

FISHERMEN'S OPINIONS OF MPA PERFORMANCE IN THE EGADI ISLANDS MARINE RESERVE

Amber H. Himes

Fish and Wildlife Service, United States
amber@tuppers.com

Abstract The success of marine protected areas (MPAs) can be analysed from the point of view of small-scale fishermen, as explored in this study. The purpose of such an approach is to involve fishermen in MPA management and to identify contextual factors and criteria to be used in management evaluation. A survey of fishing boat captains was used to characterise the views of the local fishing industry in a region of the central Mediterranean. The variety of how fishermen define success in the Egadi Islands Marine Reserve (Italy) was analysed. Qualitative data was collected through face-to-face interviews to explore the apparent status of the MPA, fisherman selection of performance indicators to evaluate the MPA, and whether others can deem a MPA a success or failure according to those indicators. The results show that fishermen hold significantly different preferences from each other for biological, economic and socio-cultural performance indicators compared to current MPA managers in judging what is needed to make the MPA successful. These results are an important first step in understanding criteria through which fishing communities view MPA management, and ultimately improving MPA success.

Introduction

The artisanal fishing industry (that is based on small-scale fishing practises, particularly using traditional techniques) in the Mediterranean basin, especially in Sicily, has intensely declined in numbers of fishermen and catch size during the last twenty years (Himes 2005; Juanes 2001; Vallega 1999). The causes of this decline can be attributed, for the most part, to the evolution of more efficient fishing gear and more powerful fishing vessels and to the subsequent depletion of most inshore resources (Juanes 2001). Both in the Mediterranean and other regions of the world, the institution of marine protected areas (MPAs) has become a universally accepted tool to help combat problems associated with overfishing (Agardy 1997; Bohnsack 1993; Kelleher *et al.* 1995; National Research

Council 2001; Pollnac *et al.* 2001). MPAs that regulate fishing activity and fisheries present an important opportunity to study the temporal evolution of fishing technology, to reconstruct original stock size, to identify an ecological baseline for management, and to propose models for the management of local renewable resources and economic development in local communities. However, fisheries scientists and MPA managers have habitually focused only on sustainable management of the natural resources themselves as a means to protect the environment, a flaw of traditional fisheries management (Harmelin *et al.* 1995; Katon *et al.* 2000; Russ and Alcala 1996). The missing component in this evaluation is the people that use those resources, the fishermen and locals, and the means by which they exploit them. It is the management of the humans involved in resource exploitation and their socio-economic involvement in the fishery and the MPA that should have the most impact on the long-term effectiveness of local fisheries management and the sustainability of local resources (Badalamenti *et al.* 2000; Bunce *et al.* 1999).

As a consequence of neglecting the resource users and the traditional use of a single discipline approach to coastal research (for example ecology), many MPAs are currently poorly managed and are faced with low compliance, little community support, poor enforcement, and ineffective management plans (Himes 2003; Russ and Alcala 1999). Without successful management programs, the attributes of the coastal and marine environment that humans utilise and find attractive will continue to be severely degraded (Vallega 1999). As a result, an important movement has begun in recent years to better evaluate protected area management effectiveness, and to create effective evaluation methodologies (Alder *et al.* 2002; Hockings *et al.* 2000; Mangubhai 2003; Pomeroy *et al.* 2000; Staub and Hatzios 2003).

Effectiveness of MPAs, to date, has been considered mostly through empirical studies, with increasing emphasis on economic and social implications (for example Bunce *et al.* 1999; Jentoft *et al.* 1998; Russ and Alcala 1999; Sanchirico *et al.* 2002). Significant progress in understanding the effectiveness of MPAs has also been made via bio-economic modelling studies (for example Sanchirico and Wilen 1999, 2001). However, the debate surrounding MPAs raises many issues about how they should be evaluated, the criteria for judging their performance, and the process through which success should be achieved. Resolving this issue is of practical relevance particularly in parts of the world where MPAs have already been established. An example is the Mediterranean, where MPAs have been developed, managed, and evaluated almost strictly through biological reasoning, for the most part ignoring the socio-economic or cultural importance of an area and its resources (Badalamenti *et al.* 2000). Using the Mediterranean as a stepping-stone, the present study looks at these

issues of evaluating performance and defining success for the case of small-scale artisanal fishermen in Sicily.

The present study identifies two major concerns with past MPA development and implementation. The first relates to the criteria by which the 'success' of MPAs is judged, a distinction between cause and effect. MPA performance has generally been judged by the ability to increase organism biomass and diversity within and adjacent to the boundary of the restricted area (the ultimate 'effects'), rather than by additionally including the social, cultural and economic needs of the local community (the main 'causes' of success or failure of an MPA) (Harmelin *et al.* 1995; Katon *et al.* 2000; Russ and Alcala 1996). The second concern relates to why MPAs have failed and what should be done to make them a success in the future. When MPAs fail, the explanation is often given as a problem of not achieving biological goals (the effects of protection), such as protection of spawning aggregations or increases in fish biomass. However, where many MPAs also fail is when socio-economic and cultural factors (the causes of success/failure), specifically potential negative impacts on local communities, have not been included in the design and implementation of the management regime. This type of failure can include increasing community protests against an MPA, minimal to zero compliance with the regulations, or lack of community understanding of/agreement on the need for an MPA, all of which can indirectly impede the growth of biomass as an MPA becomes an ineffective paper park with no support from the local community (Himes 2005). A key concept in solving these failures is that people and their actions, the causes of the failure, have to be managed, not just the environmental effects managers are seeking (for example biomass increase). Furthermore, in order to manage the people, their views and needs regarding the environment they are exploiting need to be taken into account (Bunce *et al.* 1999; Himes 2005). Furthermore, an important issue is the need to recognise that these 'people' or 'stakeholders' have competing standards of success due to competing perceptions of what an MPA should achieve.

