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Cultural and socio-economic impacts of Mediterranean marine protected areas

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Summary

Marine protected areas (MPAs) may be important for protecting the marine environment, but they may also have substantial socio-cultural impacts about which very little is currently known, or acknowledged. In the Mediterranean, few data are available on the socio-economic consequences of MPAs. The present study reviews the existing data on MPAs in Spain, France, Italy and Greece. A general increase in tourist activities in Mediterranean MPAs is evident, as are increases in the abundances of larger fish species, although there are no data indicating yields for fisheries increase adjacent to MPAs. A large increase in the number of divers and vessels using MPAs has already had impacts on natural benthic communities as a result of diver damage, mooring and the feeding of large fish by divers. Emphasis has been given in only a few MPAs to promoting public awareness of these impacts. Although the conservation of nature should be considered the fundamental objective of MPAs, neglecting their social, cultural and economic impacts has at times led to poor local consensus, if not hostility. We believe that planning and managing MPAs should be conducted on a multidisciplinary basis. Nonetheless, no single model can be considered valid for the whole Mediterranean. The very variable characteristics of coastal areas, from those of small uninhabited islands to those of cities, require different weightings to be assigned for each factor in order to achieve a durable equilibrium and realize the original objectives of each MPA. Only with such flexibility of management will it be possible to reach a greater understanding of the MPA system and create a lasting consensus in favour of conservation, a consensus which would mean an overwhelming majority of people actively avoiding damaging nature and preventing others from doing so.

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Introduction

Marine protected areas (MPAs) are being proposed at an increasing rate in many parts of the world today (Dixon *et al.* 1993; Ballantine 1995; Agardy 1997). The main purpose of MPAs is to safeguard nature (Riggio 1989; Agardy 1994) through the protection of species (Panou *et al.* 1993; Stoner 1996), threatened environments (Garcia Rubies & Zabala 1990; Boudouresque & Ribera 1993) and the biodiversity which the latter support. However, the role of MPAs now goes beyond these aims (Brunckhorst & Bridgewater 1995) as they can provide economically valuable activities (Farrow 1996) and interact with human beings and their institutions (Caldecott 1996). Tourism (Agardy 1993; Davis & Harriot 1996; Davis & Tisdell 1996), the replenishment of fisheries and the protection of the natural resource bases of fisheries such as breeding (Harmelin *et al.* 1995), nursery and recruitment habitats (Alcala & Russ 1990; Bohnsack 1990; Bennett & Attwood 1991; Fairweather 1991; Jones *et al.* 1992; Agardy 1994; Clark 1996; McClanahan & Kaunda-Arara 1996; Russ & Alcala 1996), certainly provide the most important economic revenues to be derived from MPAs. MPAs may also possess economic value which is quite unrelated to any actual expenditure associated with their use, a situation more likely to occur where the area protected is unique and people may be willing to pay for its preservation because of so-called 'existence' and 'bequest' motives. In these circumstances, MPAs may be said to have a passive use value and many attempts have been made to quantify this (Harpman *et al.* 1993; Jones 1994; Farrow 1996; Anderson 1998).

MPAs have social impacts on local communities, which can accept (Salm & Clark 1984; Andersson & Ngazi 1995) or reject (Fiske 1992) the MPA idea, but should in any case be involved in the planning and realization of MPA projects (Wells & White 1995; Bersales 1996) from a very early stage

(Fogarty 1999). In many MPAs outside of the Mediterranean, the success of protective initiatives has often been found to be proportional to the degree of involvement of the local community (West 1989; West & Brechin 1991; Fiske 1992; Andersson & Ngazi 1995; Bersales 1996). Although the involvement of the local community is pertinent in every MPA, an important distinction should be drawn between MPAs in wealthier areas belonging to industrialized countries, or industrialized parts of countries, and those in developing countries, or underdeveloped areas of countries (West & Brechin 1991; Bersales 1996). The economic revenues from many MPAs may be more easily exploited by the local community when the MPA is located in a more developed area than when it is in a less developed one. This could be the case in, for example, the development of a diving centre, which, at least during the first few years, is managed by people from outside the MPA (Richez 1991; F. Badalamenti, personal observation 1994 & July 1999) who possess the skills and resources (specialist diving qualifications, modern vessels, more advanced photographic equipment) to organize and direct the business. These two realities, developed and underdeveloped areas, should be treated separately, and a strategy adopted which addresses as much the social and cultural spheres as the economic objectives (Dixon *et al*. 1993).

If we look at the Mediterranean in this way, we must acknowledge that it offers examples from all points along the scales between wealth and poverty, and between industrialization and underdevelopment. There is great variation in the size of the areas protected, the levels of protection imposed and the activities carried out in existing MPAs. Despite their shared history, the countries of the Mediterranean maintain distinct social and cultural characteristics, with marked differences existing even within the same nation. Italy is perhaps the best example, where the *questione meridionale* (southern problem) has long been the object of debate (see Villari 1988 for a review). The disparity that has existed throughout history between the north and south in their economic parameters and social customs has been highlighted in both ancient and more recent studies (Ghisleri 1906; Coletti 1976).

The issue of MPAs in the Mediterranean demands specialized research on the part of the social sciences. In this paper we review the few studies which exist on Mediterranean MPAs, with special regard to those developed within the European Union (EU), and assess the extent of the need to consider cultural and socio-economic factors in their establishment and management.

EU MPAs in the Mediterranean

The history of Mediterranean EU MPAs is all recent. The first MPAs were established at the end of the 1970s in France (Meinesz *et al.* 1983), in the early 1980s in Spain (Ramos & McNeill 1994), in the middle of the 1980s in Greece (Eliniki Etairia 1994) and between the end of the 1980s and the beginning of the 1990s in Italy (Cognetti 1991). There are currently 33 Mediterranean MPAs in the EU, with 5 in France, 11 in Spain, 16 in Italy and 1 in Greece, with a total protected area of 477 453 ha (Tables 1 & 2). Very few data exist on the social, cultural and economic aspects of Mediterranean MPAs and there is a marked lack of homogeneity in the little information that is available (Richez 1991; Badalamenti *et al.* 1998), with much of the existing information only available in unpublished reports.

French MPAs have been investigated with an emphasis on their economic value (Appendix 1), and a virtually exclusive focus on tourist and diver use of the areas concerned (Bachet 1991; Richez 1991, 1992, 1993). Studies on MPAs in Spain take into account small-scale fishing (Bayle & Ramos 1993; Mas & Barcala 1997; Sanchez Lizaso & Giner in press) as well as diver (Ramos 1992; Ribera 1992; Costa Brava Sub 1997) and tourist interests (Capellà *et al.* 1998; Pozo 1998), and make reference to the conflict existing amongst resource users (Ramos *et al.* 1992; see also Appendix 1). The activities permitted vary from one MPA to another (Table 3). In Italy, only 4 of the 16 MPAs are functional (Ronchi 1998). The remaining 12 have been instituted by law (Table 1) but various problems, such as the lack of a managing body or the absence of a delimited protected area, have impeded their realization (Appendix 1). The information available regards predominantly the history of MPA implementation. In Greece, despite the large size of the MPA (Tables 1 & 2), the data available are few and fragmentary and focus chiefly on the protection of the monk seal *Monachus monachus*.

