim such an organization that is really effective.

Technocratic	Participatory	
Traditional		
Urban	Urban, peri-urban	Rural,
villagers		
Recreational	Mixed	Food-
producing		
Unilateral	Power relationships	Common
consent		
Expensive	Expensive	Cheap
Professional	Corporate, by categories	
Voluntary, disciplinary		
Science	Negotiation	Experience
Vertical Organization	Forum	
Horizontal organization		
Bureaucratic	Conflicts, dialectics	
Community-based		
Extravert	Introvert	Extravert
STATE LEGITIMACY	SOCIETY LEGITIMACY	
INDIGENOUS LEGITIMACY		

Figure 20 : Proposal of MPA management models (Féral, 2011, Cazalet 2012)

We could multiply the counterpoints to these three main categories resulting from our analyses (Féral 2010, 2011, 2012, Cazalet, 2012). According to an integration gradient of the society model to the state model, a range of mixed applications appears, combining interferences and items of the three models. Therefore, according to the agreed criteria, local management of an MPA⁶⁸ can be associated with the society or indigenous model. However duality remains and is articulated:

- either around cooperation, sharing, synergies and complementarity;
- or around tension, confrontation and competition.

In any case, these two lines of “State/society” dialectics are also found in MPA management issues. They often work in tension and conflict. This tension could be cancelled since these models need to strengthen each other to create “good governance”. In the next

⁶⁸ Entrusted to professionals (traditional fishers) or private institutions (NGOs, associations, unions) in collaboration with local populations.

section, we will try to illustrate these different models associating them with Mediterranean study cases.

c) Which effective MPA governance to the benefit of small-scale fisheries?

Participatory management or co-management can be defined (Pomeroy et Guieb, 2006, from Garcia *et al.* 2013) “as a partnership arrangement in which the community of local resource users (fishers), government, other stakeholders (boat owners, fish traders, boat builders, business people, etc.) and external agents (non-government organizations, academic and research institutions) share the responsibility and authority for the management of the fishery. Through consultations and negotiations, the partners develop a formal agreement on their respective roles, responsibilities and rights in management, i.e. the shared power they negotiated”. Such “agreements” can be of different types and determine levels of transfer or delegation of very different competences and powers⁶⁹.

The challenge of a convention is to ensure that each stakeholder benefits from it in the exercise of his rights and in complying with its obligations. The aim being that no party feel strongly or unjustifiably disadvantaged against the other party(ies). “Good governance” aims at promoting constructive interactions between the components of the State, the private economy sphere, and the civil society. Thus, “co-management is not a formula, a model strategy, but an adaptive process which changes, grows and develops over time. It involves democratisation of processes, social emancipation of the actors, decentralisation, sharing of powers and social learning. In short, the principles and characteristics are those of “good governance”. The concept was strongly used as a tool and sometimes misused, the actors’ involvement being only promoted by the authorities to make them better comply with centralised and preconceived decisions (Kuperan *et al.*, 2003). This is the case in many traditional fisheries and MPAs” (Garcia *et al.* 2013). So, fisheries integration levels also depend on the different chronological phases of MPA implementation: planning, creation, regulation (territorial use rights for small-scale fisheries), monitoring, surveillance and conflict resolution.

⁶⁹ Although the following typology cannot always be transposed to any legal and administrative framework, we can retain the following terminology:

- **Decentralisation:** when there is a transfer of authority and/or responsibility relative to management (competence) from the centralised higher authority (State, Ministry of fisheries) to an institution of local administration level (region or commune) with a certain level of autonomy (institutional, legal, fiscal, etc.) and legitimacy (electoral) or to the private sector.
- **Deconcentration:** involves a transfer of management responsibilities from the ministry headquarters or any agency responsible for the management to its own personnel within a peripheral administrative area (e.g. prefecture, commune) where the employees are agents from the central authority. The decentralised action requires peripheral administration and is generally framed by guidelines set by the headquarters. It is a variant of the delegation, since the State is still – remotely - in power.
- **Delegation:** involves a transfer of certain functions of the central government to a semi-autonomous or paragonmental organisation. The delegated functions cover: the selection of management measures, registration of rights, local conflict resolution, full planning responsibility and implementation of specific protected area or fishery management. The State hands over the supervision of the operations, but remains in control.
- **Devolution:** decision-making authority allocated to local governance, which - within the established limits (geographic areas, type of resources) - can decide and enforce decisions. The State reserves the right to intervene in the last resort if the basic objectives or the rules in force are not complied with.

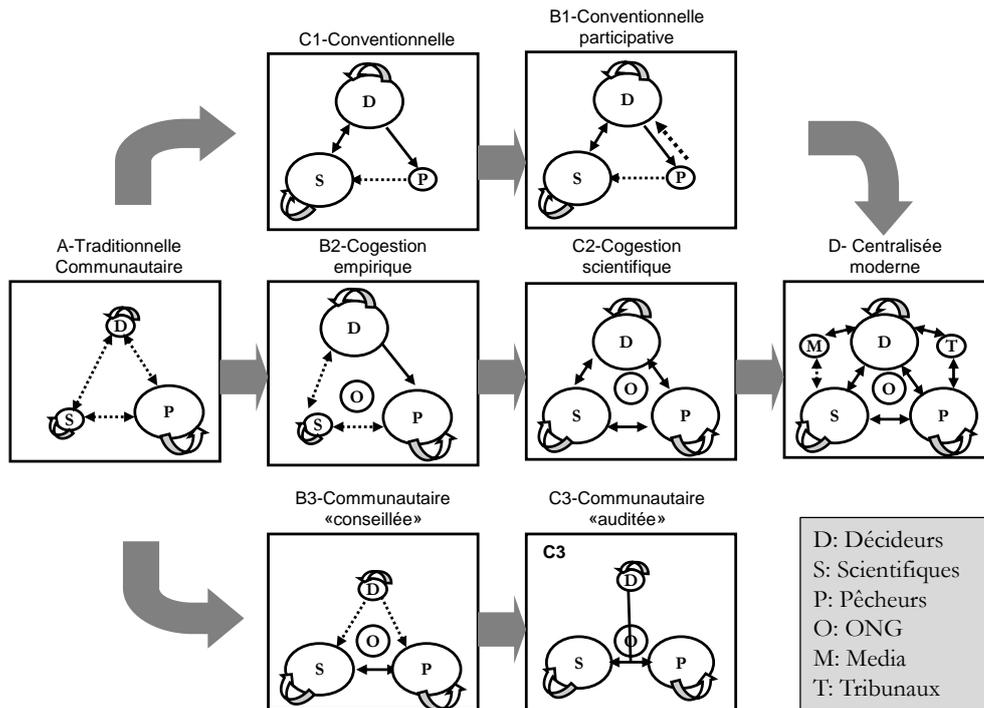


Figure 21: Relationships between decision-makers (D), fishermen (F), scientists (S), NGOs (N), courts (C) and media (M) in the different types of fisheries governance.