The present research proposes to counter this problem by beginning to understand how an MPA's ultimate performance can be increased from the viewpoint of one stakeholder group, the small-scale fishermen, affected by the Egadi Islands Marine Reserve (EIMR). Research that the author conducted in 2001 found that, in general, fishermen are not happy with the EIMR (Himes 2003). The question that the present research is trying to answer is why fishermen think this and what could be done that would result in more positive views (and actions) relative to the EIMR. To answer this question, the present research was given two goals: first, to characterise the local professional fishery, and second, to gain an under-

standing of local fishermen's opinions and preferences regarding the MPA and its management.

This paper describes the study area and the methodology used to study the local fishing industry and fishermen's opinions of current MPA management in the EIMR. The results of two surveys are reported and discussed.

Study Area

Sicily is perhaps the ideal setting for an examination of the evolution and performance of MPAs in Italy and the Mediterranean. Sicilian MPAs vary in their protection of the tremendous diversity of marine resources, and in the degree to which each has achieved protection. The EIMR was chosen as the key case study for the present research due to its dramatic history, the poor level of performance of the MPA, the large variety of interested stakeholders, and its placement in the poorest region of a highly developed country.

The Egadi Islands are located directly west of the city of Trapani at the western-most point of Sicily (figure 1). The EIMR was created around the Islands in 1991, one of twenty-three established off the coast of Italy by the Italian Law for the Defence of the Sea (L979/1986 *Legge per la Difesa del Mare*). After being ineffectively managed by the Coast Guard from 1991 to 2000, management responsibility was transferred to the local government in 2001. The MPA is managed by a mayoral appointee and an advisory board. The MPA stretches westward off the coast of Trapani encompassing three islands, Favignana, Marettimo and Levanzo, and two rocky outcroppings, Formica and Maraone. It covers approximately 54,000 hectares, and twenty-two kilometres of protected coastline. It is the largest MPA established in Italy to date and the second largest MPA in the Mediterranean.

The EIMR is partitioned into four zones, A, B, C, and D, with varying levels of restriction. Zone A can be considered a no-take/no-entry area where only permitted research can take place. Zone B allows only general non-consumptive uses (for example swimming, boating beyond 500 metres from the coast). In Zone C, all non-consumptive uses and permitted recreational and commercial fishing are allowed, with the exception of trawling. In Zone D, all activity is allowed; only trawling has limitations. At inception, the EIMR was given six stated objectives: (1) protect the local environment; (2) protect the local biological resources; (3) educate the public about the unique characteristics of local waters; (4) support scientific research; (5) increase the understanding and protection of local ar-

archaeological resources; and (6) promote socio-economic development connected to the environmental importance of the area.

With many residents dependent on fishing and marine resources (for example tourism and boating) for their livelihoods and survival as an isolated community, the people of the Egadi Islands have become the unintended victims of their government's attempts at marine conservation. Unfortunately, in most cases, the establishment of MPAs in Italy was done bureaucratically at the Ministry of the Environment in Rome in concert only with local governments and environmental organisations. Rarely were local peoples' issues, ideas, or objections considered. In the Egadi Islands, the main proponents of the MPA were local environmental groups that successfully lobbied the Ministry of Environment to create a protected area to eliminate the threat of oil drilling in local waters. Local residents and fishermen were not given the opportunity to comment on MPA design and most have been adamantly opposed to its existence from

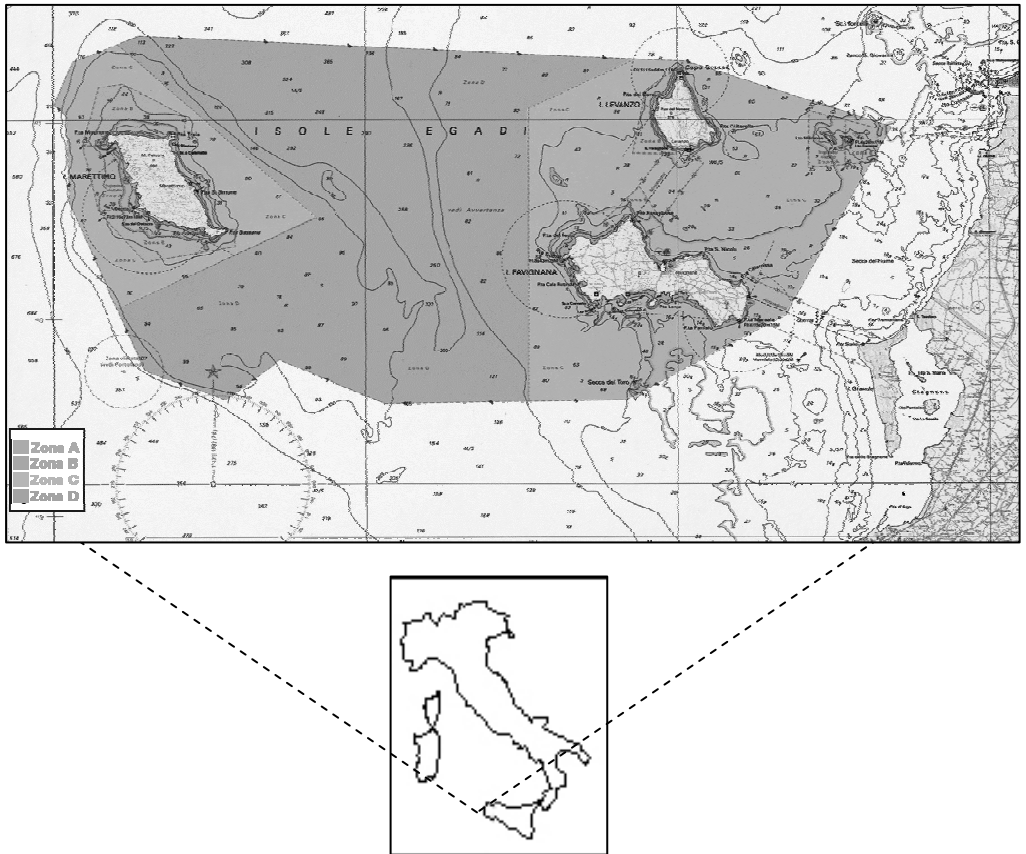


Figure 1. Map of the Egadi Islands Marine Reserve, Sicily.

the beginning. They feel that the MPA as it currently exists is worthless and refuse to believe it could benefit them in the long run under current management, assisting in the failure to meet management objectives. Despite this, however, most have commented that if the MPA is managed 'better' it will be a success and benefit everyone (Himes 2003).