French and Spanish MPAs are generally managed at a regional-national level (i.e. by the national and regional governments or authorities; see Appendix 1 and Table 1), while the Italian MPAs are the responsibility of local governments (i.e. councils and provinces). In a very few cases EU Mediterranean MPAs are managed by non-governmental organizations (Table 1). Some Spanish MPAs are managed by a combination of national and regional authorities. This is the case with larger MPAs, where the regional government is responsible for the marine area up to a certain distance from the coast, after which the jurisdiction passes to a national authority (Table 1). Information currently available on EU Mediterranean MPAs is summarized in Appendix 1.

Other MPAs: fishery reserves

Other forms of protection of the marine environment, exclusively aimed at restoring commercial fish species, go back to the middle of the nineteenth century, when the French administration introduced fishery reserves variously called *établissements de pêche* and *cantonnements de pêche* (Meinesz *et al.* 1983). Similar areas exist in Spain but are often referred to as 'paper reserves'(Ramos & McNeil 1984). In southern Italy, large areas of sea were periodically closed to fishing between the end of the nineteenth century and the first years of the twentieth (D'Ancona 1926). More recently, as a temporary

Table 1 Summary of the EU Mediterranean marine protected areas (MPAs) at June 1999 (excludes fishery reserves). M = municipality; MR = marine reserve; NG = national government; NGO = non-governmental organization; NP = national park; NR = nature reserve; P = marine park; PLA = public local authority (council and/or province); RC = regional council; RG = regional government; RMP = regional marine park; RNP = regional natural park; N = no; NY = not yet; Y = yes; ? = no data available.

MPA name	*Region*	*Size (ha)*	*Established in*	*Regulation approved*	*Status*	*Managed by*	*Potential managing body*	*Zonation*
Spain								
1 Medes	Cataluña	21.5	1983/90	Y	P	RG		N/Y
2 Tabarca	Valencia	1400	1986	Y	MR	NG+RG+M		Y
3 Columbretes Islands	Valencia	4000	1990	Y	MR	NG+RG		Y
4 Cabrera	Baleares	8164	1991	Y	NP	NG+RG		Y
5 San Antonio	Valencia	85	1993	Y	MR	NG+RG		N
6 Ses Negres	Valencia	80	1993	Y	MR	RG+NGO		N
7 Cabo de Gata	Andalucia	12 200	1987/95	Y	NP+MR	NG+RG		Y
8 Cabo de Palos	Murcia	1898	1995	Y	MR	NG+RG		Y
9 Alboran	Andalucia	49 444	1997	Y	MR	NG+RG		Y
10 Cabo de Creus	Cataluña	3073	1998	Y	P	RG		Y
11 Formentera	Baleares	?	1995	?	P	RG		?
France								
12 Port Cros îles d'Hyères	Var	1800	1963	Y	NP	NP of Port Cros		Y
13 Banyuls-Cerbère	Pyrenees	650	1974	Y	NR	RC Languedoc-Roussillon		Y
14 Scandola	Corsica	1000	1975	Y	NR	RNP of Corsica		Y
15 Lavezzi	Corsica	5000	1982	Y	NR	RNP of Corsica		Y
16 Larvotto	Monaco	50	?	?	?	?		
Italy								
17 Ustica	Sicily	16 000	1986–87	Y	MR	Ustica Council		Y
18 Miramare Gulf of Trieste	Friuli	127	1986–87	Y	MR	WWF		Y
19 Isole Tremiti	Puglia	1509	1989	NY	MR	NP of Gargano		Y
20 Capo Rizzuto	Calabria	13 500	1991–92	Y	MR	Province of Crotone		Y
21 Torre Guaceto	Puglia	2207	1991–92	NY	MR	Provisional body	PLA	Y
22 Isole Egadi	Sicily	53 810	1991–92 + 1996	NY	MR	Provisional body	PLA	Y
23 Isole Ciclopi	Sicily	902	1991–92 + 1996	NY	MR	Provisional body	PLA	Y
24 Golfo di Portofino	Liguria	372	1997–98	NY	MR	Provisional body	PLA	Y
25 Isole di Ventotene e S.Stefano	Lazio	2787	1997–98	NY	MR	Provisional body	PLA	Y
26 Cinque Terre	Liguria	2784	1997–98	NY	MR	Provisional body	PLA	Y
27 Punta Campanella	Campania	1128	1997–98	NY	MR	Provisional body	PLA	Y
28 Penisola del Sinis Isola Mal di Ventre	Sardegna	30 357	1997–98	NY	MR	Council of Cabras	PLA	Y
29 Tavolara Punta Coda Cavallo	Sardegna	15 091	1997–98	NY	MR	Provisional body	PLA	Y
30 Porto Cesareo	Puglia	17 156	1997–98	NY	MR	Provisional body	PLA	Y
31 Capo Carbonara	Sardegna	8857	1998–99	NY	MR	Provisional body	PLA	Y
32 Secche della Meloria	Toscana	?	1998–99	?	NP	NP Arc. Tosc.	PLA	?
Greece								
33 Alonnisos	Sporades	220 000	1992	Y	NP	NG		Y

measure, trawling has been banned inside the continental shelf of three gulfs in Sicily since 1990 (Pipitone *et al*. unpublished data 2000). There is an almost total lack of research of any kind as regards the effects of these protective measures, socio-economic or otherwise. Overall, only one published study demonstrated potential benefits, namely an eight-fold increase in catch per unit effort as a result of a four-year trawling ban in the Gulf of Castellammare in Sicily (Pipitone *et al.* 1996) and improved economic revenue for the small-scale fishers there (D. Whitmarsh, C. James, H. Pickering, C. Pipitone, F. Badalamenti & G. D'Anna, unpublished data April 1999).

Table 2 EU marine protected areas (MPAs) in the Mediterranean at June 1999 (excludes fishery reserves): (a) by number and (b) by area. (+ = including Larvotto, which is actually located in Monaco; ° = not including Secche della Meloria in the Arcipelago Toscano National Park; * = not including Formentera in the Balearic Islands).

(a) Number

	Number	*% on islands*	*% on capes or promontories*	*% other locations*
Spain	11	64	27	9
+France	5	60	0	40
Italy	16	53	20	27
Greece	1	100	0	0
Total	33	58	18	24

(b) Area

	Area (ha)	*% on islands*	*% on capes or promontories*	*% other locations*
*Spain	82 366.5	76	21	3
+France	8500	92	0	8
°Italy	166 587	78	9	13
Greece	220 000	100	0	0
Total	477 453.5	88	7	5

Table 3 Management of Mediterranean MPAs in Spain. CF = commercial fishing; D = diving; F = forbidden; M = mooring; RA = regulated by area; RF = recreational fishing (angling); RG = regulated by gear; RN = regulated by number; SD = skin diving, snorkelling; SF = spearfishing, U = uncontrolled; V = visitors; VC = visitor centre; N = no; Y = yes; ? = no data available.