The relative size of the circles represents the relative importance of the roles. If we extended the fishermen group to the group of actors in general, the diagram could easily be applied to multi-use MPAs (Garcia *et al.*, 2010).

The ideal of balanced co-management however remains counterbalanced by many uncertainties resulting from the complexity of fisheries phenomena, marine ecosystems and human responses (Charles, 2001; Garcia, 2009, from Garcia *et al.*, 2013):

- *“Delayed responses:* which can appear long after the first implementation of management measures (e.g. when responses depend on the age of fish or the actors);
- *Teleconnections:* the effects of measures can occur far from their application point, including in another country (e.g. due to migrations, currents, or through the food chain);
- *System sensitivity to external factors:* environmental, social or economic factors at the global, regional and/or local scale;
- *Feedback loops* that adjust (amplify or absorb, accelerate or slow down) the system responses;
- *Strong interconnections between the different time and space scales* that must, as far as possible, be considered simultaneously. Conclusions made at a certain scale (e.g. local) cannot necessarily be extrapolated to another scale (e.g. national or regional) and the role of the State in the search for consistency between the scales is of utmost importance (Jones, 2012);
- *Self-organisation capacity* which allows the system to react unpredictably (e.g. the ecosystem does not react as expected; Fishermen find an unexpected way to counter a measure, or an unexpected solution to their problem);

- Loss of universality. Protocols cannot necessarily be transferred from a region or a community to another, even if managers always search for successful transferable protocols (often gathered in good practices catalogues);
- Non-linearity of phenomena: impacts are not just proportional to the measures taken. Saturation, acceleration and threshold phenomena may occur.
- Ambiguous relations: one action may lead to several types of responses and one problem observed may have various origins; so one issue can actually have different solutions.
- Irreversibility of impacts: unlike what is assumed with conventional management, the phenomena observed (e.g. impacts of fishing activities or conservation measures) cannot necessarily be reversed.
- Actors may have different perceptions, and they may change over time;
- Reduced prediction and control capacities. All the above elements lower the governance capacity to accurately predict the impacts of the measures taken, and therefore to entirely control possible events”.

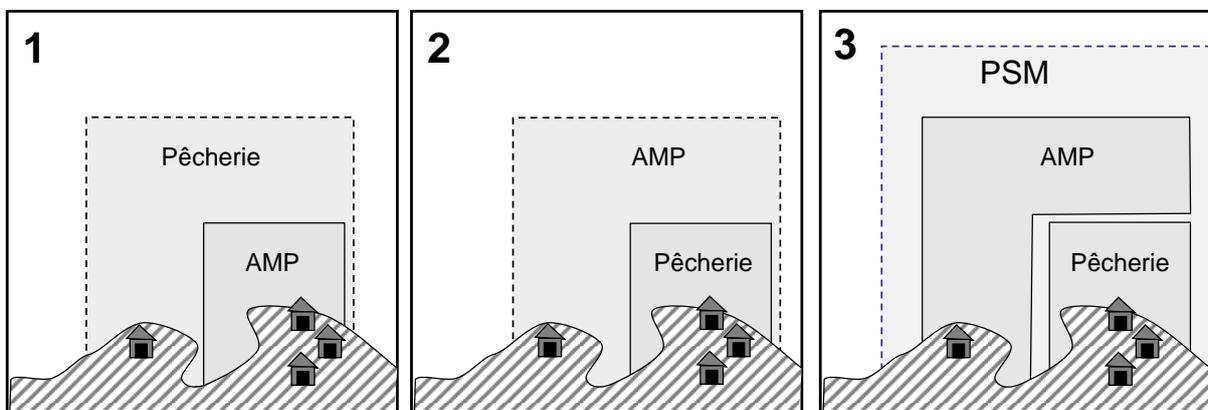


Figure 22: Types of interactions between MPAs and fisheries. 1: MPA integrated in fishery management. 2: Fishery integrated in MPA management. 3: Fishery and MPA integrated in Maritime Spatial Planning (Garcia *et al.* 2013).

2. Conditions for the integration of small-scale fisheries in MPA governance

a) Which forms of small-scale fisheries governance in the Mediterranean MPAs?

In France, we can consider that fishing reserves or regulated areas (fishery-oriented MPAs) are *de facto* systems of professional governance. We have seen that the Cap Roux MPA corresponds to this type of management being delegated to a professional institution (the St Raphaël fishermen organization).

Another example in the French Mediterranean is the MPA of the Côte Bleue. It is an innovative initiative, *sui generis* within the meaning of law, but perfectly integrated in the local environment and accepted by the users and actors, especially the small-scale fishers. The presence and efficiency of a MPA do not necessarily involve being part of legal categories expressly provided by law...the Marine Park of the Côte Bleue is a relevant case study.

Indeed, the status of “Marine Park” does not exist under the French law. This designation has been used by the local organization, which initiated the creation of the MPA in the 1980’s. The legal basis is a combination of various statuses (fishing regulated areas, marine culture concessions for the installation of artificial reefs, etc.) that have developed to progressively form the “Marine Park” entity. Today, a single concession has simplified the MPA legal framework, without changing the functioning principles based on the cooperation between local authorities and professional fishermen within a joint association. Acceptance of this MPA in the official categories of the Environmental Code has progressively been normalized under the European Marine Natura 2000 Network (European *Habitats* Directive) - where the marine park manager is an operator.