To date, few biological studies have examined the effectiveness of the EIMR in terms of its ability to increase the biomass of local marine organisms and none have been published. In addition, no analysis of the success of the EIMR has been done, either by the MPA managers or through scientific research. Popular opinion, expressed in interviews in research conducted by the author in 2001 as well as in this study, concludes that, even though very little research has been done to determine the effectiveness of the MPA, the MPA is ineffective biologically, economically and socially (Himes 2003). Furthermore, minimal work has been done to determine the economic impacts of the MPA and no work has been done on the socio-cultural impacts of the MPA on local stakeholders (Bertolino *et al.* 2001).

The Local Fishery

The fishing industry has historically been very culturally and economically important to the local community of the Egadi Islands (Rachelli 1979). Commercial fishing has been passed down through generations and has contributed significantly to local income (personal communication with local residents). In order to analyse the success of the EIMR, it is necessary to describe the characteristics of the local fishery.

A survey was conducted among small-scale artisanal fishing boat captains based in the three islands of the EIMR. Data collection took place between May fifth and twelfth, 2003. Interviews were conducted by the author in conjunction with an introduction of the research project to the fishermen.

Vessel registration information was obtained from the port authority of Trapani, which officially registers all vessels in the Egadi Islands. Because of the small numbers of registered vessels, a census of registered fishing boat captains was attempted on an opportunistic basis. Overall, thirty-two of thirty-nine fishing boat captains were interviewed, with two refusals (ninety-four percent response rate). Four were never located. All fishermen were approached at their vessels either in the early morning after they had returned from collecting their nets or in the afternoon while they were repairing their nets. Almost all fishermen were very interested in answering the questions and understanding the content of the research project. Previously, contact was made with key informants that

then served to introduce the author to the other fishermen and help explain the purpose of the research project. This had a significant positive impact on fishermen's decision to respond to the present questionnaire.

Questionnaires were completed in face-to-face interviews, where a statement of consent was read before the survey and the questions were asked and recorded on a paper version of the survey. The majority of the questions were closed-ended, with a few open-ended questions scattered throughout. Regarding the local fishery, respondents were queried regarding education, age, residence time, additional income sources, where they fish, what type and how much gear they use, years they have been fishing, crew, fish caught, with what gear and how much they are sold for, by-catch, and where they sell their catch. Regarding the MPA, respondents were questioned regarding their knowledge of the MPA, whether they feel it is beneficial to them and the community, and how their fishing activity has changed (results regarding MPA opinions are presented in the next section.).

Fishing vessels average twelve metres in length and are classified as a small-scale fishing fleet. Most vessels cannot legally travel farther than six nautical miles (nm) from shore, the majority of which stay within three nm from shore. Approximately all vessels carry between one and three crew members, (1=28.1 percent, 2=43.8 percent, 3=21.9 percent) the majority of which carry two crew. Two vessels reported having a crew of five or six, both of which were located at Favignana.

Fishermen in each village have access to a port maintained by the provincial government. During the summer months, the number of recreational fishermen increases significantly. In addition, large trawlers from Marsala, Trapani and Palermo (cities on the mainland of northwest Sicily) are commonly seen throughout the MPA. Fishermen typically set their nets in the waters directly adjacent to the island that they live on, for convenience purposes. This pattern of fishing allows them access to the nearest fishing grounds, reducing potential conflict from overlap of preferred fishing grounds.

Throughout the Egadi Islands, ten types of fishing gear are used (table 1). Trammel nets and long-lining are the most common types of gear used, followed by hand lines, monofilament and combined gillnets-trammel nets.

Local catch consists of sixty-three species, including nine species that were classified as by-catch by local fishermen. The most commonly caught species are the tub gurnard, John Dory, scorpionfish, red and striped mullet, octopus, bogue, common dentex, squid, seabream and moray eels.

Table 1. *Types and frequencies of fishing gear used in the Egadi Islands. N=32 (Favignana N=20, Levanzo N=2, Marettimo N=10).*

Gear type	Total boats		Frequency used (# boats)			
	%	#	Always	Freq	Rare	Never
Trammel net	84.3	27	25	1	1	5
Trawling	6.3	2	2	0	0	30
Cages	6.3	2	1	0	1	30
Purse seine	9.4	4	1	0	2	17
Long line	46.9	15	5	4	6	17
Hand line	34.4	11	2	0	9	21
Monofilament	28.1	9	1	3	5	23
Beach seine	12.5	4	1	2	1	28
Gill + trammel net	21.9	7	3	3	1	25
Set net	12.5	4	0	4	0	28

Trammel nets are used to catch forty-nine of the sixty-three species. Apart from long-lining, which is used to fish indiscriminately, the other gear types are used to catch very specific species. For example, cages are used only for lobster; beach seines nets only for saddled seabream, wide eyed flounder, and Mediterranean sand eel; and trawling generally only for octopus, hake, horse mackerel, greater forkbeard, and a variety of shrimp species. In addition, nine species of fish are caught as by-catch and either discarded overboard or consumed by the fisher. Twenty-two fishermen reported catching at least one species as by-catch.