MPA name	*SF*	*RF*	*CF*	*M*	*V*	*D*	*SD*	*VC*
Medes	F	RA	RA/RG	RA	U	U/RN	U	N
Tabarca	F	RA	RA/RG/RN	RA	U	RA/RN	RA	N
I. Columbretes	F	RA	RG	RA/RN	RA/RN	RA/RN	RA	Y
Cabrera	F	F	RA/RG/RN	RA/RN	RA/RN	RA/RN	RA	Y
San Antonio	F	F	F	F		RA/RN		N
Ses Negres	F	F	F	?		RA/RN		N
Cabo de Gata	F	RA	RA/RG	RA	U	RA/RN	RA	Y
Cabo de Palos	F	RA	RA/RG	?	U	RA/RN		N
Alboran	F	?	RA	?	?	RA/RN		N
Cabo de Creus	F	RA	RA/RG	?	U	RA/RN		N

These protected areas (that is, no-fishing zones or restricted fishing areas) can be defined according to Auster and Shackell (1997) as fishery reserves: spatially bounded areas in which the harvesting of marine resources is restricted or forbidden. Such areas may be temporarily or permanently closed to all fisheries or may be closed to specific types of fishing gear and can be assigned to category VI of the IUCN classification (Kelleher & Kenchington 1992; Gubbay 1995). In this sense, MPAs in categories I–IV in the IUCN classification may include fishery reserves but not vice versa. While the ecological effects of these two types of MPAs are comparable, the social and cultural aspects differ substantially.

Mediterranean MPAs in non-EU countries

A number of MPAs exist in Mediterranean countries which are not part of the EU, but information regarding the socio-economic and socio-cultural effects is practically non-existent (Werner 1999). MPAs have been established along the coasts of the Adriatic (Croatia, Slovenia and Yugoslavia), the eastern Mediterranean (Cyprus, Israel, Lebanon and Turkey) and north Africa (Algeria, Morocco and Tunisia), while none exist in Albania, Bosnia, Libya and Syria. Two fishing reserves exist in Egypt (Cognetti 1991). Israel has only very small protected areas, a number of which are close to the shore to protect structures of the Vermetid gastropod *Dendropoma petraeum* (R. Ortal, personal communication June 1998). A small area is also protected in Cyprus for the endangered marine turtle *Caretta caretta*. Turkey is very active in protecting its coasts. Since 1989, 385 000 ha have been placed under protection (Kelleher *et al.* 1995), and as in Greece, protection of the monk seal is considered one of the most important priorities. The importance of involving fishermen in conservation initiatives has been noted.

General considerations on Mediterranean MPAs

Apart from the biological and ecological aspects, a number of geographical factors will affect the success of MPAs, such as

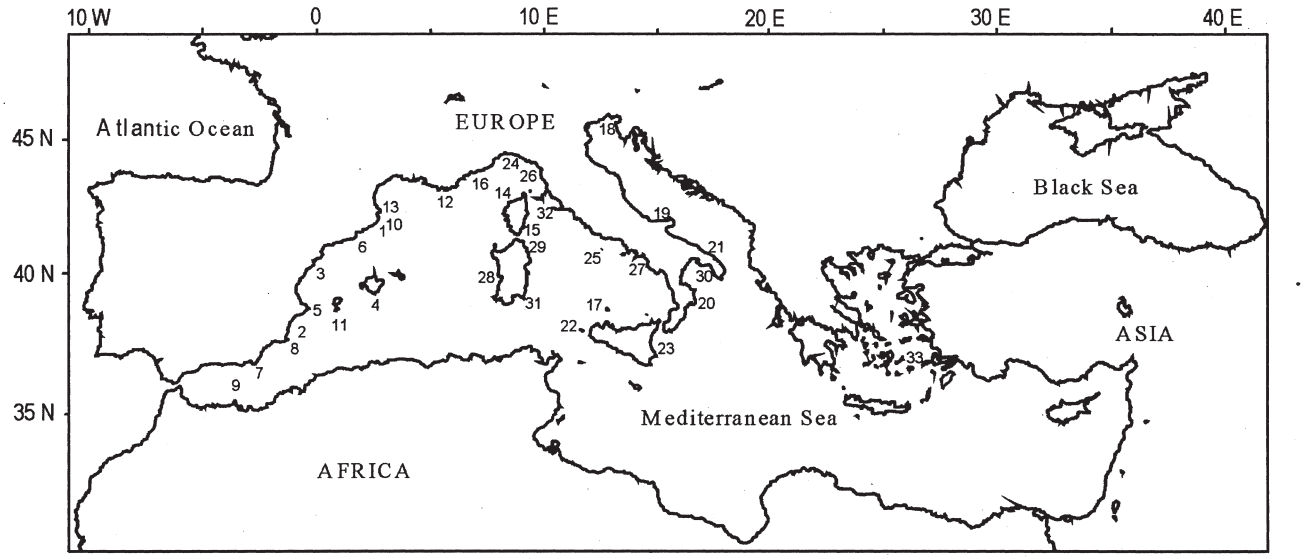

Figure 1 Location of the EU Mediterranean marine protected areas (MPAs), fishery reserves excluded. Numbers correspond to MPAs as listed in Table 1.

the degree of isolation, the size of the resident human population and the culture and traditions of the latter (Arculeo *et al.* 1994; Riggio 1994). For schematic purposes, but also because of the importance of socio-cultural differences (Fiske 1992), we will separate the Mediterranean MPAs located in remote areas (generally small islands) from those located near urban areas (Fig. 1). Such a distinction distinguishes the MPAs of the Mediterranean into zones located in the generally wealthy and industrialized north from those located in the more depressed and less developed south.

MPAs in isolated places and the south

Many of the Mediterranean MPAs in the EU are found in the southern part of their respective countries and in many cases these fall into areas defined by the EU as economically depressed (Fig. 1, Tables 1 & 2). Ten of the 16 designated MPAs in Italy are located in the southern part of the country or in more depressed areas (Cognetti 1989, 1991). An analogous proportion can be found in the list of potential new MPAs in Italy. Greece is another area considered to be economically depressed. Most of the Spanish MPAs are located in the southern part of the country, again a depressed area (Ramos & McNeill 1994), whilst the most extensive French MPAs are in Corsica, which is also economically deprived (Boudouresque 1994). To these considerations we can add the fact that over half the Mediterranean MPAs of the EU are located around islands (Cognetti 1989, 1991; Augier 1991; Ramos & McNeill 1994).

Southern areas and smaller islands share common characteristics with respect to both the level of economic development and their socio-cultural aspects, allowing us to put forward a number of generalizations. Apart from being generally depressed, the economies are based on agriculture, fishing, the working of primary resources and some tourism rather than on industrial production or the tertiary sector. In all of these areas, tourism is seen as both a potential and a fundamental source of income, although its excessive growth (Ribera 1991; Boudouresque & Ribera 1993) and its impact on the environment (García Charton *et al.* 1993; Sala *et al.* 1996; Zabala 1996; Martínez *et al.* 1999) have become a cause for concern (Appendix 1).

