

Small-scale Sicilian Fisheries: Opinions of Artisanal Fishers and Socio-cultural Effects of MPAs

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ABSTRACT

Marine resource management and related stakeholder conflicts have been clearly defined in recent decades as pressing issues worldwide. What most managers neglect to include in management is social science to inform the development of more effective marine protected areas (MPAs). This is a significant problem in the Mediterranean where few socio-cultural and economic studies have been conducted. This paper begins to fill this knowledge gap by accounting for a comparative study of three marine reserves in Sicily, Italy. Using data collected with standard anthropological field methods, analysis was conducted on how artisanal fishers are impacted by reserves, the extent of their knowledge regarding regulations, their opinions on management, and demographics. The results indicate that while fishers are aware of the marine reserves where they fish, most fishers were not well informed of the regulations. Fishers feel alienated from the management process and would feel more comfortable with reserve managers and regulations if they were involved in management. The paper concludes by showing how such data could help to develop more useful and practical management practices.

KEY WORDS: Marine Protected Areas, Italy, socio-economic and cultural impact

Pescadores Artesanales de Sicilia: Opiniones de los Pescadores Artesanales y los Efectos Socio-culturales de las Áreas Protegidas Marinas

La gerencia de recurso marino y los conflictos relacionados del tenedor de apuestas se han definido claramente en décadas recientes como presionar ediciones por todo el mundo. En una escala global, los seres humanos dependen de la existencia y de la abundancia de recursos marinos para satisfacer sus necesidades y desean en dimensiones recreacionales, estéticas y económicas. En años recientes, los encargados de recurso marino se han centrado cada vez más en las áreas protegidas marinas, reservas de la industria pesquera y ninguno-toman zonas al reparto con esta dependencia. Sin embargo, la mayoría de estas áreas de la gerencia han confiado casi exclusivamente en los mejores datos biológicos disponibles para aconsejar decisiones de gerencia. Qué la mayoría de la negligencia de los encargados incluir es investigación científica social para informar al desarrollo un MPAs más eficaz. Esto

es un problema significativo en el mediterráneo donde pocos, si cualesquiera, socio-culturales y económicos los análisis se han conducido en MPAs. Para comenzar a llenar este boquete del conocimiento en el mediterráneo, conduje un estudio comparativo de tres reservas marinas en Sicilia, Italia. Usando los datos recogidos con métodos antropológicos estándares del campo, analizaba cómo las reservas afectan a los pescadores en reducida escala del artesanal, cómo esta' bien informado están sobre las regulaciones en la reserva, sus opiniones sobre la gerencia, y demographics del pescador. Los resultados indican que mientras que los pescadores están todos enterados de las reservas marinas donde pescan, la mayoría de pescadores entrevistados con no era informada muy bien de las regulaciones asociadas. Los pescadores se sienten muy enajenados del proceso de la gerencia, y se sentirían mucho más cómodos con los encargados y las regulaciones de la reserva si estuvieron implicados en revisar regulaciones actuales. Muy pocos pescadores indicaron que la aplicación es bastante adecuada evitar que los barcos rastreadores ilegales destruyan el habitat béntico en la reserva. Finalmente, los pescadores del artesanal están en conflicto constante con los pescadores recreacionales que se sienten los están exprimiendo fuera de los puertos y están tomando todos los recursos de los fishery's. Estos datos deben ser útiles en convertirse prácticas de gerencia más útiles y más prácticas.

PALABRAS CLAVES: Pescadores artesanales, áreas protegidas marinas, efectos socio-culturales

INTRODUCTION

Marine resource management and related stakeholder conflicts have been clearly defined in recent decades as pressing issues worldwide. On a global scale, humans and economies depend on the existence and abundance of marine resources to satisfy their needs and wants on recreational, aesthetic, and economic dimensions. Commercial users rely on fisheries and aquaculture in many regions of the world, while beaches and rocky cliffs provide for swimming, fishing, beachcombing, and sunbathing as prominent leisure activities (O'Riordan and Voisey 1997). These areas are among the most productive natural systems available to humans. They also include some of the most sensitive ecosystems in the world (Scura et al 1992). The problem of resource depletion already exists from conflict between them. In the case of fishery resources, where as many as 25 - 30 % of species are overfished, and another 44 % are fully exploited (FAO 1999). Previous governance efforts to sustain fisheries have frequently failed and have often exacerbated the problem of biological overexploitation and economic inefficiency (Lauck et al. 1998). Without proper management, the attributes of the coast and marine environment that humans find attractive will be destroyed (Vallega 1999).