Catch is distributed in the Islands by four methods. The most common method is to set up a stall at the port and sell directly from the landing site (sixty-nine percent overall). Fishermen also distribute their catch to local fish shops (thirty-one percent), restaurants (thirteen percent), and the large fish market in Trapani (thirty-one percent), the nearest city on the mainland, when catches are large.

Opinions of EIMR Management

After gaining information about the local fishery itself, an understanding of stakeholder perceptions of *de facto* success in the EIMR was needed. To get at this, a sample population of the main stakeholder groups were interviewed in mid 2003 and early 2004. Semi-structured questionnaires were completed with a random sample of thirty-two (2003) and forty-

seven (2004) fishermen. Respondents were directly asked, ‘Do you think the EIMR has been successful?’, with yes, no and I don’t know as potential responses. Following this, respondents were asked to explain why they answered the way they did.

The majority of fishermen stated that the EIMR has not been generally successful throughout its history (Table 2). Fishermen were asked this question three times between 2001 and 2004. In a questionnaire completed in the summer of 2001, it was apparent that fishermen, as a whole, did not perceive any positive benefits from the reserve and ‘felt that overall the reserve is a failure...fishermen in the EIMR show virtually no support for the reserve’ (Himes 2003, 401). The second time, in the 2003 survey, approximately fifty percent believe that the EIMR is successful. Forty one percent believe it is not at all beneficial, and nine percent did not have a clear idea of whether they believe the MPA to be beneficial. The final time fishermen were asked this question, in the 2004 survey, showed similar but stronger results. In 2004, only 8.5 percent of all fishermen believed that the EIMR has been a success.

Table 2. Number of fishermen that believe that the EIMR was successful in 2001, 2003 and 2004. Data represent number of fishermen and percentage of total fishermen.

Island	2001¹	2003²	2004³
Favignana	10 (56%)	10 (50%)	3 (10%)
Levanzo	1 (50%)	2 (100%)	0 (0%)
Marettimo	1 (20%)	1 (10%)	1 (7%)
Total	12 (48%)	13 (41%)	(14%)

¹ Total Interviewed N = 25 (Favignana N = 18, Levanzo N = 2, Marettimo N = 5)

² Total Interviewed N = 32 (Favignana N = 20, Levanzo N = 2, Marettimo N = 10)

³ Total Interviewed N = 47 (Favignana N = 29, Levanzo N = 4, Marettimo N = 14)

Finally, fishermen were questioned about their opinions on whether their catch has changed since the 1980s and potential explanations, analysing the history of the EIMR starting before it was created until the present. Almost all fishermen stated that their catch has decreased or decreased a lot during the history of the EIMR, while the remaining 9.4 percent did not know if their catch amount has changed. Furthermore, fishermen were questioned on why they thought this decrease in catch has occurred. The most frequent response was that trawlers frequently fish throughout the EIMR illegally, not only indiscriminately catching everything their net encounters in a short period of time, but also destroying the set nets of the

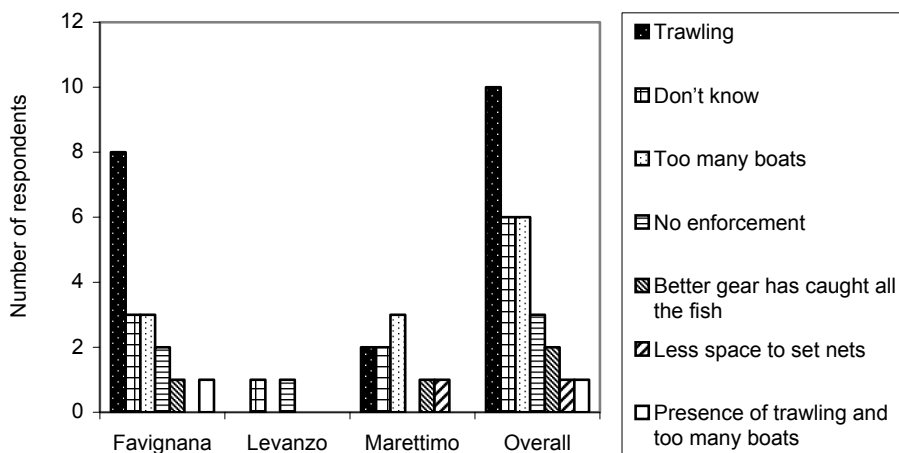


Figure 2. Fishermen views as to why they believe their catch has been steadily decreasing ($N=50$).

small-scale artisanal fishing fleet. The comment that there are too many non-local fishing boats, which, combined with local boats, are overexploiting the fishery, was also relatively common. Other explanations given were that there is less space to set nets because of the no-fishing zones of the reserve and too many fishermen, that no enforcement of the MPA and fishing regulations existed, and that technological improvements in gear allow fishermen to catch too much (figure 2). Almost twenty percent of fishermen did not have an explanation of why their catch was decreasing.

Understanding stakeholder perceptions of what constitutes overall success of an MPA is an important step in evaluating what must be done to improve management. It is clear that the EIMR has been an apparent failure to at least one user group that is significantly affected by it and whose members are important component of that success or failure. To understand these reactions, respondents were also asked to qualify their responses by identifying their relative preferences for management performance indicators and what could be done to improve the MPA, as per their vision of what the MPA should be.

Eliciting Stakeholder Management Preferences

The main objective of this phase of the research was to develop an initial set of stakeholder performance indicators for the EIMR. To accomplish this, a questionnaire was used to elicit a range of fishermen's definitions of success and how success can be achieved, and to improve how evaluations of MPAs are conducted in the future. 'Fishermen' are defined as anyone working on a fishing vessel that is based in the Egadi Islands.

Information on the number of crew aboard each vessel was taken from the 2003 survey. The data showed a count of eighty-three fishermen that work on vessels in the Egadi Islands. A census of registered fishermen was attempted on an opportunistic basis. Questionnaires were presented to fishermen either on board the vessel that they work on or at the commercial fishing port at each island. Structured questionnaires were presented in face-to-face interviews to a random sample of fifty-four fishermen, with four refusals (92.6 percent response rate). All data collection took place between 17 January and 31 March 2004.