The problem is therefore one of safeguarding not only the environment but also the cultural heritage of the human inhabitants, whilst still allowing for economic development (West 1991). This does not mean that the protection of the human aspects should be romanticized or that the natural economic and cultural development of the resident population be impeded. Rather, the cultural resources of the area must be acknowledged and enhanced. To concentrate exclusively on the income-generating effects of a MPA is risky. Research carried out on areas outside the Mediterranean has revealed the importance of guarding against the temptation to exploit tourism without setting limits, and of reflecting on the consequences for both the environment and the resident human population (Wilkinson *et al.* 1994; Davis & Tisdell 1995).

As we have already highlighted, the social and cultural components and the economy of the Mediterranean areas destined to become MPAs have rarely attracted the interest of specialists (Badalamenti *et al.* 1998; Richez 1991). This is due both to the fact that the establishment of MPAs has proceeded more rapidly than have the relevant economic and sociological studies (Farrow 1996), and to the young age of most of the MPAs. For the remote areas and, more generally, the rural and less developed areas of the Mediterranean, we are left to speculate as to the impact of MPAs. Here we will examine the effects on two of the groups directly involved, namely resi-

dents and tourists. Amongst the residents, two sub-groups will be considered, namely fishers and young people.

Resident fishers

Fishers are probably amongst those most directly affected when MPAs are established, especially in those localities where a high degree of protection is instituted, for example in cases where all activities are prohibited. The creation of MPAs results in a reduction in the size of fishing grounds, causing legitimate resentment from fishers.

A number of studies have demonstrated that in the long-term, MPAs can cause overall increases in fish biomass (Pipitone *et al*. 1996; Russ & Alcala 1996), and there is evidence that fish move out across MPAs boundaries as the biomass accumulates (Roberts 1997). However, it can prove difficult to convince fishers of the positive effects of MPAs on fisheries. Difficulty can also be encountered in convincing members of the fishing community of the economic benefits to be gained from diversifying their work activities. MPA tourism offers many ways of supplementing income, for example by leading boat tours and fishing trips, producing handicrafts, providing holiday accommodation and meals for tourists, and offering services such as tank refilling for divers. The responses given in a questionnaire distributed to the inhabitants of the Egadi Islands in Sicily by a local association reveal the great wariness felt by local fishers towards the institution of the local MPA (Appendix 1).

Resident young people

Young people can feel a strong identification with a site to which they have always enjoyed unlimited access. Being less directly involved in the economic life of MPAs, they may be less aware of the benefits brought by the creation of MPAs and are more likely to resent restrictions placed on their access. This group must be kept well-informed and encouraged to use MPAs in more compatible ways, whilst being made aware of the opportunities that MPAs can offer. Such opportunities are many and include involvement with MPA management, diving centres, diving and snorkel guiding, tourist boat trips, hotels and hostels, conference centres, outdoor equipment shops, local natural products, handicrafts, books, photography, films and restaurants offering local cuisine. Educational activities such as sea-watching, nature trips and fieldwork courses can also be offered. It seems highly desirable that local communities involve themselves in exploiting the economic potential of MPAs. If they are unwilling to do so, outsiders will move in and take over the task, causing ties between local communities and MPAs to be loosened.

Tourists

In remote areas, tourism can be considered necessary for the success of MPAs. The revenues from activities connected to tourism can be vital for depressed economies (Richez 1991, 1993) but they can have negative impacts if, as has been shown in several cases, either the biological or social carrying capacities of the areas involved are exceeded (Dixon *et al*. 1993). Regulation is thus essential. Outside of the Mediterranean, various strategies have been proposed, including education (Kaza 1995), enforcement of controls and entrance fees which increase with the level of protection (Alder 1996), or a combination of the above (Lindenberg & Huber 1993; Davis & Tisdell 1996). The effect of MPAs on individual tourists will depend on the relationships which they have with the MPAs as well as the type of activity they intend to carry out in the localities concerned. These visitors can be divided into two broad categories, namely those who benefit (the 'winners') and those adversely affected (the 'losers').

The 'winning' tourists are especially the new visitors who are attracted by publicity about MPAs and by the new facilities offered in and around the areas involved. They discover a new environment and generally have no opportunity to make comparisons with the past. The arrival of these individuals is likely to be resented by 'losers'. This new tourism, together with all the recreational activities connected with it, should be regulated. Although tourism is believed to have a lower impact than for example manufacturing industry, its excessive development is considered by many to have exerted negative effects on the benthic communities of MPAs if left uncontrolled (Sala *et al*. 1996; Harriot *et al*. 1997). Particularly damaged are seagrass meadows (García Charton *et al*. 1993; Martinez *et al*. 1999), coelenterates and bryozoans (Sala *et al*. 1996; Zabala *et al*. 1999) and intertidal assemblages (Kay & Little 1989). As many 'winning' tourists will be very likely to fall into the category of mass tourism, they should be the focus of attention of MPA planners and managers, so that any potentially deleterious effects on the environment, the economy and, ultimately, the resident community can be avoided.

The 'losers' include habitual visitors who often have strong attachments to wilderness and related values. This group may feel resentment at the restrictions placed on their use of MPAs and towards new visitors. The former stand to lose not only physical space but any sense of tranquillity that originally attracted them. Such individuals will be forced to change their use of the spaces involved and are likely to feel discouraged from continuing to visit MPAs. In this group we include the recreational fishers who may find restrictions on the use of hooks and other small gear unacceptable. Conflict may arise between this group and environmentalists who object to the sport on ethical grounds.

Recreational users must be encouraged to make their voices heard and to involve themselves in the planning and realization of MPAs. This category of person is generally sensitive to the issues involved and may be especially receptive to educational programmes; the imposition of restrictions on the activities of such people may prove unnecessary (Alder 1996).

MPAs in accessible localities and the north

There are few MPAs in accessible localities in the EU Mediterranean (Appendix 1). Amongst these we can include

the MPAs of Portofino and delle Cinque Terre (Liguria, Italy), Port Cros and the MPAs of the Côte Bleue near the cities of Marseille and Toulon in France, and the MPAs of Medes Islands (near Barcelona) and Cape Creus (Spain; Fig. 1, Table 1). MPAs in the vicinity of urban, industrialized or wealthier areas will face quite different pressures from those at the other end of the scale. In these areas, fishers are used to the presence of large numbers of people and often have more than one occupation. For these reasons, the impact of MPAs on the activities of fishers may be smaller and better-tolerated in comparison with isolated areas. It is likely that fishers will develop their secondary activities and gain benefit from MPAs. Moreover, it is less likely that they will have to compete with outsiders, as can happen in more remote MPAs. In this case, the tourists include those coming from the immediate vicinity of the MPA who will mostly benefit from the new services. It is also likely that income from MPA activities will be shared almost entirely within the same community. Inhabitants of the surrounding area may also gain benefits of a cultural kind from didactic courses, scientific activities and cultural events in general. A new and diversified tourism is also likely. MPAs will attract young people and environmentally-oriented tourists from afar, and natural resources can be exploited all year round and inserted into tourist 'packages' offered in conjunction with the cities and towns near MPAs.