As regards the notion of professional discipline, it would be interesting to study further orientations, such as spatial management of artificial reefs. The relevance of these restoration structures is strengthened, they have diverse functions and help consider almost “personalized” installation strategies (design, sites, depth, target species, etc.) for small-scale fishers (high demand), sport fishers, recreational fishers and divers (vision), anti-trawling, etc. Concessions or licenses can help implement reef installation projects, but with recurrent difficulties to anticipate the crucial challenges of artificial reef post-installation management in a consensus framework. Except in Japan, the historic leader, rather limited data and works are available on the governance of artificial reefs in an integrated, adapted-to-use and non-exclusive framework (Cazalet, 2009).

A meeting organized in Carovigno Italy 17-18 March 2012, brought together MPA managers and Mediterranean artisanal fishermen around two ideas:

- Promoting sustainable fisheries in and outside Mediterranean MPAs;
- Support the artisanal (small-scale) fisheries in the Mediterranean.

At the end of this work, returns (Piante, 2012) offered their results in the form of case studies of rich teaching fruits of experiences and concrete initiatives, with findings/guidelines for policy makers.

b) Perspectives of small-scale fisheries self-management (spatial-based)

This idea has already been mentioned in this work, especially in the processes of small-scale fisheries integration in local, daily and decentralised MPA management (not only fishery-oriented MPAs). Consideration should be given to the ways of supporting or reactivating spatial management capacities (“fishery regions” inherent to traditional fisheries), directly by the fishermen themselves - according to the community-based models (existing or once existing) (Féral, 2004, Cazalet *et al.* 2011). In France, for instance, historical models that progressively disappeared seem to gain a renewed interest, especially with the European institutions and the Common Fisheries Policy reform process. Besides, the current context of institutional and socio-economic crisis must not be omitted since it inevitably reduces the daily presence and *in situ* intervention capacity of public authorities (human, logistical and financial resources for fisheries and MPAs). This will lead to changes in the governance of maritime spaces and it can help reach new forms of local appropriation and decentralised management. The maritime public space has always been traditionally over-managed, with a growing trend to multiply regulatory constraints (protection, fishing, etc.), but with a decreasing *in situ* support. Bureaucratic and technocratic management are still used, but they are centralised and less field-related.

The will to promote coastal small-scale fisheries specificities (sustainability, selectivity, environmental integration, etc.) should be expressed through better spatialized access rights' recognition processes and according to decentralised management criteria, adapted to local fishing conditions. The possibility to strengthen sustainable fishing livelihood raises the question of – usually very irregular and sometimes very weakened - dynamism among fishers' communities, their sufficient number and their capacity to appropriate a protection and fishing effort management space (collective discipline). This also raises the same issues of legitimacy and compatibility/articulation with the rules and practices (uses) in force in the marine/coastal spaces (risk of conflicts, protests). Finally, it cannot seem incongruous to promote better access/use conditions for professional categories having a particular and exclusive dependence to the natural environment and whose role remains essential in terms of food supply ...

In terms of “models” (types of concessions, delegations, etc.), we come back to fishing reserves and regulated areas, but with a perspective of stronger governance, with a true management autonomy and appropriation for the benefit of the fishermen groups likely to achieve it. Some of these models already exist *de facto* in the daily practice of some fishers' communities, but they are not enough regarded, nor considered by the decision-making/management centralised authorities: access/use rules, reserves/voluntary and temporary closing, conservation of areas for natural and extensive enlargement, adaptation/modification in real time of practices and techniques based on empirical observations, including of longer-term changes in species behaviour, environments or climate, etc. The installation of artificial reefs can also facilitate the appropriation initiatives, provided that appropriate management mechanisms are used.

c) Summary report

The table below “*is a synoptic overview of the main arguments put forward, in the literature, by the supporters of the integration of MPAs in fisheries management and their opponents*” (Garcia et al, 2013).

Arguments of pro-MPAs		Arguments of pro-management
MPAs are a universal solution for fisheries management	→	MPAs are only one of the potential fisheries management instruments <i>Correct answer for Reserve-MPAs but multi-use MPAs are integrated spatial management frameworks</i>
MPA objectives and fisheries management objectives are different but MPAs can help fisheries	↔	MPA objectives and fisheries management objectives are different. MPAs are not designed to help manage fish stocks
MPAs are crucial means for ecosystem reconstruction	→	yes, provided that they are properly managed
Natural shelters were eradicated by development Trawling is destructive and needs to be prohibited on large surface areas	→	NO: trawlers only affect a few % of the surface areas available (<i>correct only for the impacts to the seabed</i>) Creation of MPAs will encourage them to damage other habitats elsewhere
	←	MPA socio-economic consequences are

Arguments of pro-MPAs		Arguments of pro-management
		largely ignored
Some fishing capacity monitoring systems (ITQ) also tend to exclude traditional users	←	MPAs tend to exclude traditional users, removing or complicating their livelihood
But multi-use MPAs attempt to secure the traditional fishers' rights	←	Reserve-MPAs lead to displacement of fishermen, increasing personal dangers, transferring stabilized impacts, concentrating overfishing
	←	MPAs cause ecological, operational and socio-economic issues
Only MPAs can reduce certain impacts on living habitats and biodiversity	→	Approval
Approval	←→	Less mobile sedentary species should better benefit from MPAs
Pelagic MPAs are necessary, especially in open and high seas	←→	Yes, but difficult to plan (boundaries, position, seasonal dynamics, extreme dimensions or networks)
	←	Adverse effects of fishers' displacement are immediately perceived. Positive effects of their exclusion will take years to be observable.
The size of MPAs has little impact on their performance. <i>However, many works indicate that small MPAs are less efficient in terms of conservation</i>	→	Only in tropical coral reefs. In temperate areas. The size of MPAs should be adapted to the life cycle geography. <i>Small protected areas should be sufficient to meet socio-economic objectives (Claudet et al. 2011)</i>
Fisheries will benefit from spillover effects and larval dispersal. There are examples in tropical reefs and temperate seas.	→	That is what the models indicate, especially for less mobile species, but actual effects are rarely demonstrated in the wildlife. <i>However, it is logical, probable and confirmed in some cases. Always hard to demonstrate without ambiguity. Effects worn off by the "attractive" effect of the reserves, especially when the prevailing effort is not controlled</i>
Such arguments are supported by some facts and contradicted by others. There are unquestionable examples of spillover effects.	←	The growth of protected stocks will slow down the recruitment and productivity (and surplus production), reducing or even cancelling the spillover effect. <i>Unless the emigration rate is high, but in this case, the protection provided by the MPA will be lower.</i>
Failed fisheries management processes are due to the search by the actors (fishermen and politics) for short-term benefits	←→	But establishing rights will rectify this problem aligning the objectives of both the sector and the society
Failed management is due to decision-	→	Frequently, but the reasons for this