With the realization that traditional fishery governance systems that rely on

concepts such as maximum sustainable yield and optimum yield have often failed (as evidenced by over-fishing and habitat loss), a movement has commenced towards the development of more ecosystem-oriented approaches as opposed to traditional single species management efforts. As an alternative to the single species approach, managers and scientists have rapidly been designing and implementing marine protected areas (from here on referred to as MPAs or marine reserves) throughout the world with the hopes of structuring access to marine resources on an ecosystem level. Within the last 20 years, MPAs and marine reserves have become a widely advocated form of marine conservation for protecting these valuable resources and interweaving fisheries management and tourism (Agardy 1997, Bohnsack 1993, Committee on the Evaluation, Design, and Monitoring of Marine Reserves and Protected Areas in the United States et al. 2001, Kelleher 1995, Ray 1999). Such an approach has the potential to effectively address several management objectives and allow multiple stakeholders to use the same resources, a must in reducing conflicts and concerns.

In this paper, I refer to two terms that commonly have different meanings in the primary literature: marine protected areas and marine reserves. The definition that I will follow equates the two terms to the following: any area of the marine environment managed for the primary purpose of preserving biodiversity, aiding in the recovery of overfished stocks and to ensure the persistence of healthy fish stocks, fisheries, and habitats either as a multi-use area or no-take zone. This is a common definition used for Italian MPAs, the subject of this paper.

Over the past decade, marine resource managers have increasingly realized the need to incorporate socio-economic and cultural factors into the decision making process. In many cases, especially in indigenous communities, stakeholder groups such as local residents and fishers can significantly contribute to management, providing historical catch trends, relative comparisons in the state of the environment between the past and present, new management strategies, and methods to gain the respect and trust of the community. Moreover, they can be trained to teach user groups about the reserve and how they can be involved in the management. Finally, enforcement by the community through peer pressure and discouragement are normally more effective and less costly than typically used government enforcement (Wells and White 1995).

While there have been many biological scientific studies conducted within MPAs of the Mediterranean, few if any socio-economic or cultural studies have been done on the impact of MPAs on local populations and visitors. This paper analyzes the effectiveness of MPA management and regulations in Sicily and how the management regimes deal with local stakeholder interests, principally local artisanal fishers. The first section provides background information on two MPAs in Sicily. Section two explains the methodology used in this study. Section three presents the results and analysis of a survey taken of local artisanal fishers in each MPA. Finally, the paper concludes with recommendations on how to improve MPA management

techniques in Sicily, and for MPAs in general, in order to obtain better conservation results from management plans.

BACKGROUND INFORMATION

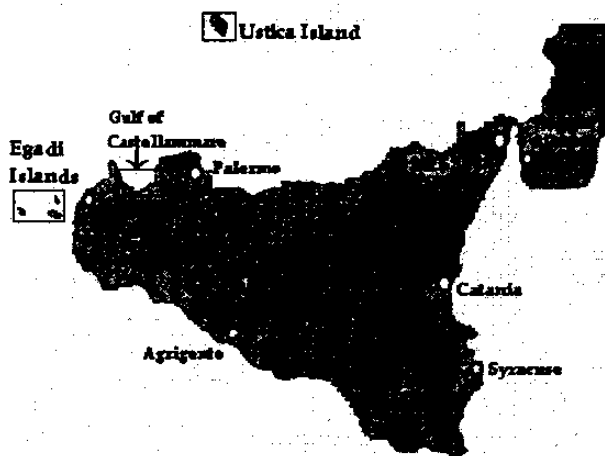
Gulf of Castellammare Fishery Reserve (GCFR)

The Gulf of Castellammare, a broad, crescent-shaped bay, is located on the northwest coast of Sicily west of Palermo (Figure 1). Its coastline is over 70 km long and its surface area is approximately 30,000 ha, making it one of the widest bays in Sicily (Badalamenti 2000). The Gulf is bordered by five villages, from San Vito Lo Capo on the Capo San Vito peninsula marking the westernmost point to Terrasini at Capo Rama marking the easternmost point. Each of these fishing villages has a publicly operated port to accommodate its commercial and recreational fishers. The majority of the fishers that are active in the Gulf are small-scale artisanal and recreational fishers from the local villages.