However, this vision may be optimistic. Tourists and resident people, especially if not involved in planning MPAs, can see protection as a menace in the same way as residents of isolated places can. As an example of this, restrictions enforced on navigation in the Portofino area in Italy have provoked strong opposition from habitual tourists who see the freedom of movement of their vessels being curbed. At the inception of the Portofino MPA in the summer of 1998, it was necessary to review a number of the restrictions and regulations of the MPA, although a socio-economic study of the area had been carried out beforehand (Diviacco *et al.* 1992; Tunesi & Diviacco 1993). Furthermore, the inhabitants of larger towns and cities will have more resources at their disposal to oppose the changes in access that MPA creation requires.

Non-Mediterranean countries

The distinction between MPAs located in economically developed areas and those in more depressed or developing zones has validity also for countries outside the Mediterranean (Walters & Butler 1995). In both cases the involvement of local communities has been recognized as fundamental (Salm & Clark 1984; Wells & White 1995; Bohnsack 1997). Once again, the problems encountered and the solutions proposed are obviously quite different for MPAs in areas with strong economies as is the case for example where a fishing industry is present (Bohnsack 1997) compared to those of a weak or depressed economy (White & Savina 1987; Andersson & Ngazi 1995).

Dixon (1993) investigated the compatibility of tourism and protected area conservation in the Caribbean, where, in 1990, at least one-fifth of the income generated by tourism was derived from diving and other kinds of special-interest activities. A significant economic return was derived from tourism in the Virgin Islands and the Dutch Antilles (Dixon 1993). Measures have been adopted to control tourism in these MPAs, including the imposition of fees for diving. Bonaire Marine Park in the Caribbean has been the object of the most comprehensive study (Dixon 1993; Dixon *et al.* 1993), and there a large part of the economy of the island can be considered to be derived from the MPA. Signs of an excessive growth in tourism which is beginning to damage the natural resources have been perceived, and such a situation could conceivably lead to the collapse of tourism and thus the economy of the area. Tourism could nonetheless be safely increased through improved management practices such as promoting diver education, rotating diving sites, spacing-out divers, regulating underwater photography and promoting better buoyancy control by divers (Dixon *et al.* 1993).

In the Philippines, a community-based MPA has been instituted to protect a coral reef in collaboration with the local fishing community. These fishers gave their approval to the creation of the MPA and took responsibility for policing it. From interviews, the fishers appeared to be aware of the importance of the MPA and were convinced of its effectiveness, and there were, moreover, signs of a recovery in the fish community (White & Savina 1987).

In more economically-developed areas, consensus-building approaches can be implemented, with extensive public involvement (Bohnsack 1997). Through such a strategy, the consensus of local inhabitants can be gained by relatively simple measures such as defining shared common goals, producing a clear legislative mandate and ensuring a continued commitment on the part of stakeholders and agency participants. The main drawback to this approach is the large amount of time, money and expertise required to develop plans and bring them to fruition.

The importance of involving the fishing community

To improve the success of MPAs it is essential to involve the local inhabitants as much as possible (White & Savina 1987; White 1989; Brechin *et al.* 1991; Fiske 1992; Salm & Clark 1994; Bersales 1996; Caldecott 1996). Local fishers can provide valuable contributions through their knowledge of the area, assisting in the choice of the most suitable site to be placed under protection and providing useful information for its successful management (Neis 1995). It is also fundamental to provide local communities with as much information as possible about new initiatives and to avoid imposing changes. In some cases, changes in the attitudes and perceptions of fishers have been detected after the inception of MPAs. Thus in New Zealand, despite the initial opposition of fishers to the establishment of the Leigh Marine Reserve, 78% later

supported the implementation of additional MPAs (Ballantine 1991). After four years of protection of the Apo Marine Reserve in the Philippines, 11 out of 12 fishers interviewed perceived their catch to have increased, and ten years after protection all said that their catch had at least doubled (Russ & Alcala 1996). When closure to trawling was effected in Shelburne Bay in the Great Barrier Area in New Zealand, fishers expressed the opinion that the closure was an imposition and should be removed. However, two years later, there were no negative reactions and a number of fishers reported increased catches through fishing along the boundary of the closed area and expressed a desire for more permanent closures (Shorthouse 1990).

What have we learnt?

Studies carried out in Mediterranean MPAs up to now have dealt mainly with their ecological aspects rather than the social, political and economic implications (Richez 1991). Despite the fact that MPAs have been in existence in one form or another for some time in the Mediterranean (Boudouresque 1994), few data are available (Ramos 1991*a*) and few studies have been carried out to assess the socio-economic aspects connected to protection (Badalamenti *et al.* 1998). Moreover, most of these studies contain limited and qualitative analyses or are too short term.

The experience outside the Mediterranean

From studies conducted outside the Mediterranean four points can be made which could aid assessment of the socio-economic impacts of MPAs:

- it is important to take into account the human component of MPAs and those areas directly or indirectly influenced by them (Fiske 1992). Keeping local communities informed and encouraging them to participate throughout all the stages of planning, establishing and managing MPAs contributes substantially to the likelihood of long-term success of the initiative;
- MPAs can lead to a recovery in the productive potential of fishery resources. Increases in the number and biomass of many species which occur in MPAs (Buxton & Smale 1989; Cole *et al.* 1990; Polunin & Roberts 1993) and fishery resources will in many cases spill over into surrounding areas (Rowley 1994; Russ & Alcala 1996; Watson *et al.* 1996). The mechanisms underlying the process of stock replenishment are not well understood (Roberts & Polunin 1991), but MPAs have been identified as an important tool in the precautionary management of fishery resources (Clark 1996);
- MPAs will often have significant impacts on the local and regional economy, typically as a result of expenditure derived from tourism and especially from diving-related activities. This in turn may generate multiplier effects, so that initial expenditure in the tourist industry creates further rounds of spending that raise incomes in other sectors. In some instances, tourism may have substantial effects on the national economy, as has been demonstrated in certain south-east Asian countries. For example, from 1985 to 1992, countries such as Indonesia, Malaysia, the Philippines, Singapore and Thailand increased their income from tourism by 57%, 22%, 5%, 35% and 35% respectively, with a global budget which varied from approximately US$4000 million to more than US$15 000 million (Anon. 1993 in Wilkinson *et al.* 1994);
- yet there are recurring worries relating to the use of MPAs for tourism ends (Wilkinson *et al.* 1994). Diving activities in particular are responsible for damaging benthic communities (Harriot *et al.* 1997) and the danger exists that over-exploitation of the economic resource which tourism represents could jeopardize its future viability (Davis & Harriot 1996).

The Mediterranean experience

Similar conclusions can be drawn for the Mediterranean (Appendix 1). General increases in tourist activities (Ribera 1991, 1992; Richez 1991, 1992, 1993; Capellà *et al.* 1998) and in the abundance of larger fish species are evident in MPAs in the Mediterranean. An increase in the biomass of exploited species in protected areas might produce greater yields for fisheries under certain conditions, but data to support this are scarce (Mas & Barcala 1997). Significant increase in demersal biomass has been observed in areas where a trawling ban has been in place for a number of years (Pipitone *et al.* 1996). Data also show a large increase in the number of visitors, divers and vessels using MPAs (Ribera 1991). An impact on natural communities has, however, been noted, especially on benthic assemblages (Sala *et al.* 1996; Zabala 1996), as a result of diving, mooring and the feeding of large fish by divers.