Arguments of pro-MPAs		Arguments of pro-management
makers' non-compliance with scientific recommendations		behaviour (compromise, clientelism) will also affect the MPA.
Extensive areas should be closed (10-65%, average 32%) (for species strongly related to their habitat)	→	For cod, closing 25% of the North Sea would have an insubstantial impact. <i>An unacceptable part of the region would need to be closed.</i> Extensive transborder MPAs (transnational) will generate significant management problems. For very mobile species, the effects of MPAs are worn off by many factors and the surface areas to be excluded would be too important (ongoing debate). The patchwork of MPAs would be hard to manage. <i>It is a typical argument for single-species management, not ecosystem-based management.</i>
The stock decline is such that conventional management will not help recover them (ITQ)	→	There is sufficient evidence that a proper effort regulation can lead to biomass recovery.
MPAs and effort control must be combined to achieve sustainable use.	↔	It is true for fisheries, but hard, with sometimes adverse effects on the ecosystem (more rejections).
Fisheries management (often) fails.	→	Yes, but the failures are mainly due to politics, and the same compromises would affect the implementation and management of MPAs.
<i>It is possible in multi-use MPAs and acceptable even in Reserve-MPAs, if they are decided for and with the fishers</i>	←	Individual Quotas (or community quotas) and TURF are successful in modern fisheries management.
MPAs should be implemented collaboratively, but some argue that exclusion can first be imposed and that approval will come later with the results (in Jones 2007).	↔	Allocating fishing rights (and the resulting exclusion) is necessarily a collaborative and compensatory process. Efficiency depends on the quality and the equity of the initial allocation.
<i>This could occur, for the same reasons in integrated spatial management where economics' forces are involved.</i>	←	The highly participatory and multi-sectorial approach of multi-use MPAs sometimes leads to progressive partial exclusion of fisheries actors (e.g. for the benefit of tourism).
<i>The lack of data for the evaluation of many MPAs is a problem.</i>	←	Configuration and implementation of MPAs require greater multidisciplinary scientific support (socio-economic aspects).
Managing Reserve-MPAs is easier (only access control). SSN and coastal radars make it easier.	→	<i>Common failure of Reserve-MPAs indicate that this control alone is not sufficient, unless it is increased to impossible financial levels or with the active support from the impacted</i>

Arguments of pro-MPAs		Arguments of pro-management communities.
MPAs can help control fishing pressure.	→	Not when the whole capacity is not reduced simultaneously
MPAs are a “guarantee” against scientific mistakes and errors in fisheries management.	→	Not always. Dissatisfactions also lead to further deviant behaviours (fraud, falsifying data).
MPAs help solve conflicts between users (with zoning).	→	Creation of MPAs can also generate conflicts, inside and outside their borders.
MPAs help reduce by-catch and catch release.	→	Yes, but in the same way that fishing reserves and other RSTs
Information needs are lower: only regarding representativity of MPAs and their connectivity within the networks.	→	<i>But total omission of information on social and economic impacts due to exclusion and pressure dynamics (demography, globalisation). Bio-ecologists’ tunnel vision</i>
Opinion being generalised	←	It is absurd to consider Reserve-MPAs as a sole instrument for fisheries management; it is a loss of precious time and energy.
MPAs and conventional management are complementary despite their respective drawbacks.	↔	Yes, but their role is not to improve the stocks and their integration in fisheries must be tested.
The conventional precautionary approach does not help address the side effects on habitats and biodiversity.	→	This aspect probably requires the introduction of MPAs.
The managers and actors’ trust in fishery science is limited.	↔	The fisheries managers and fishers’ trust in MPA science is even lower, given the radical and unilateral message from MPA supporters.
Conclusions: MPAs are a key solution MPAs need less ideology and more science	↔	Conclusions: Rights systems are a major solution component. In temperate systems, MPAs are a symptom of poor management, but not a solution. If MPAs are needed, uncertainties must be recognized, tests must be carried out and they must be included in appropriate regulation contexts.

Figure 23: Comparison of the arguments put forward in the debate on the role of MPAs in fisheries (From Garcia *et al.* 2013). In the central column, the arrows go from the initial argument to the response.

Bidirectional arrows indicate that the argument is used on both sides, without controversy. Italic text indicates comments made by the authors in this chapter. Grey cells indicate conditional or total consensus. The table idea comes from Jones 2007. Data from: Agardy *et al.*, 2003 ; CEFAS, 2005 ; Fonteneau, 2001 et 2007 ; Game, 2009 et 2009a ; Garcia, 2009 ; Jones, 2007 ; Kaiser, 2005 ; Kaplan *et al.*, 2010 ; Norse, 2005 ; Weigel *et al.*, 2007 et 2011

3. Recap of the successes of Mediterranean MPAs with regards to small-scale fishing

We repeat here the essential data shown on a few case studies of the most documented of the Mediterranean and made available by the association MedPAN

a) Natural reserves of Bonifacio and Scandola

These two island MPAs in Corsica (France) have a significant and successful experience in associated managing between small-scale fisheries and MPA. The results of scientific and socio-economic monitoring highlight the positive effects of protective measures for local professional fishermen. On the basis of a negotiated process of co-construction of the MPA legal framework, supplemented by a daily and dissuasive presence of sworn officers, they offer interesting perspectives in terms of potential contribution of MPAs to maintain small local fishing activities. The findings of Scandola managers consider the practice of small-scale fisheries "*can develop in accordance with the principles of good management of fisheries resources and benefit from the reserve effect*". Managers are sometimes asked to undertake specific actions in the interest of professional fishermen and working directly with them (e.g. lobsters and sea urchins in the Straits of Bonifacio).

b) Natural marine reserve of Cerbere-Banyuls

In Banyuls (France), the natural marine reserve allows fifteen small-scale fishermen to work within the buffer zone of 585 hectares. Their level of involvement is considered by the Manager to be relatively high, as shown in the following indicator.