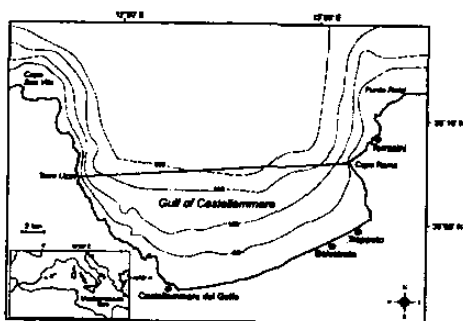
Evolution of the Reserve — The Gulf of Castellammare was established as a fishery reserve in 1990, along with two other Sicilian gulfs with important artisanal fisheries, the Gulf of Catania on the central eastern coast of Sicily and the Gulf of Patti located on the northeastern corner of Sicily. The Sicilian Regional Government imposed the fishery reserves in order to “rebuild the severely depleted demersal stocks and eliminate the conflict between the trawlers and the small-scale artisanal vessels operating in the Gulf (Whitmarsh 2000).” Over 70 commercially viable species are caught and sold locally.

Since the establishment of the fishery reserves, numerous biological studies based on annual monitoring of biomass fluctuation have shown a positive reaction by the marine environment inside the Gulf of Castellammare to the presence of the fishery reserve. A study measuring fish biomass increase after a four-year trawl ban indicated an increase in biomass for all species considered, from a 1.2-fold increase for the musky octopus to a 497-fold increase for the gurnard (Pipitone 2000). Similar results were found in biomass studies after eight and ten years of the trawl ban (Badalamenti 2000).

Regulations — In 1990, the Gulf was completely closed off to trawling, from the tip of Capo Rama south of Terrasini to Torre dell’Uzzo north of the town of Scopello on the western side of the Gulf. Current regulation also specifies that artisanal and recreational fishers are the only categories of fishers allowed to fish within the boundaries of the reserve. As a result, the few commercial trawling vessels that remain are registered in Terrasini and San Vito and can be seen trawling in the outer reaches of the Gulf as well as trawling directly along the limits of the fishery reserve attempting to catch any biomass spillover.



Gulf of Castellammare Fishery Reserve



Egadi Islands Marine Reserve



Figure 1. Map of northwest Sicily showing the Egadi Islands and the Gulf of Castellammare

Enforcement was designed to incorporate all local enforcement officials with access to vessels capable of patrolling the area. Enforcement officials include members of the Carabinieri (military police), the Guardia Costiera (coast guard), the Capitaneria (port authority) and the Guardia Finanza (charged with protection of the economic interests of Italy and the EU). Each is responsible for having at least one vessel patrolling local waters.

Egadi Islands Marine Reserve (EIMR)

The Egadi Islands are located directly west of the city of Trapani at the westernmost point of Sicily (see Figure 1). The reserve encompasses three islands, Favignana, Marettimo and Levanzo, and two rocky outcroppings, Formica and Maraone. The total length of protected coastline is approximately 22 kilometers and the reserve is approximately 50,000 ha and consists of four zones of increasing restrictions (Kelleher et al. 1995). Fishers in each village have access to ports on each island provided by the provincial government. As in the Gulf of Castellammare, the majority of fishers are small-scale artisanal and recreational fishers from the local villages.

Evolution of the Reserve — The reserve surrounds the archipelago of the Egadi Islands stretching westward from offshore of Trapani in an oval shape encompassing all five of the islands in the archipelago. Law 979/1982 (Agreement on the Defense of the Sea) was the first attempt by the Italian government to protect areas of its national waters. It identified 20 reserves to be established throughout Italy within two years after the law was written. However, there were not sufficient resources to make all 20 a reality immediately; consequently, the EIMR was not instituted until 1991. It is the largest marine reserve established in Italy to date and the second largest marine reserve in the Mediterranean.

To date, few biological studies have examined the effectiveness of the Egadi reserve in terms of its ability to increase the biomass of local marine organisms, and none have been published. The consensus of popular opinion, expressed in interviews with the author, suggests that even though very little research has been done to determine the effectiveness of the reserve, the reserve is completely ineffective. Furthermore, minimal work has been done to determine the economic impacts, and no work has been done on the socio-cultural impacts of the marine reserve on local stakeholders (Bertolino et al. 2001).

