

MEDITERRANEAN MARINE PROTECTED AREAS AND FISHERIES RESERVES

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1. Marine Protected Areas: definition and objectives

Marine protected areas (MPAs) are defined as “*Any area of the littoral 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*” (Kelleher and Kenchington, 1992). This definition includes intertidal reserves, as well as areas for the protection of shipwrecks and archaeological remains.

Marine protected areas are designated to conserve the diversity of life according to the three aspects of Biodiversity: ecosystems diversity (habitats and species), species richness and genetic diversity. Also MPAs play a key role in promoting sustainable development. They are designed to enhance the sustainable use of marine resources and to promote local economic activities (such as sustainable fisheries practices) within the boundaries of social realities. Moreover MPAs are used for education and research, as well as for recreation and tourism purposes. Therefore MPAs can be described as multiple objective tools designed to accomplish conservation objectives and to promote sustainable development (considering social and economic aspects).

1.2. MPA categories

IUCN identifies six protected area categories according to their management objectives and selection criteria (Davey, 1988):

Category I - *Strict Nature Reserve/Wildlife Area*; protection areas (PAs) managed for science, research purposes and wildlife protection.

Category II - *National Park*; PAs managed mainly for ecosystem protection and recreation.

Category III - *Natural Monument*; PAs managed for conservation of specific natural features (unique value for aesthetic value or cultural significance).

Category IV - *Habitats/Species Management Area*; PAs managed for conservation through management intervention.

Category V - *Protected Landscape/Seascape*; PAs managed for landscape/seascape conservation and recreation.

Category VI - *Managed Resources Protected Areas*; PAs managed for the sustainable use of natural ecosystems and their resources.

At a political level MPAs are considered as an important technical conservation measure (TCM) also for the sustainable use of fisheries resources¹. These types of marine protected areas can be closed to fishing activities on a seasonal or spatial basis and are also referred to as fisheries reserves (FRs). Marine protected areas in category I-VI may include FRs (Badalamenti *et al.*, 2000).

1.3. MPA extension and distribution

EU Mediterranean MPAs

There are 33 Mediterranean MPAs in the European Union covering a total 477453 ha. Five are in France, 11 in Spain, 16 in Italy, one in Greece.

French and Spanish MPAs are generally managed at regional or national level (by national or regional government authorities) or by a combination of both; in Spanish MPAs the regional government is responsible. Italian MPAs are mainly managed by local government (councils and provinces); in Greece it is managed by the national park authority. Only in a few cases are Mediterranean MPAs managed by NGOs.

French MPAs have been studied mainly with an emphasis on the economic value, focusing on touristic use of the area concerned. Studies on Spanish MPAs take into consideration small-scale fishing as well as tourist activities. In Greece there are few data available on MPAs, but great importance is given to the protection of the monk seal *Monachus monachus* (Badalamenti *et al.*, 2000).

Non-EU Mediterranean MPAs

MAP data on accession countries (Croatia, Cyprus and Turkey) and non-EU Mediterranean countries (Algeria, Morocco, Tunisia, Lebanon, and Israel) were obtained from the RAC-SPA database. Information on the functional status need to be further investigated (i.e. management bodies, existing scientific committees). There are 21 non-EU Mediterranean MPAs covering a total of 53257 ha. Five are in Croatia, 1 in, 9 in Turkey, 2 in Tunisia, and 1 each in Cyprus, Lebanon, Algeria, Israel and Morocco.

1.4. MPAs: key issues

Ecological characteristics

Marine Protected Areas are characterised by special ecological features that are attributes to the marine environment. As a consequence, issues concerning objectives, selection, design and management reflect these ecological characteristics (Jones, in press). The marine environment has a wide spatial scale and relatively indistinct boundaries, and as a consequence the effectiveness of MPAs is site-scale specific - in fact they are considered most appropriate for site-dependent species with limited dispersal. Site specific protection is appropriate for areas of high biodiversity, endemism and productivity, spawning and nursery grounds, migration stop-over sites, and areas of particular importance for vulnerable species (Norse, 1993). Moreover, because of the connectivity of the marine environment, MPA effectiveness is critically dependent on whether the design takes into account the functional connectivity over a wider spatial scale between different parts of the ecosystems mosaic (Ray and MacCormick-Ray, 1994; Jones, in press).