c) Blue Coast natural marine park

Also in France, these MPA is an instructive example of a decentralized process of creation and management, with a very high degree of integration of small-scale fishing and involvement of its representatives. The patterns of creation/evolution of the MPA have always had the express wish to support this category. The results were quite successful, as shown in the figure below. In addition, the managers of these MPA are attached, more recently, to determine the volumes of catches made by recreational activities. In some areas of the MPA, the percentage of biomass taken by recreational fishers is identical to that produced by professional fishermen (Charbonnel *et al.* 2013). This kind of additional data seems to us very important in this study because it confirms a number of perceived trends, but found difficult to demonstrate and measure. It is clear that small-scale fisheries are increasingly forced to "share" their workspace and catch volumes with recreational fishing. However, the level of regulation of non professional fisheries is minimum, or nonexistent in terms of control/monitoring, including within MPAs. When the biomass taken is identical between professionals and non-professionals, it may seem logical and necessary that the manager and decision maker facing the question of control or strict limitation of these extractive practices. Professional fishermen and representatives of Mediterranean MPAs also recalled their expectations in this regard in their recommendations at the Carovigno meeting (Piante, 2012).

d) Networks of fishing reserves in Spanish Mediterranean Medes

The table below describes the general characteristics of the Spanish MPAs (7 Mediterranean) established under fishing reserves status (Revenga *et al.*, 2012).

RESERVA	R INTEGRAL (ha) Categoría I. UICN	RESTO (ha) Categoría VI. UICN	TOTAL (ha)
ISLA DE ALBORAN	695	955	1.650
CABO DE GATA- NIJAR	1.665	2.988	4.653
CABO DE PALOS- ISLAS HORMIGAS	267	1.664	1.931
CALA RATJADA- LEVANTE DE MALLORCA	2.000	9.285	11.285
ISLAS COLUMBRETES	3.112	2.381	5.493
ISLA GRACIOSA	1.076	69.363	70.439
MASIA BLANCA	457		457
ISLA DE LA PALMA	837	2.618	3.455
PUNTA DE LA RESTINGA- MAR DE LAS CALMAS	237	943	1.180
ISLA DE TABARCA	78	1.676	1.754
Total	10.424	91.873	102.297
%	10,2	89,8	100

Figure 24: Network (surface, category) of 10 fishing reserves established along the Mediterranean coast and the Canary (Revenga *et al.* 2012)

For example, and according to the authors (Revenga *et al.*), the evaluation of the effect of reserve Columbrete Islands after 20 years of protection shows that:

- "11% of the annual catch is exported as net biomass of the marine reserve.
- The density of lobsters and egg production is 5 to 20 times higher in the marine reserve than outside.
- Increase - multiplied by 6 – of regional lobster egg production due to the large breeding marine reserve hosts".

e) Torre Guaceto MPA

Located in the south of Italy on the Adriatic Sea, the marine reserve of Torre Guaceto provides a dynamic example of adaptive co-management. The outcome of such a result has been difficult preliminary steps related to the effective implementation of the management plan in the 2000s and the strict enforcement of the MPA. After objections and refusal on the part of fishermen's, mutual efforts, dialogue and involvement in the management of the MPA

have improved to legitimize the presence of the reserve in the heart of a historic fishing area for fishermen in this region. According to the statements of the fishermen themselves, the loss (or strong access restrictions) of a workspace of more than 2000 hectares now seems largely offset by the spillover effect : *"In 2001, survey/control of the reserve has been applied, we thought we were so "stole" a piece of sea and during for 4 years, we poached. After, we were able to discuss and collaborate. Today, we catch 4 times more than 10 years ago"*.

f) The marine extension to the Taza national park

The offshore extension of the national park of Taza (Algeria, South MedPAN project) has generated an intense work of communication and exchange between experts, members, partners and small-scale fisheries stakeholders. For the first time, the public and fishermen have discovered the concept of protected area and its benefits (social, economic and environmental) applied to the marine part of the national park of Taza. The objectives for local small-scale fisheries have been established to:

- The perennity of local fisheries in a sustainable development process;
- The introduction of new alternative activities generating income.

Instead, this example illustrates a recent initiative whose main interest lies in the participatory nature of its design and its implementation, without prejudging the final outcome and the expected effects to be produced in relation to the small-scale fishing sector.

IV. PROMOTING SMALL-SCALE FISHERIES AND THEIR RECONVERSION POTENTIAL IN AND AROUND MPAs

1. Foreword

In line with MPA positive effects on small-scale fisheries, it is important to consider the possible additional benefits, auxiliary, which are not necessarily specific to MPA traditional functions. To what extent can we go further in the integration objectives between fisheries and MPAs? In any case, fishing economy features (dynamism, stability or disintegration) are a key to understanding the expectations and needs of fishers' groups and the perspectives of MPA contributions to coastal small-scale fisheries. It is self-evident that situations and contexts are not even, nor reproducible, so our study will only cover action principles and relevant orientations, illustrated when appropriate with solid examples and study cases. Finally, the scope of "reconversion" needs to be specified. "Reconversion" can refer to a career change, which involves giving up the main original activity, here professional small-scale fishing, and replacing it by another form of activity. This type of rather radical change is always possible, sometimes inevitable, but we consider that it should not be the main solution in our developments. Indeed, achieving such a result – "losing" small-scale fishermen – in the implementation of fisheries or environmental policies can be considered a failure⁷⁰. In this study, we do not regard it as a desirable end even if it can sometimes result from a normal development due to changes in one part of a specific economy. Therefore, we prefer a moderate vision of reconversion, sometimes redundant with our previous analyses, from a simple compensation to a real reconversion. Generically, related to these concepts, we

⁷⁰As the plans for withdrawal of fishing vessels (regulation of overcapacity and/or individual and collective fishing effort), which compensate fishermen for the voluntary destruction of their fishing vessel, with permanent or temporary prohibition to exercise any fishery-related professional activity.

often use the expression “alternative livelihood and income-generating activity”. At last, in any case, the consequences of such alternatives will need to be anticipated and evaluated. For instance, diversification around MPA tourist attractiveness⁷¹ can rapidly worsen the managers’ constraints, jeopardizing the site protection.

Measures very likely to put pressure on fishery resources*	Measures unlikely to put pressure on fishery resources
Direct contributions to fishing effort (grants for purchase of engines...)	Activity diversified towards agriculture, aquaculture, crafts and tourism
Monetary compensations awarded to fishers	
Indirect contributions to fishing effort (harbour infrastructures, FADs, artificial reefs...)	Attribution of exclusive fishing rights
Contribution to catch promotion (labelling, marketing, processing...)	