Emphasis has been given in only a few MPAs to promoting public awareness and collaboration (Appendix 1). This can be especially important where artisanal fishing communities are present and/or the special protection of animal species is sought, as in the case of the monk seal *M. monachus* (Dikou 1995).

The need to consider cultural and socio-economic factors

While many might regard the conservation of nature as the fundamental starting point, neglecting the sociocultural and socio-economic aspects can lead to only a partial comprehension of MPAs as a whole and often to poor local consensus, if not hostility. The shortage of studies to justify MPAs from an economic point of view could be one of the reasons for the small numbers of MPAs and of the slow pace at which they are established. To evaluate in terms of economic return the role played by MPAs in safeguarding and increasing biodiversity is a task which presents no small difficulty

(Salm & Clark 1984; Dixon & Sherman 1991). One particular reason for this is the problem of placing an economic value on biodiversity through the use of contingent valuation methodology (CVM), an approach which requires particular care in order to elicit valid and reliable results (Turner & Adger 1996). The wider implications of MPAs for commercial fisheries are similarly difficult to assess, and bioeconomic modelling may be required to identify the circumstances in which zones closed to fishing will produce overall net gains to society. Examples of such studies include those by Holland and Brazee (1996), Hannesson (1998) and J.C.V. Pezzey, C.M. Roberts & B.T. Urdal, (personal communication June 1998).

In order to avoid or reduce the conflicts between economic exploitation for uses such as tourism, recreation and fishing and conservation, several strategies have been proposed. Amongst these is the use of education to increase environmental awareness and reduce the negative impact of visitors in popular sites. A judicious blend of regulation and economic measures such as entrance fees is needed (Davis & Tisdell 1996). An important management tool could be rational zonation (Laffoley 1995) which takes into consideration both traditional and new resource uses such as selective small-scale fishing and eco-tourism in delimited sub-areas. It is also important to define the social and biological carrying capacity of MPAs and to formulate suitable management responses to prevent deterioration and the consequent loss of their value (Davis & Tisdell 1995).

Nonetheless, any one reference model cannot be considered valid for the whole Mediterranean: as explained, there is a wide diversity in the characteristics of MPAs and this requires different weightings to be assigned to each factor in order to achieve a durable equilibrium and realize original objectives for them.

What future for Mediterranean MPAs?

The MPAs of the Mediterranean need, and will in future need, to be reconsidered in a more holistic way. A network of MPAs similar to that suggested by Brunckhorst and Bridgwater (1995), could be an appropriate solution for the Mediterranean. Applying to such a network a bioregional scale, which encompasses the physical, biological, economic and sociological dimensions, could contribute to the maintenance of ecological processes and the functions of ecosystems, together with their cultural and social structure (Brunckhorst & Bridgwater 1995). A network of Mediterranean bioregional MPAs could provide for the exchange of information in the different Mediterranean areas, including non-EU marine areas. The biological and ecological values of MPAs, however, should not be allowed to take precedence over their social and cultural worth.

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Appendix 1

Case studies from Mediterranean EU MPAs

The following is a country-by-country account of the studies which have been conducted on the cultural and socio-economic aspects of EU Mediterranean MPAs.

France

In France there are approximately twenty protected zones which can be divided into six categories of different levels of protection (Meinesz *et al.* 1983; Augier 1991). *Etablissements de pêche* and *cantonnements de pêche* can be considered fishery reserves. They are generally small and of limited duration, going back to 1852 and 1915 for the établissements and 1963 for the cantonnements. Nature reserves also have a long history. Their institution began in 1930 and they were first gazetted with a 1976 law. Their aim is to conserve nature and safeguard the environment and its plant and animal species. Diving and spear fishing are prohibited, while small-scale fishing is permitted but controlled. Scientific research and environmental awareness activities are conducted. MPAs may each contain up to three zones with different levels of protection, namely a zone with the highest level of protection where all human activities are prohibited, a peripheral buffer zone and a zone of general protection or 'park', where a number of human activities can be carried out and tourism which respects the natural environment is permitted. The law defining these MPAs goes back to 1960 but a number of interpretative problems have arisen. At Port Cros, for example, small-scale fishing is tolerated and no buffer zone exists (Augier 1991).

The MPAs with the highest levels of protection are generally found inside marine parks and all activities, apart from authorized science, are prohibited. Biotope protection zones derive from a relatively recent legislative measure (1977) aimed specifically at the protection of two areas of Corsica where a number of activities are prohibited. Data are available for the following MPAs: Port Cros, Lavezzi, Scandola, and Carry le Rouet, this last is a cantonnement de pêche.

Port Cros

Visits by scuba divers (snorkellers excluded) to Port Cros National Park during summer 1990 were investigated by Richez (1991). Total spending by divers in July–August was estimated to be Euro 505 337, divided into: transport, food, equipment hire, souvenirs (in total 51.3%); occasional expenses for diving, clubs and charters (34.3%); purchase of equipment (9.9%); and tank refilling (4.5%). Only a very small part of the above amount was spent in Port Cros. Most was spent on the mainland, even though the tourist-attracting power was considered to be attributable exclusively to the Marine Park (Richez 1991).

Lavezzi

Richez (1993) also investigated tourist diving activity (skin diving excluded) in Corsica in summer 1991, with special regard to the MPA of Lavezzi. Tourists were attracted by the natural beauty of the MPA seascape and its flora and fauna. Three out of 10 divers came to Corsica to dive at Lavezzi. Although tourists declared themselves to be attracted by the wealth of the marine flora and fauna, they were badly informed about the diving sites of the MPA and, generally speaking, visitors had a low level of knowledge of the island (Richez 1993). Calculations of the economic return derived from underwater activities indicate that, in the two months under consideration, in the whole of Corsica (approximately 30 diving clubs) 76 618 dives were carried out at a cost of Euro 1 612 290, including tank refilling. To this figure must be added Euro 3 875 906 for derived activities and Euro 971 405 for transport, and thus a total expenditure of Euro 6 459 601. These expenditures were not specifically for Lavezzi, although they indicate that approximately Euro 83.8 were spent in total per dive.

Scandola

In the nature reserve of Scandola diving is prohibited. As part of a study on tourist attendance at a number of sites, Richez (1992) conducted an investigation of pleasure boating in the MPA. This study focused on gaining an understanding of the main characteristics of the pleasure boaters, the way in which they use the area, their motivation and, above all, their reaction to the possible prohibition or limitation of their activities. On this last issue, 42% declared themselves to be against, 22% in favour, 22% in favour with certain conditions, and 11% did not express an opinion.