¹ ((COM(2001)143); (COM(2001)135); (COM(2001)162, Vol IV)

Structure and functioning of the marine ecosystem is still largely unknown since there is a general lack of understating of abiotic and biotic dynamics and processes characterising marine ecosystems and their communities. The potential of MPAs as management tools has not been realised yet also because science highlights the fact that MPA effectiveness and management is poorly understood (Mascia, 2001).

Mediterranean MPAs: species, habitat protection and responses of population and communities

The role and the effectiveness of Mediterranean MPAs have been recently investigated through the ECOMARE project (Annex I). MPAs generally increase species diversity and the abundance of the average size of exploited species, nevertheless long term and more indirect effects need to be investigated further. The effectiveness of MPAs in enhancing recruitment has been studied by Planes *et al.* (2000). Near-shore zones are critical nursery habitats for Mediterranean shallow water species. Studies carried out in the northwest Mediterranean have shown no significant differences between survival of early life stages of littoral fish in MPAs and in areas outside them; for older recruits, mortality was higher within MPAs because of the increased predation within this areas to the protection provided to large predators. Other indirect effects of protection and potential negative feedback have been studied by Sanchez Lizaso *et al.* (2000). They suggest that fish populations are controlled by density-dependent factors; the increase of abundance in protected areas could have implication for the life history characteristics such as growth, survival and migration. Further studies could be useful to analyse density-dependent processes and how they control recruitment. In order to better understand and promote the potential of MPAs Garcia Charton *et al.* (2000) suggest that there is a need for long-term data sets to study responses of populations and communities in MPAs and being able to distinguish between effects of management and natural variability.

Conflicting interests and keys to success

In the Mediterranean region there are multiple uses for coastal areas. Here, the establishment of MPAs generate both internal (between users) and basic (between uses for conservation) conflicts. These can be difficult to manage when scientific arguments for MPAs are mainly for conservation purposes or there is inadequate scientific evidence to fully justify their use as fisheries management/conservation tools.

In order to provide benefit to local fisheries MPAs should lead to increased species recruitment and emigration to non-protected areas, therefore long-term studies on MPAs effectiveness should be promoted.

There are two main stances for the selection, design and management of MPAs, which are based on substantially different approaches. The top-down stance is government led and science-based, whereas the bottom-up stance is community based and science guided, usually with emphasis on multiple uses. MPAs developed according to the top-down approach have often been more poorly enforced (Jones in press; Jones, 2002). In fact, it is widely recognised that co-management and local community involvement is an essential factor for MPA enforcement and success (Kaza, 1998).

2. Fisheries Reserves

Fisheries Reserves (FRs) are protected areas created for conservation purposes and for the sustainable use of fisheries resources. Fisheries reserves are spatially bounded areas where the harvesting of marine resources is restricted, according to gear types (restricted fishing areas), or forbidden (no-take zones), and they can be assigned category IV status within the IUCN classification (Gubbay, 1995). No-take zones (NTZs) are marine areas where any activity involving the extraction of natural resources is prohibited². These NTZs are designed to protect populations of species at risk from serious and irreversible damage. Further information is needed, however, on the status of implementation, on the institutional framework, and on the specific purpose of these reserves.