*In descending order of probability to increase the pressure

Figure 25 : Main compensation measures, according to their pressure on fish resources (from Garcia *et al.* 2013)

2. Compensations

Negative impacts of MPAs on fisheries (real or perceived) mentioned earlier are sometimes put forward by the fishers to protest against MPA projects. Such reactions can encourage the managers to adopt compensatory measures to make up for the consequences - especially on the short-term - of the implementation of a protected area where any extraction activity is prohibited.

a) Marine seabed planning and artificial reefs

These tools⁷² are frequently mentioned in our study, reminding that they are considered by most small-scale fishermen as excellent “fish-producing” tools and they can help support the sustainability of activities. Such considerations may be empirical and often disregarded by managers and scientists responsible for monitoring these tools. Without getting into the debate on bio-ecological evaluation of the reef effects, we will consider here the fishers’ expectations and opinions, whatever the scientific uncertainties around these operations. Let’s remind that reefs have been used for thousands years by some civilisations (Asia), sometimes in extraordinary proportions, without any scientific justifications or considerations⁷³. We consider that it is much more important to study the reef post-

⁷¹ Some sites in the Mediterranean have become real “amusement parks” that attract and amuse visitors; MPAs are therefore sometimes more visited inside their borders than outside ... (Cazalet, 2008).

⁷² Are not covered here the artificial reefs that would be the main subject of MPA operation (e.g. Côte Bleue), nor the FADs which do not seem much used, as far as we know, in the Mediterranean, and especially in the coastal areas.

⁷³In Japan, the worldwide leader in this field (12% of its continental shelf), reefs are installed following coastal fishing support logics, regarded for ages as a national priority. Scientific monitoring and technological approaches are now very efficient and benefit from extensive public and private investment. Nevertheless, such technico-scientific support is not the criteria - *a priori* - for exclusive or conditional legitimization of installation reasons and decisions. Positive perception of

installation access/use management/regulation (professional or multi-use fisheries), rather than to focus on preliminary issues, such as the installation itself and scientific monitoring.

Uncertainty must not lead to cancellation or postponement of the actions and decisions related to artificial reefs. However, the positions of States are quite different, they are cautious to a greater or a lesser extent, reluctant and sometimes opposed to the reef installation policies and conditions in the Mediterranean⁷⁴. Finally, the financial and economic stakes behind reef installation projects (e.g. modules *versus* wrecks) are significant and can substantially influence political decisions and reef installation choices.

In any case, MPAs may have to consider the installation of “compensatory reefs” within or around their borders. Such consideration must mainly focus on spatio-temporal and socio-economic factors in order to lead to positive perspectives for small-scale fisheries: whom the reefs are for (professional or multi-use fisheries)? What features (volume, design, composition)? How deep (distribution of uses, conflict prevention)? Which management (conventions, management plans, etc.)? Which control and monitoring? etc. This kind of projects should be launched in the recently established *Golfe du Lion* Marine Natural Park in the French Southern Mediterranean.

b) Accompanying measures

To make up for spatial and regulatory constraints, other compensatory approaches can also be implemented to support small-scale fishers in their daily work. Such initiatives are not supposed to be funded by the MPA, but the MPA can lead the process (file setup, grant application, partnerships, etc.). Through involvement and *leadership*, the MPA strengthens its legitimacy towards fishermen extending its functions to direct or indirect support to small-scale fishing economy. Some examples can be highlighted:

- Professional infrastructures and collective services: fish storage and processing means⁷⁵, improvement of harbour conditions (docking/landing), storage of material, product promotion (selling stands), etc.
- Support to modernization (e.g. improving engine energetic performance or modernising the fishing fleets) in return for more environment-friendly practices (gear selectivity, limited fishing effort, etc.)
- Direct financial support: quite uncommon, “*since it is expensive and generally does not encourage the beneficiaries to modify their behaviour towards a sustainable use of resources*” (Garcia *et al.* 2013). Occasional and limited contributions in return for services rendered to MPAs can however be considered: compensation, fishers’ remuneration, e.g. during scientific fishing activities, transport of researchers/scientific divers, larval fish catch, rental/manufacturing of catching gear for scientific purposes, etc.

artificial reefs is an assumption, an observation that is not questioned, and it is on this basis that it is supported and enhanced by science in order to improve its efficiency (Cazalet *et al.* 2009).

⁷⁴See on that matter the North/South controversy regarding the immersion of shipwrecks, and the related differing interpretations and applications of the Barcelona Convention and the corresponding protocol. – See oral communication, Cazalet, 2013 *et les résultats du Colloque Euro-méditerranéen sur les récifs artificiels, Marseille, Palais du Pharo, 5-8 février 2013.*

⁷⁵ Such as funding the installation of an ice-maker for fishermen in the Bages-Sigean lagoon within the *Narbonnaise Regional Natural Park* in the Mediterranean, terrestrial and marine protected/managed area (France).

3. Diversification – conversion

The FAO (2011) takes into account the MPA capacity to generate revenue and employment diversification for the relevant fisheries. Numerous measures (tourism, agriculture, aquaculture, crafts, etc.) can generate an additional activity (diversification), or even a complete reconversion for the fisherman and/or its family. According to Garcia *et al.* (2013) “among the diversification measures towards tourism, the ones related to “fishing tourism” should most directly reach the fishers. It consists in encouraging professional fishers to take tourists on board, to either introduce them to traditional fishing (Bellia, 2010), or develop sport fishing or ecotourism”. However, even if fishing tourism can be initiated by the MPA or determined by its presence (attractiveness and added value related to the activity), this option can be considered in any context, with or without MPA. For example, the development of this type of diversification has been specifically requested by the fishermen in the MPA of the national park of Taza in Algeria during the consultation process conducted in 2012.