Carry le Rouet

Bachet (1991) assessed the economic impact of the Côte Bleue regional marine park of Carry le Rouet. The aim of the MPA is to maintain traditional economic activities (i.e. a small-scale fishery consisting of about 22 boats and 35 fishers), protect the natural environment and educate visitors. Increased fishery production, greater productivity from an artificial reef system located near the MPA, greater fishing selectivity and reduction in overall fishing effort due to the artificial reef and an anti-trawling system, income from an educational programme for the schools of the surrounding area, income from scientific meetings, income from diving centres and diving trips in both the MPA and the artificial reef areas are reported (Bachet 1991). Bachet (1991) highlights the need for better quantification and documentation, especially of tourist activities.

Spain

In Spain there is a distinction between marine reserves which are aimed mainly at fisheries enhancement and marine parks, aimed at protecting species and ecosystems. However, their management plans are similar. Both can be considered multiple-use areas, protecting different zones differently (Salm & Clark 1984) and the philosophy of the Biosphere Reserves of the MAB Programme (UNESCO 1974) has been adopted, with the three basic functions of conservation, logistics and development. In this sense, the first operative marine reserve in Spain, Tabarca Island, although formerly created to enhance exploited populations, has served as an example to the other MPAs, as its protection is compatible with the rational exploitation of small-scale fishing and 'soft' tourism (Ramos 1991*b*). Socio-economic studies are rare and the data available are limited to the changes in the number and composition of visitors and divers and the development of activities in some of the MPAs since the implementation.

Medes Islands

The Medes Islands were protected in 1983 as a no-fishing area and in the first few years diving was not controlled. The increase in diving activities was spectacular, reaching 2000 divers per day and more than 200 000 divers per year (Ribera 1992). A new law was introduced in 1990 which increased the size of the MPA and a maximum limit of 500 divers per day was established (about 50 000 dives per year). Economic activities in L'Estartit, the small village on the mainland opposite the Medes Islands, are exclusively related to tourism on the islands; these include diving centres, hotels, restaurants, snorkelling tours and glass-bottom boating. It has been estimated that all this economic activity represents a direct income of about US$7 million per year (Capellà *et al.* 1998). In 1996, 10 of the diving centres operating in the area had 125 employees and 17 boats with a total capacity of 725 passengers (each diving boat also containing an auxiliary pneumatic boat), representing an investment of US$3.6 million (Costa Brava Sub 1997). In L'Estartit, a reduction in the seasonality of tourism has been observed when compared to other tourist resorts in the area (Ribera 1992). In the Medes Islands intensive diving has damaged benthic organisms such as gorgonians, bryozoans and the *Posidonia* meadows (Sala *et al.* 1996; Zabala 1996). In Cap de Creus, near the Medes Islands, the announcement of the creation of a marine park increased the number of diving centres (J. Romero, personal communication March 1999).

Tabarca

Tabarca Marine Reserve was established in 1986. The protected area is divided into three zones: (1) a core zone (about 10% of the surface area), subject to the highest level of protection; (2) a buffer zone (about 40%), with the same level of protection as the former but with permission given for some professional fishing using selected methods (trap-nets and trawl-lines) and scuba diving; and (3) a multi-use or peripheral zone (about 50%), where many activities are permitted. Tabarca Marine Reserve is the only protected area in the Spanish Mediterranean around an inhabited island. In contrast to the Medes Islands, diving in the Reserve was severely limited from the start to 50 divers per day (Ramos *et al.* 1992) and is now limited to 30 divers per year as a result of opposition from Tabarca fishers to divers. The number of diving licences issued in Tabarca multiplied each year from the inception of the Reserve up to 1993, when it reached almost 2000 licences per year, with the number stabilizing or declining slightly thereafter due to restrictions placed on diving by the Reserve Management Commission.

In spite of the huge difference between Tabarca and Medes in the number of divers, diving is seasonal in both protected areas, with a large number of divers between April and November. Visitors to the island constantly increased from 1983, before the establishment of the Reserve, up to 1998. In the same period, a doubling in the number of restaurants and souvenir shops was observed (8 restaurants in 1985 and 14 in 1995; RANDOM 1998). Although Albeza *et al.* (1994) report that these visitors have had a low impact on the Marine Reserve since most of them (95%) stay on the beach and in the village, the impact of visitors has been observed on the mooring areas over *Posidonia oceanica* beds (Martinez *et al.* 1999). As regards the small-scale fishery, preliminary data have shown an increase in the catch rates of some key species (*Dentex dentex*, *Sparus aurata* and *Epinephelus marginatus*) after the implementation of protection, in comparison with catches made in 1985 (Ramos *et al.* 1992). A more complete study which includes data from 1987 to 1995 (Mas & Barcala 1997) confirms this pattern for *D. dentex*, *E. marginatus* (data for *S. aurata* are not presented) and other species such as *Pagrus pagrus* and *Diplodus annularis*. Other species do not present a clear pattern and the only one which has declined in catch is *Sciaena umbra*, despite its being one of the most abundant species in the Reserve (Bayle & Ramos 1993). Mas and Barcala (1999) also report that catch per unit effort is higher in the vicinity of the Reserve. On the other hand, the turnover of the artisanal fleet of Tabarca has been the highest in the region since the creation of the Reserve (Sánchez Lizaso & Giner in press).

A preliminary socio-economic study on Tabarca Marine Reserve (RANDOM 1998) shows that the population inhabiting the island increased from the establishment of the village in 1769 up to 1920, after which there was a constant decrease until 1991. From 1991 to 1996, the number of residents on Tabarca Island increased. The same study shows that, as a consequence of establishment of the Reserve, the number of fishers in Tabarca increased in recent years, with 19 fishers in 1985 before the Reserve was established and 23–5 in 1990–92.

Columbretes

The Columbretes islands are remote volcanic islands located 30 miles from the mainland. Since the creation of the Marine Reserve an increase in the inflow of recreational boats has

been observed from the reports taken daily by the Reserve keepers (Goñi 1998). The main activity of these boats is sports fishing (72% of boats in 1996). At the time of the creation of the Marine Reserve in 1990, sports fishing was a marginal activity in comparison with professional fishing and the Reserve regulations excluded small-scale fishing (except purse seine), while sports fishing was tolerated outside the core areas which constitute about 12% of the Reserve (Goñi 1998).

Diving in the Reserve has undergone a similar increase, from 20 authorizations (114 divers) in 1990 to 175 (1547 divers) in 1994 (Jimenez 1996). The increase in the amount of diving, which was a marginal activity at the beginning of protection, induced the management authorities to prohibit the activity from December 1994 to February 1996. Since the reopening of the Reserve to diving in March 1996, the number of authorizations and divers has been increasing (Goñi 1998), despite the more restrictive policy (2856 divers in 1997).

Cabrera

Pozo (1998) summarized the human activities in Cabrera National Park from annual reports of the Park made from 1993 to 1996. During this period, increases were observed in the numbers of licences: for sailing from 173 to 1706, moorings from 3400 to 6495, and dives from 166 to 408. The number of visitors reached 39 066 in 1996. The number of divers reached its maximum in 1995 with 2699, decreasing in 1996 to 1165 despite the increase in the number of diving authorizations due to the reduction in the average number of divers per licence.