In defining what constitutes a successful MPA to the fishermen of the EIMR, it is important to understand what overall objectives and goals fishermen have for the MPA. This in turn can help managers understand how the management objectives for the MPA could be modified to accommodate fishermen's preferences, as well as how management of the MPA could be generally improved, including compliance with the MPA's rules. Respondents were asked to complete the sentence: 'In my opinion, the EIMR will be a success in the future when or if...'. The aim of the question was to identify what management issues were most important to fishermen in creating a successful MPA. Asking about each respondent's personal vision attempted to evoke an emotive response that would indicate fishermen's objectives for and priorities in successful MPA management. Most respondents were able to list one to four brief indicators of good performance of the EIMR. Very few were able to list more than four distinct responses. A total of 146 individual responses were collected. Each response was examined and coded into one of fourteen categories according to the terms that the respondent used in describing their vision of a successful MPA. Occasionally a respondent's description referred to the same category more than once. In these cases, the related components of their responses were combined and tallied only once in the associated performance indicator category.

The results from the interviews were helpful in establishing several points to consider about fisherman preferences for performance indicators in evaluating the EIMR. The results are also useful in helping MPA managers identify new management objectives or modify the existing management objectives for the MPA. A description of the management categories and most frequently identified performance indicators are listed in table three to give an indication of fishermen's overall notion of success in the EIMR and how their priorities and criteria for success are distributed across various categories of management. The distribution of coded responses for the fourteen all-inclusive categories is shown in figure three. The indicators are discussed in terms of how they were ranked. The ranks were based on the frequency of citation.

Respondents' priorities and criteria for 'success' are distributed across various aspects of management. Fishermen clearly value the planning, output and outcome aspects of management (for example increase enforcement and better organise management, see table three and figure 3). A clear majority of respondents nominated at least one performance indicator in these three categories.

Table 3. *Explanation of the categories used to code data on visions of 'success' (performance indicators) for the EIMR. Percentages represent percent of all fishermen that identified each performance indicator.*

Element of management	Applies to responses regarding:	Suggested Performance Indicator
Planning	Planning activities and plans for managing the park, including issues of design and developing regulations	<ul style="list-style-type: none"> • Management better organised (66%) • Tourism is better organised (12%) • Change in regulations (36%)
Inputs	The adequacy and/or appropriateness of financial, technical and human resources needed to manage well	<ul style="list-style-type: none"> • More efficient management (financially, timely, needed projects carried out) (44%)
Processes	Efficiency and appropriateness of processes for making decisions and implementing management strategies	<ul style="list-style-type: none"> • Community involved in management (22%) • Achieve sustainable development (2%)
Outputs	The quantity or quality of products or services delivered directly from management	<ul style="list-style-type: none"> • Improve basic services, signage, port, facilities (2%) • Increase enforcement/compliance (48%) • Increase accuracy and quantity of information (6%)
Outcomes	Biological or ecological improvements	<ul style="list-style-type: none"> • Decrease in pollution (6%) • Environment protected and repopulated (e.g. habitat is protected, increase in fish biomass) (26%)
	Economic changes	<ul style="list-style-type: none"> • Increase in economic development (2%) • Community benefits economically from MPA (17%) • Tourism increases (12%)
	Positive changes in social behaviours or attitudes	<ul style="list-style-type: none"> • Community recognises the benefits of an MPA (14%) • Community begins to value the MPA (4%)
	Increased awareness of stakeholders	<ul style="list-style-type: none"> • Local community is helped to cope with MPA (12%)

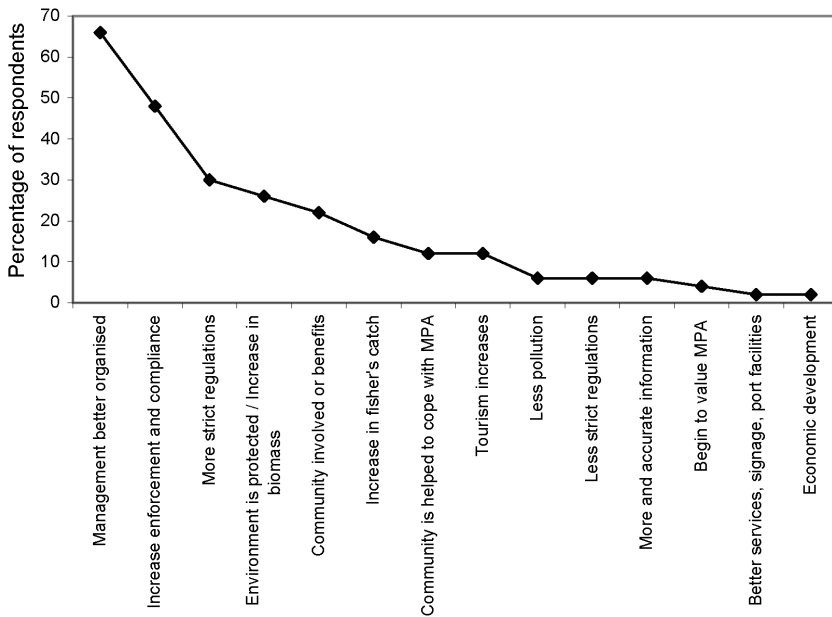


Figure 3. Frequency of response for performance indicator categories (N=50).

By far, the most cited indicator is that of improvement in the organisation of MPA management. This includes performance indicators such as qualified staff, the consideration of locals and fishermen by management authorities and when the MPA is managed seriously (for example a qualified manager is hired – the current manager was hired as a political favour as opposed to being hired for having experience in park management or biology).