4. Promotion and communication

Following the accompanying model, the MPA can help promote and communicate on the small-scale fishing products and practices:

- Support the implementation of labels. Although the concept of “label” is frequently considered very extensively, true (legal) initiatives on maritime products are rather uncommon. As an example, the most famous label, MSC⁷⁶ (Marine Stewardship Council), is still not used in the Mediterranean. MSC covers the stocks and/or fisheries sustainability considering their impact on the environment and the management mechanisms implemented to ensure sustainable use of resources. This type of approach inevitably leads to a “label” effect on the product image (or the fishery image) and on the market. The labelling process however remains expensive especially for small-scale fisheries: 10,000 to 20,000 Euros, plus the application file fees, as well as a post-labelling payment of about 0.5% of the product value. The rather classic awarding criteria yet seem to favour the stock condition. It must be assessed and considered as sustainable, whatever the technique used (selectivity? impact on habitats?) or the economic structure of the fishery (industrial, artisanal, jobs generated, etc.).
- Strengthening and diversification of sales channels: direct sale, rather short channels, inland regions, etc.
- Partnerships (quality charter), especially for the communication process towards the general public. The diversity and resources of small-fishery products are often too little known beyond the local fishery villages. This Mediterranean specificity can sometimes hinder the promotion of discredited products⁷⁷ (wariness, preconceptions), which actually have interesting qualities and could be granted a better added value.

⁷⁶ Currently includes 215 certified fisheries, i.e. about 8-10% of worldwide catch

⁷⁷ Other older and sometimes infamous examples, such as the cod, indicate how much the perception and economic value of the product can change over time, and not only because of its scarcity.

V. CONCLUSION

Based on the findings of the study, our conclusions focus on the principles and orientations for the optimal and sustainable integration of small-scale fisheries within MPAs. The aim is also to integrate this work in the general framework of the 1st Regional Symposium on Sustainable Small-Scale Fisheries in the Mediterranean and Black Sea and its main objectives⁷⁸. Finally, we will remind that the convergence between MPAs and small-scale fisheries can also be expressed with other tools and means, in particular such as the ones resulting from the recent Antalya Declaration⁷⁹ and its roadmap.

1. Towards a win-win strategy between MPAs and small-scale fisheries

The objectives of small-scale fisheries and MPA management intersect on many aspects: territorial management, sustainable fishery resources and practices, search for balanced and “acceptable” governance between conservation of ecosystems and extractive activities. In any case, establishing spatial-base standards and implementing them through an institutional structure determine levels of constraints and the organisation of use/access rights according to the objectives set, especially those established to ensure best conservation of spaces and resources. But this general framework is not sufficient as many other parameters add to the complexity of small-scale fisheries’ « good » governance in or around the MPAs: 1) the instability⁸⁰ and non-linearity of marine ecosystems and the natural interactions they encompass, including global change effects; 2) the multiple uses and human pressures other than fishing activities, especially in coastal areas.

Besides, although the features and challenges are often shared, the priorities remain different, sometimes even contradictory and conflicting. MPAs give priority to the wildlife, its non-market dimension⁸¹ and its protection against practices likely to harm it. Whereas small-scale fisheries aim for daily – or at least regular – accessibility to a working area, profitability of the enterprises (mainly individual), their renewal and the constant demographic strength of professional communities. *In fine*, a successful win-win strategy would provide ideal integration and enhance synergies between small-scale fisheries and MPAs, as expressed in the strategic objectives 2 and 3 of the Antalya Declaration⁸².

⁷⁸ 1) Foster and renew political commitment towards small-scale fisheries; 2) Agree upon a possible roadmap for the gradual implementation of tasks in support to the sustainable development of small-scale fisheries; 3) Discuss the set-up of a regional cooperation project on small-scale fisheries; 4) Lay the foundation of a platform where stakeholders could be directly involved and participate in the management of small-scale fisheries

⁷⁹ Adopted further to the Forum of MPAs in the Mediterranean, organized in Antalya, Turkey, 25-28 November 2012, to commit “to achieve by 2020, a connected, ecologically representative, effectively managed and monitored network of Marine Protected Areas”. Declaration based on Aichi Target 11 of the Strategic Plan for Biodiversity 2011-2020.

⁸⁰ In the sense that an ecosystem is never fixed but rather always subjected to transformations and variations where the “global” and sustainable stability is only a series of equilibrium and progressive adaptations measured on different time scales.

⁸¹ Original vision of protection policies. The production of market services related to ecosystem conservation measures has become a tangible reality, especially in the MPAs... Conservation is also a business that is often much more profitable than local professional fisheries.

⁸² Strategic objective 2: Achieve an effective, efficient and sustainable management and good governance in Mediterranean MPAs. Strategic objective 3: Develop a territorially and sectorially integrated governance of Mediterranean MPAs while promoting the sharing of environmental and socio-economic benefits.

2. What do small-scale fishermen expect of MPAs?

- 1.1. Avoid worsening regulatory and spatial constraints regarding access to and use of fishery resources. Such constraints tend to be developed and strengthened in coastal areas due to the diversified uses, activities and regulatory frameworks established. Despite their specific difficulties⁸³, small-scale fisheries are gradually losing their political, economic and social importance, becoming increasingly minority even controversial activities. With a view to compensation and to support sustainability of these “integrated” practices, MPAs can determine priority objectives more likely to maintain small-scale fisheries as historical, heritage and structuring activities within the protected territories and surrounding areas.
- 1.2. Improve the quality/resilience of natural environments acting similarly and complementarily on other causes of damage to the marine environment (pollution/pressures) and fish mortality. Overfishing is not the only reason for the crisis in the sector and the deterioration of coastal ecosystems. Although they are little known, the environmental challenges related to global change, their (positive or negative) consequences on the environments, the resources and the economy, encourage the public authorities to be cautious. The precautionary approach leads to considering fisheries management in this general context of uncertainty around marine ecosystems. Coastal fisheries are also affected by water pollution, sediments from watersheds, estuaries, habitats deterioration, contamination with heavy metals, hydrocarbons and other industrial and domestic chemical compounds. All these harmful effects are well known and measurable, and the risks threatening the quality of fishery products are real and sometimes proven, with potential consequences on human health. The capacity of MPAs to effectively improve the marine/coastal environment quality indicators on the long term remains a crucial component of their support to small-scale fisheries.
- 2.3. Develop tools to improve the productivity of the marine environment. We have seen that artificial reefs - whatever their design is - are particularly appreciated by small-scale fishermen. Extensive natural enlargement initiatives are also likely to support small-scale practices. Such planning measures favourable to the productivity of marine environments are not systematically included in MPA policies. However, many examples show that they could be easily and complementarily integrated.
- 2.4. Maintain the versatility of fishing units. Small-scale fishing is characterized by a great adaptability in terms of techniques used, target species, seasons and fishing areas. Such flexibility is territorialized (daily scope) and needs to be best articulated with spatial protection measures. Besides, regulatory and time-space management of fishing effort needs to include the complexity related to versatility, for which regulation cannot be limited to specialized or single-species approaches. Indeed, the will to compartmentalize the regulations (per species or technique) may “rigidify” daily practices and highly hinder small-scale fishers adjusting capacities. MPA design, size, regulation and governance must help preserve the fisheries features.