Closed areas /NTZs

As a single-species fisheries management tool, the closure of areas to fishing industries is expected to help control fishing mortality and promote the recovery of overexploited populations, but designated prohibition can also yield positive results for several other species (Davis and Dodrill, 1989). NTZs are recognised as a special case of closed areas where the anthropogenic impact is negligible; most of the positive benefits attributed to NTZs are associated with the management of reef species, characterized by relatively immobile fish species. The same benefits, however, can not be directly translated to temperate wide-ranging European fish stocks (Horwood, 2002). Therefore there is a need to establish these tools and investigate their effectiveness in the Mediterranean Region as well.

The WWF International Marine Programme and the Endangered Sea Campaign and IUCN could encourage the establishment of NTZs in the Mediterranean Sea both in EU countries and non-EU countries. This would be the result of a consultation processes with national experts, consultants, NGOs and national, regional and local authorities.

Key of success

FR effectiveness depends on the design, location, size and number of reserves that may be necessary in relation to the auto-ecology of the species to be protected. Therefore biological data on larval dispersal and adult migratory patterns, home range and habitat requirements are crucial to the effectiveness of the fisheries marine reserve (Bennett and Attwood, 1993).

Co-management and community involvement in FRs is essential for their success. Fishermen must have ownership of the process and perceive that they are proactively involved in the management of their own resources. This is mainly true for NTZs and temporal area closure, where the involvement of fishermen must start in the early decision making process, then their knowledge can be used to design and manage the protected area. NTZs based on a compromise/opportunistic approach have been more successful (Jones, in press).

² fishing and gravel extraction.

3. Conclusion

Acknowledgement of the limitation in understanding marine ecosystems, and the scientific uncertainty of MPA effectiveness, has sculpted a precautionary approach principle to be used when creating MPAs.

A MPA's main aim should be to rebuild ecosystems, rather than simply controlling fishing mortality for target species. Permanent and temporal area closures should protect critical habitats such as nurseries, spawning and feeding grounds, or homes to important phases of life cycles such as migration and spawning aggregation. The effect of fishing on the ecosystem can also be addressed through MPAs - these can be used as an experimental tool for target and non-target species recovery and for ecosystem management.

The way forward:

- Science gap

Due to the lack of scientific data on MPAs, research should be targeted to investigate and evaluate further the potential benefits of existing MPAs and FRs. Long-term monitoring programmes on the effect of MPAs and associated ecosystem rebuilding should be enhanced.

The Mediterranean Sea has important nursery areas for highly migratory fish species. Further studies should be carried out and temporal closures of these areas should be promoted to ensure the sustainable use of these important resources.

- Economic

MPAs can also play a very important role in promoting sustainable fisheries practices (sustainable artisanal fisheries practices) and other sustainable economic activities. In the Mediterranean region there is a lack of socio-economic data and analysis of MPAs, therefore this key aspect should be investigated further.

- Social

Because of the knowledge gap and scientific uncertainty, MPAs should be created mainly using a bottom-up approach.

4. References

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Annex I: List of most important Mediterranean research studies on Mediterranean MPAs.

ECOMARE

ECOMARE: is a project within the framework of the European Community Marine Science and Technology Programme (MAST III). This study aims to investigate the ecological effects of MPAs in the Mediterranean.

The specific objectives of the project are:

- To establish the state of knowledge of the response of marine communities to protective measures.
- To identify main research needs to progress with the assessment of MPA effect on exploited populations and at the ecosystem level.
- To review working methods used to carry out comparable and coordinated research studies within the Mediterranean region.

The first product of ECOMARE project is series of four papers published in a special issue of *Environmental Conservation* (2000, Vol.27, No.2):

- Effect of MPAs on recruitment processes with special reference to Mediterranean littoral ecosystems (Planes *et al.*, 2000).
- Evaluating the ecological effects of MPAs: habitat scale and natural variability of ecosystems (Garcia Charton *et al.*, 2000).
- Density-dependent and marine protected populations: a review. (Sanchez Lizaso *et al.*, 2000).
- Trophic cascade in benthic marine ecosystems: lessons for fisheries and protected area management (Pinnegar *et al.*, 2000).