Increasing enforcement and compliance were the second most ranked performance indicators. Fishermen ranked increasing the strictness of regulations regarding activity in the MPA third. Closely behind increasing regulation strictness, fishermen identified *de facto* protection and repopulation of the marine environment and involving the local community in MPA management. Surprisingly, increasing fisher's catch was only nominated as an important performance indicator by sixteen percent of fishermen. Instead, more importance was placed on changing the regulations and zone boundaries, and involving fishermen (and the community) in management. Other less frequently nominated performance indicators include increasing available educational materials, increases in local tourism, less pollution, increasing community value for the MPA, and better services and port facilities. Interestingly, eight percent of fishermen indicated that nothing would ever make the MPA successful.

An interesting result is that many fishermen identified 'better management' as a priority for managing a successful EIMR. Better manage-

ment, however, cannot be measured as an objective or performance indicator in its own right to achieve relevant outputs or outcomes. It is too vague and requires further clarification. However, this type of response should be expected if it is assumed that most people do not give importance to how outcomes are achieved, as long as they are achieved in the end. What this shows is that follow-up questions should be asked of the respondents, such as 'To better manage the MPA, what would you want the managers to do?', to help define more measurable performance indicators. The same is true for other unmeasurable indicators that respondents provided (for example better organised tourism, involve community in management, environment is protected).

Furthermore, through the type of interview results presented here, fishermen's priorities can be understood more clearly in light of their livelihood strategies and fishing practises. For example, in the EIMR, fishermen give high priority to better enforcement and compliance, more strict regulations, decreasing trawling, and decreasing the number of non-local boats fishing local waters. It appears from an initial look at these preferences that fishermen and conservationists would not agree on how to improve the success of the EIMR because fishermen did not directly identify conservation oriented performance indicators, which would be expected of conservationists. However, these preferences could also be interpreted to show that fishermen want to decrease outside fishing pressure so that more fish are available for themselves. This leads to the indirect conclusion that, instead, there actually is a strong connection between the conservationist's vision of success (increase in biomass) and local fisher's vision of success (increasing biomass so only local fishermen can exploit it). The same result could be achieved from both points of view: less fishing pressure (by outsiders) and increases in biomass. This could also result in a strong connection between fisherman support for the MPA and a view of success as a means to keep outsiders out, thus retaining fish biomass for local fishermen.

Discussion

The task set in this study was to address one of the fundamental problems of MPA evaluation by shedding light on the development of competing criteria for 'success' and measuring management performance. The empirical basis lies in a case study in the Egadi Islands, an MPA in great need of performance evaluation and acceptance by local fishermen. It represents a situation where neither the MPA managers nor local fishermen believe that the MPA is successful, but where fishermen disagree with each other and MPA managers on what would make the MPA a suc-

cess in the future. By analysing the interactions and conflicts between fishermen in the present study, numerous insights were gained into the management of MPAs and stakeholder perceptions and preferences.

One of the more significant challenges faced by those interested in and responsible for MPA management is to refine their understanding of the linkages between different aspects of management and stakeholder points of view, each of whom may have distinct opinions regarding what aspects of management should be prioritised. Inherent in those linkages are potential conflicts that can develop between various interests and render MPA 'success' difficult to achieve. In the face of such conflict, performance indicators and evaluation schemes must be adapted to assist decision-makers in modifying and designing appropriate management plans that attempt to improve overall performance and management effectiveness. This is especially true in the Mediterranean basin, where few, if any, evaluations of MPA management effectiveness have been undertaken and almost all research focuses on the biological aspects of MPAs, completely ignoring the socio-economic components, such as compliance, economic impacts, and community support (Badalamenti *et al.* 2000; Himes 2003).

The present research attempts to confront this by arguing that the definition of 'success' must be created with input from concerned stakeholders in conjunction with MPA managers. Arguably, any measurement of 'success' should be determined with input from the local community in order to take into account the factors that they find most important and to address potential areas of conflict. At the same time, local or external researchers should undertake in-depth research into varying definitions of 'success' and relevant indicators of success given by different stakeholder groups and develop ongoing monitoring programmes to measure those definitions of success (Alder *et al.* 2002). The same can be said for identifying and modifying the initial goals and objectives for an MPA. Many studies have shown that stakeholder input is critical in developing the goals and objectives of an MPA and identifying appropriate management effectiveness indicators by which to measure MPA success (Pomeroy *et al.* 2004; Steins 1999; Suman *et al.* 1999). The inclusion of stakeholders this way can also help increase community support. This occurred in the case of the Egadi Islands, where fishers were given the opportunity to provide their input on what would make a more successful MPA and were enthusiastic about being able to participate in management.

Another important reason for including resource users in management development decisions is that they can often have substantial impacts on MPA success through their actions. Because fishermen, for example, rely on marine resources for their income, if they do not feel involved in creating and managing the MPA, they may essentially disregard

the regulations and set their fishing gear wherever they want, unintentionally damaging the resources that the MPA is trying to protect. However, if they are included in management decisions and their concerns are listened to, their support for MPA managers and compliance with the regulations is likely to go up, allowing the MPA to successfully meet more of its goals and ultimately provide better conservation of local marine resources.

One of the most important insights discovered here is the approximate level of importance that fishers assign to a variety of components of MPA performance. It is clear from the fisher nominated performance indicators that they tend to assign importance to a mixture of management components. The performance indicators fishers suggested cross boundaries between management components to create a unique set of criteria for management that each individual upholds. In this way, it is reasonable to hypothesise that fishers in the Egadi Islands, as well as members of other local stakeholder groups, consider multiple management criteria and objectives on a regular basis. This result can also be significant in helping managers to re-evaluate the stated management objectives and develop appropriate success criteria for a given protected area. For example, in the EIMR, fishers appear to give more weight to using the MPA to improve their livelihood (for example by keeping trawlers out) rather than to the EIMR's stated objectives involving scientific research, protecting archaeological resources and educating the public. However, fishermen's preference for increasing and improving the local tourism industry does fall in line with the stated objective of promoting marine socio-economic development. Using this type of information, managers can then look at an MPA's objectives and modify them to be more in line with the needs of local resource users as well as protecting local resources.