Italy

MPAs in Italy have a more recent history but the procedures undertaken to arrive at the inception and functioning of the areas concerned are long and, in fact, only two of the MPAs have been running for more than five years, namely Ustica in the southern Tyrrhenian Sea and Miramare in the northern Adriatic. However, both areas are extremely small and do not allow proper evaluation of the consequences of MPAs for social and economic activities. The Acts which establish and regulate MPAs in Italy are number 979 of 1982 and 394 of 1991. MPAs are instituted by the Ministry of the Environment in conjunction with the Ministry of the Merchant Navy and in agreement with the Treasury. Marine areas of particular value may be identified by organizations such as environmental associations, citizens' groups and scientific institutions. A proposal is made for the area identified to be instituted as a MPA and the proposal is presented to the 'Consultation for the defence of the sea', an organ of the Ministry of the Environment in which representatives of universities, research bodies, environmental associations and other interested parties participate. This consultational body has the task of determining, in conjunction with the Istituto Centrale per la Ricerca Scientifica e Tecnologica Applicata al Mare (ICRAM), the conditions of the site, the development of the area, possible research programmes and the integration of the MPA with pre-existing activities. The likely effects of a reserve both on the marine environment and on the socio-economic framework of the area should also be addressed at this stage.

At present, there are 15 marine reserves in Italy and one marine area belonging to a National Park instituted by decrees published in the official newsletter of the state *La Gazzetta Ufficiale della Repubblica* (G.U.). The procedure involving the creation of these institutional decrees and their successive publication in the G.U. for these 15 MPAs has taken over 10 years to complete (Table 1). In addition to those listed in Table 1, numerous other areas (more than 30) exist, indicated as 'finding areas' in the Act 394/91, where marine parks or reserves may be instituted in the near future. Feasibility studies and the procedures for instituting new MPAs in these areas are at various stages of completion. Italian MPAs are each divided into zones with various levels of protection, namely zone A with the highest levels of protection, zone B with 'general protection' and zone C with fewer restrictions. In some cases (e.g. Isole Egadi, Sicily) a zone D, where trawl-fishing is permitted, is foreseen.

From those listed in Table 1, the only MPAs which we could strictly call functional, with competent managing bodies, delimited areas and approved regulations are Ustica, Miramare, Capo Rizzuto and Isole Tremiti.

Ustica

With the institution of the Reserve in Ustica, many new activities have been initiated and pre-existing ones improved. These include: the development of a visitor centre and an aquarium; the training of Reserve guides; glass-bottomed boat tours for tourists; the renovation of a medieval tower to use as an international conference centre; the creation of a marine laboratory; the obtaining of funding for research activities in the Reserve; the stipulation of an accord with the University of Palermo; summer courses in marine biology and underwater archaeology; a summer school in marine chemistry and practical fieldwork classes in marine ecology organized by the University of Palermo; classes given by fishers on the construction and use of traditional set gears; *Settimane blu*, or marine-based didactic activities for school children organized at a national level; a convention on underwater activities; a festival of underwater photography; facilities for divers including diving centres, a decompression chamber and underwater trails; and the official delimitation of zone A (the area with the highest level of protection). These activities are likely to have had the effect of stimulating tourism, although no data on tourism are available. Anecdotally, an increase in tourism of about 35 000 visitors in the first four years seems to have occurred.

Miramare

At Miramare, courses in marine biology at different levels (primary and secondary, and university undergraduate and

postgraduate) are held. There is a visitor centre and research activities are conducted at the marine laboratory and at the nearby CNR Institute. Approximately 145 000 tourists visited the Reserve between 1990 and 1995.

Other Italian reserves

In the Tremiti Reserve, the managing authority has proved inadequate. At present, illegal fishing is still problematic and the Reserve has still not been delimited. Capo Rizzuto is a very new Reserve and even anecdotal data are unavailable. Managers claim that there have been increases in tourism and fishing. A number of associations, such as Nautilus in Sicily, have distributed questionnaires to the community around the Marine Reserve. Comments collected included the following:

'You want to put everything inside a glass case, both humans and things', 'I don't like the word "reserve", I hate it. It reminds me of the American Indians, who were ranched and abandoned', 'You environmentalists are destroying our society. You are only able to isolate us and deny us our right to work and live in our territory. This reserve is useless if the needs of people like us who live far away from the mainland are not taken into account', and 'They should train us first and then start the reserve. It is always like this: first they construct the cover and then the well'.

Greece

The National Marine Park of Alonnisos, Northern Sporades Islands was established in 1992 and is protected under the 519/92 Presidential Decree. However, it is not yet fully functional. The Ministry of the Environment has the authority and responsibility for running the Park, which encompasses seven islands, namely the uninhabited Island of Alonnisos, which is the biggest, the thinly populated islands of Kyra Panagia, Yioura, Piperi, Peristera and Skanzoura, and 22 small islets.

The main institutional aims of the NMPANS are the following:

(1) The protection, conservation and management of the wildlife and landscape, which constitute a natural heritage and a valuable national resource, in extended marine and terrestrial areas of the Northern Sporades islands.
(2) The protection of the most important habitats of the monk seal *Monachus monachus* which is high on the list of species threatened with extinction.
(3) The protection of other rare and threatened plant and animal species on the islands.
(4) The development of the area through the sustainable use of its resources.

The human population of the area is about 3000 and is principally employed in fishing, stock farming, agriculture and a flourishing tourism sector. The main socio-economic regulations in the Park affect the tourism and fisheries sectors, and take into consideration the contradiction inherent in the aims of protection and socio-economic development (Giaoutzi & Nijkamp 1992). Since 1986, the Park has been run experimentally and there has been limited access to visitors in certain parts of the marine area. In addition, fishing has been controlled by a number of regulations regarding fishing zones, periods and types of net. Tourists, sports boats and fishers are prohibited from entering some areas (Dikou 1995). As mentioned above, one of the main institutional aims of the Park is to protect the habitat of the highly endangered monk seal, *Monachus monachus* (Elliniki Etairia 1994). Great effort has been made to convince local fishers of the benefits to be gained from protection of the area and, more specifically, the seal, and that despite prohibitive regulations, this protection will eventually lead to an increase in fish stocks in the area. Fishing by purse seines and trawlers is prohibited in the area and fishers have been offered incentives to encourage them to protect the monk seal. Traditional occupations and ecotourism have also been supported.

Protection has also been encouraged through the promotion of public awareness (Elliniki Etairia 1995). Various non-governmental organizations have been authorized to undertake this task in a number of ways, through information offices on the island, environmental education in schools throughout the country with emphasis on the monk seal, publications, lectures, exhibitions and other activities (Dikou 1995). Another area in Greece which is currently under protection and will in the near future be established as a National Marine Park is Zakynthos Island in the Ionian Sea. The main institutional aim of this Park will be the protection of the nesting population of the marine turtle *Caretta caretta*. Several areas of the island are already subjected to special regulations concerning building, boating, fishing and tourist activities. In some periods of the year any approaching whatsoever of the nesting site is prohibited.