⁸³ Decreasing resources and attractiveness of the profession, increasing installation and functioning costs, etc.

- 2.5. Encourage diversified small-scale fishing activities. The MPAs must help enlarge the range of economic activities directly or indirectly linked with small-scale fisheries. We have seen various tools in details, from simple additional activity to pure and simple reconversion. From this point of view, diversification must be considered as a mean to help maintain small-scale fisheries and the related number of professionals.
- 2.6. Promote the sustainability of practices and the quality of small-scale fishery products. This is a concrete and applied dimension of the collaboration and support of MPAs to the small-scale economy. MPA actors are often requested to promote and circulate the actions and results of the protection measures. In return, the MPA must help promote good practices (particularly related to IUCN categories) and provide a substantial added value to the efforts undertaken by small-scale fisheries: 1) Promoting selectivity, sustainability, environmental integration; 2) Contributing to the promotion of products in or around the MPA (labelling, traceability, etc.)
- 2.7. Encourage conservation of the coastal area (3/5 miles) in favour of small-scale fishing (priority area for access and use). Small-scale fishermen do not have technical, material and regulatory capacities to practice their art beyond coastal areas and territorial waters. However, other more remote and “deterritorialized” (un-spatialized) practices/techniques (industrial and semi-industrial) can access such areas more or less intensively (legally or illegally), using sometimes non-selective or even destructive techniques for the habitats (bottom trawling). Such situations are very common in the whole Mediterranean basin, they affect the environment and they can lead very quickly to overexploitation of resources and to conflicts between professional sectors. Therefore, coastal MPAs can contribute to: 1) ensuring use and access priorities to small-scale professional structures that depend exclusively on the resources; 2) defining accurate and adapted criteria for small-scale fisheries; 3) locally supporting measures that promote small-scale fisheries (funding, renewal, installation, etc.). Finally, the recurring problem of “paper MPAs” remains a major weakness in the governance of coastal areas.
- 2.8. Improve planning/decision-making mechanisms in terms of fisheries and MPAs. The ecosystem-based approach tends to better coordinate the environmental and economic challenges of the marine environment. In some regional (European Union) and national contexts, the legal and political framework establishes the conditions for a better synergy between small-scale fisheries, their environmental integration and the MPAs: definition of criteria and economic and environmental indicators, awarding of use and access rights, shared governance, sectorial support to the branch, etc.
- 2.9. Establish measures and sufficient means for limiting/monitoring catching effort of non-professional fishing practices (booming activities). The latter remains lightly regulated or unregulated and poorly controlled in many Mediterranean countries, it sometimes creates a real sense of "differential treatment" penalizing for small-scale fishermen. This should be especially consider in contexts where these practices have become very intense, having a significant impact on the environment and resources, comparable or even higher than professional fishing

- 2.10. Ensure systematic involvement of professional representatives within the MPA design, development, creation and implementation processes. The complex aspects of co-management need to find an ideal expression ground within MPAs. small-scale fisheries must remain a major referent for maritime practices and receive special attention from managers and decision-makers, even though they sometimes tend to lose influence, representativity and their historical position in the coastal context.

3. What are the MPA managers' expectations?

3.1. Enhance communication between fishermen, managers and scientists. To varying extents, small-scale fishermen maintain more or less close and constructive relationships with MPA managers and scientists. Disagreements (on objectives, content, methods, consequences, risks, etc.) may sometimes hinder dialogue. Fishermen may feel like they serve the interests of – sometimes too obscure and technical – scientific disciplines, without any operational feedback or tangible benefits. MPA contribution to science is significant, and so is the related financial investment. Scientists (fundamental and applied research) often bear the consequences of the conflicts between fishermen and decision-makers. Sometimes used as a shield by the decision-makers, when unpopular regulations need to be backed up by expert scientific advice; or scape-goated by the fishermen who consider they supported measures (restrictions, prohibitions) without considering economic requirements nor consulting field professionals. In the end, using the scientists as a tool is all the more detrimental given that they have quite little influence on the decision-making processes. MPA managers are in the best position to optimize the links between fishermen and scientists. They can act as an ideal intermediary to define and direct scientific protocols considering the fishers' expectations. According to us, this involves two joint approaches: 1) keep in mind the versatility of small-scale fisheries and their effect on management objectives; 2) complete the prevailing bio-ecological approach with research in social sciences on the organization of fisheries and fishermen communities, the institutional and legal analysis, the actors' strategies, the territorial challenges, the economic context, the role of the market... Progress has clearly been made on that matter, but it needs to be consolidated in terms of research and managers' training.

3.2. Identify or build referent groups. Involving the actors is one of the governance's core concerns. We believe that this commendable undertaking implies one prerequisite: what do we mean by "actors"? It does not involve providing the list and distribution of the actors in a MPA, but a simple quantitative evaluation/follow-up work can provide such information. For the governance, it is necessary to determine groups of actors likely to be represented and, where possible, to represent the MPA users. Whether it is about professional fishermen, recreational fishermen, recreational boaters or other users, a minimum of organisation is required to ensure everyone's participation. Professional fishing organizations (committees, consortiums, *cofradias*, Prud'homies, fishermen organizations, associations, federations...) have always taken part in public decision-making, this is nothing new, including in MPAs, but such participation is not necessarily systematic or satisfactory in all the Mediterranean countries. We have seen earlier that personal and split strategies were likely to lead to area-use conflicts. We can discuss individually with fishermen, understand their position, hear their proposals, but it is still not sufficient. As an institution, the MPA should be able to hold a dialogue with identified, structured and, where possible, institutionalized focal points. Beyond the decision-

making process and its legitimacy, this parameter is also necessary to receive the MPA regulation, disseminate it “internally”, support its efficiency and its enforcement within the group’s own functioning system (using self-monitoring and/or disciplinary rules).

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