This research also sheds light on an additional problem. How do stakeholder defined performance indicators differ from *a priori* developed indicators and management objectives? Managers are faced with a number of choices regarding how to assess the performance of *de facto* management and how to then increase its effectiveness. The sole use of managers' personal experience and previously developed theories regarding MPA 'success' lies at one extreme. At the other lies stakeholder preferences for and participatory evaluation of management effectiveness. Under this point of view, management evaluation and the selection of performance indicators must combine the two extremes; user groups, such as local fishers, and managers must monitor and evaluate management together in order to achieve a well-rounded protected area. From the start, the process of management should be aimed at reaching consensus about the multiple objectives, criteria and targets that are utilised to design

management interventions (Pollnac *et al.* 2001). In recent years, many methods have been developed to get at the heart of this, including the IUCN's 'How is Your MPA doing?' Workbook (Pomeroy *et al.* 2004), the United Nation's Foundation 'World Heritage Management Effectiveness Workbook' (Hockings *et al.* 2004), the IUCN Eastern African Regional Programme's Workbook for the Western Indian Ocean (Mangubhai 2003), and the World Bank's Score Card to assess progress in achieving goals for MPAs (Staub and Hatzios 2003). These methods all argue that the inclusion of information on the human context of the MPA is essential for assessing sources of stress to the local marine ecosystem, developing effective conservation strategies, measuring threat abatement, and increasing stakeholder buy-in.

Another noteworthy finding is that the differences in individual fishermen's perceptions and opinions compared with other fishermen in the EIMR indicate that similar differences are probable both between and within the other stakeholder groups present in the EIMR (for example residents, tourism business owners). This could be significant enough to negatively affect the overall potential of obtaining a successful MPA in the future. The preferences elicited from EIMR fishermen present a wide variety of potential indicators for what is needed to make the MPA successful. This becomes even more complicated when preferences for management are obtained from all stakeholder groups and when those preferences are in conflict with the MPA managers objectives. Whose preferences should be weighted more?

Considering the significant influence these fishers have on the MPA as consumptive resource users, if local stakeholders are expected to support the MPA and comply with its regulations, then their interests will inherently need to be included and considered in future management interventions in order to be effective. Specific attention should be given to consumptive resource users since their actions, by either decreasing resource quantity and quality or trying to help protect it, can dramatically affect the state of the resource that an MPA is trying to protect. Given this, if MPA managers can bring important stakeholders on board and allow them to participate in management and decision-making, a protected area can more easily gain wide social acceptance, meet a variety of stakeholder needs, and begin to be more successful in everyone's eyes.

However, then the question is, if stakeholder interests and objectives are in direct conflict with one another, how is the achievement of MPA objectives and targets affected? In such cases, is it possible for a protected area to ever become an overall success? As the marine environment and stakeholder interests constantly change and evolve, so does the concept of 'success.' With this argument it becomes clear that the concept of 'success' will always remain relatively elusive. The result, then, of the present

research, while designed to discuss fisher identified opinions of and preferences for management, is to bring to light the argument that stakeholder preferences must be uncovered on a case by case basis and included in management decisions if an MPA is to be considered successful.

Conclusion

To develop successful MPA institutions and policy, management objectives must be defined, targets set, and evaluations done to monitor the overall achievement of those targets (Pomeroy *et al.* 2004). Frequently, MPA governing bodies have taken on these responsibilities in their attempts at management. More often than not, however, managers fail to recognise and encompass important stakeholder opinions in their attempt at realising a successful MPA (Himes 2005). Individual stakeholders in MPA management often exhibit conflicting needs and interests. Consequently, conflicting management objectives and points of view can develop on how natural resources should be managed (Halpern 2003). These differences relate to stakeholders' often unique definitions of 'success', considering the economic, social, biological, or management components of performance, and perhaps a mixture thereof. Therefore, in order to achieve a well-rounded and well-performing MPA, managers must recognise and incorporate these differences into management plans and interventions.

The EIMR case study was designed to highlight some of the similarities and differences between individual fishers regarding preferences for MPA performance indicators and management interventions that should be undertaken to achieve those indicators. While much theory exists regarding the different components of MPA 'success' (for example Arnason 2000, Halpern 2003, Russ and Alcala 1994, Tompkins *et al.* 2002), very little theory exists to assist in the compilation of stakeholder preferences in order to develop successful management programs. The solicitation of fisher preferences for performance indicators discussed herein is a crucial first step in understanding the criteria through which stakeholders view MPA management. The next step is to expand the data set collected here to include other significant MPA stakeholder groups and analyse the differences in performance indicator selection between and within stakeholder groups.

It is also clear that in the development of new tools for the evaluation of MPA management effectiveness, particular focus should be given to participatory methodologies that help to reveal important stakeholder priorities and preferences for management objectives and performance.

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References

- Agardy, T.
1997 *Marine Protected Areas and Ocean Conservation*. Austin, TX: R.G. Landes Company.
- Alder, J., D. Zeller, T. Pitcher, R. Sumaila
2002 A Method for Evaluating Marine Protected Area Management. *Coastal Management*. 30: 121-131.
- Arnason, R.
2000 Marine Reserves: Is there an economic justification? Proceedings of the conference *Economics of Marine Protected Areas*, 6-7 July 2000 in Vancouver, B.C., Canada: UBC Fisheries Centre.
- Badalamenti, F. *et al.*
2000 Cultural and socio-economic impacts of Mediterranean marine protected areas. *Environmental Conservation* 27(2): 110-125.
- Bertolino, F., S. Lombardo, A. Santulli
2001 *Valutazione degli effetti dell'istituzione della riserva naturale marina delle Isole Egadi sulle attività di pesca*. Mazara del Vallo, Italy: Consiglio Nazionale della Ricerca, pp. 1-41. [Italian]
- Bohnsack, J.
1993 Marine reserves: They enhance fisheries, reduce conflicts and protect resources. *Oceanus* Fall 1993: 63-71.
- Bunce, L., P. Townsley, R. Pollnac, R. Pomeroy
1999 *Socioeconomic Manual for Coral Reef Management*. Townsville, Australia: Australian Institute of Marine Sciences, pp. 251.
- Halpern, B.S.
2003 The impact of marine reserves: do reserves work and does reserve size matter? *Ecological Applications* 13(1): S117-S137.
- Harmelin, J.G., F. Bachet, F. Garcia
1995 Mediterranean Marine Reserves: Fish indices as tests of protection efficiency. *Marine Ecology* 16(3): 233-250.

- Himes, A.H.
 2005 *Performance indicators in marine protected area management: A case study on stakeholder perceptions in the Egadi Islands Marine Reserve*. Doctoral Dissertation, Portsmouth Business School, University of Portsmouth, Portsmouth, England, pp. 303.
- 2003 Small-Scale Sicilian Fisheries: Opinions of Artisanal Fishermen and Socio-cultural Effects in Two MPA Case Studies. *Coastal Management* 31(4): 389-408.
- Hockings, M., S. Stolton, N. Dudley
 2003 *Evaluating effectiveness: A summary for park managers and policy makers*. Gland, Switzerland: IUCN.
- 2000 *Evaluating effectiveness: A framework for assessing the management of protected areas*. Series editor Adrian Phillips. Best Practice Protected Area Guidelines Series No. 6. Gland, Switzerland: IUCN, pp. 121.
- Hockings, M. *et al.*
 2004 *The World Heritage Management Effectiveness Workbook*. Washington, D.C.: The United Nations Foundation, pp. 97.
- Istituto Ricerche Economiche per la Pesca e l'Acquacoltura (IREPA)
 2003 Osservatorio economico sulle strutture produttive della pesca marittima in Italia 2001-2002. XI Rapporto, 360 p. Milano: Irepa Ricerche, FrancoAngeli edizioni.
- Juanes, F.
 2001 Mediterranean marine protected areas. *Trends in Ecology and Evolution* 16(4): 169-170
- Katon, B., R. Pomeroy, L.R. Garces, M. Ring
 2000 Rehabilitating the mangrove resources of Cogtong Bay, Philippines: A co-management perspective. *Coastal Management* 28(1): 29-37.
- Kelleher, G., C. Bleakley, S. Wells
 1995 *A Global Representative System of Marine Protected Areas, Volume I*. Washington, D.C.: The World Bank and IUCN.
- Mangubhai, S.
 2003 *Assessing Management Effectiveness of Marine Protected Areas: a draft Workbook for the Western Indian Ocean*. Nairobi, Kenya: IUCN Eastern African Regional Programme, pp. 74.
- National Research Council
 2001 *Marine protected areas: tools for sustaining ocean ecosystems*. Washington, D.C.: National Academy Press, pp. 272.
- Organisation for Economic Co-operation and Development (OECD)
 2005 Fisheries management systems in OECD fisheries – Italy. Paris, France: OECD, pp. 15.

- Pollnac, R.B., B.R. Crawford, M.L.G. Gorospe
 2001 Discovering factors that influence the success of community-based marine protected areas in the Visayas, Philippines. *Ocean and Coastal Management* 44: 683-710.
- Pomeroy, R.S., J.E. Parks, L.M. Watson
 2004 *How is your MPA doing? A guidebook of natural and social indicators for evaluating marine protected area management effectiveness*. Gland, Switzerland: IUCN, pp. 216.
- Rachelli, G.
 1979 *Egadi, Mare e Vita: Natura, storia, arte, turismo dell'Arcipelago eguseo e delle Isole dello Stagnone*. Milan, Italy: U. Mursia editore S.p.A. [Italian]
- Russ, G.R., A.C. Alcala
 1999 Management histories of Sumilon and Apo Marine Reserves, Philippines, and their influence on national marine resource policy. *Coral Reefs* 18: 307-319.
- 1996 Do marine reserves export adult fish biomass? Evidence from Apo Island, central Philippines. *Marine Ecology Progress Series* 132: 1-9.
- 1994 Sumilon Island Reserve: 20 years of hopes and frustrations. *NAGA, The ICLARM Quarterly* July 1994: 8-12.
- Staub, F., M.E. Hatziolos
 2003 *Score Card to Assess Progress in Achieving Management Effectiveness Goals for Marine Protected Areas*. Washington, D.C.: The World Bank, pp. 28.
- Steins, N.
 1999 *All Hands on Deck: An interactive perspective on complex common-pool resource management based on case studies in the coastal waters of the Isle of Wight (UK), Connemara (Ireland) and the Dutch Wadden Sea*. Ph.D. Dissertation, Wageningen Universiteit, The Netherlands.
- Suman, D., M. Shrivani, J.W. Milton
 1999 Perceptions and attitudes regarding marine reserves: A comparison of stakeholder groups in the Florida Keys National Marine Sanctuary. *Ocean and Coastal Management* 42: 1019-1040.
- Tompkins, E., N. Adger, K. Brown
 2002 Institutional networks for inclusive coastal management in Trinidad and Tobago. *Environment and Planning A* 34: 1095-1111.

- Tudela, S.
2004 Ecosystem effects of fishing in the Mediterranean: an analysis of the major threats of fishing gear and practices to biodiversity and marine habitats. *Studies and Reviews. General Fisheries Commission for the Mediterranean*. No. 74. Rome, FAO. 44p.
- Vallega, A.
1999 *Fundamentals of Integrated Coastal Management*. London: Kluwer Academic Publishers.