Regulations — Political jurisdiction in the reserve falls under the hierarchy of the Region of Sicily, the Province of Trapani and the Commune of Favignana. Each of these entities has some level of responsibility in managing and contributing resources to the reserve. Until 2000 the reserve was directly managed by the port authority of Trapani, which limited its responsibilities to administrative and bureaucratic work in the management of the reserve. In 2000, the responsibility of management was transferred to the Commune of Favignana. The Commune has become a much more

active and dynamic management body. As an example, it nominated a new director of the reserve in 2001, whose first action was to sponsor and promote a research program to determine the efficacy of the current management scheme and the overall success of the reserve. The reserve is partitioned off into four zones, A, B, C and D, with varying levels of restrictions. Zonation within the reserve allows for a multi-use aspect of marine resources in the management plan of any regulated area. The zone restrictions range from permitting only limited types of activity such as diving, research and swimming (zone A), restrictions on navigation within 500 m of the coast, fishing in general, and prohibition of trawling and spearfishing (zone B), prohibition only of using trawling gear (zone C), and allowing almost all stakeholders to use the reserve resources to some extent (zone D).

METHODOLOGY

Sicily is perhaps the ideal setting for an examination of the evolution and performance of marine reserves in Italy and the Mediterranean. Each reserve in Italy was established for unique cultural, sociological, economic, and conservation reasons. There is tremendous diversity in the types of marine resources they are designed to protect and in the degree to which each has achieved that protection. Analysis of the effectiveness of marine reserves in Sicily required the collection of both primary and secondary data. Primary data was gathered through the use of a series of survey instruments and personal interviews in three marine reserves in northwest Sicily. Secondary data was collected through an extensive primary literature review of articles and reports on the effectiveness of marine protected areas in general and in the marine reserves in question.

The present study focuses on the opinions of fishers affected by the GCFR and the EIMR. These three reserves were chosen due to the differences in creation dates, the level of success that has been reported in each reserve as determined by the initial objectives and the regulatory structure between nationally and regionally created reserves.

A personal survey was conducted among small-scale artisanal fishers in the five villages surrounding the GCFR. A second, shorter version of the survey was conducted in the three villages within the EIMR. All data collection took place during the summer of 2001. Interviews were conducted in each village by the author and technicians from the *Istituto delle Ricerche Marine e L'Ambiente* (IRMA). Due to the small size of the total and individual village populations, the questionnaire was directed to the entirety of the fishing population instead of choosing a subset.

In addition, several informal interviews were conducted with fishers to expand and complete information gathered in the formal survey process. Sampling was opportunistic, occurring throughout the course of research activities. To complement these interviews, official documents including laws, ministerial decrees, and educational pamphlets provided to the public were used. One fisher was interviewed per boat. Typically, the interview was held with the owner of the boat.

However, on a few occasions, another crew member was interviewed as the boat owner was not available. The surveys were designed to gather site-specific data regarding the opinions about and knowledge of the management, enforcement, and regulations that apply to the reserve. The questionnaires focused on five categories of questions: demographics, fishing activities, reserve knowledge, legal framework, and concerns.

RESULTS AND DISCUSSION

In the Gulf of Castellammare, a total of 68 of 115 artisanal fishers were interviewed. This accounts for 59 % of the total population of fishers in the Gulf. Three fishers refused to be interviewed. The fewest fishers were interviewed in the port of Terrasini, where it is speculated that a number of fishers have retained their fishing licenses, but have ceased fishing activities. The percentage of active artisanal fishing population interviewed is likely to be higher than 59 %. In the Egadi Islands, 25 of 32 or 79 % of all artisanal fishers were interviewed with no refusals. Lack of data on license holders precludes formal analysis of response bias. However, except as noted below, it can be assumed that the data summarized here is not representative of the respective sampling populations.

In each MPA, the distribution of population demographics, fishing characteristics and fishing gear seem to be fairly similar. As all of the fishers are small-scale artisanal fishers, and this demonstrates a series of generalities that could characterize or define groups of such fishers in Sicily. Fishers in these reserves vary widely in age from 23 to 80, however, fishers' formal educational level is generally very low, and they do not have sources of income other than fishing. Most run fishing vessels alone or with only one other person, the vessels are all in the same size range (4.5 - 12 m in length), and the most utilized piece of fishing gear is the trammel net with occasional use of one or two other gear types. In addition, fishers use purse seines and long-lines to supplement the catch provided by trammel nets. Other gear types used, although much more infrequently, include drift nets, cages, line fishing, and set nets.

Interviews with local fishers in each MPA brought out similar needs for future management within each. The present study found four commonalities between the three MPAs studied in terms of needed management measures. These include:

- i) Better communication, especially regarding regulations and boundary delimitation,
- ii) Increased enforcement of regulations,
- iii) New performance measurements and monitoring along with a commonly agreed definition of 'success,' and
- iv) Increased involvement of local communities in decision making. The following is broken up into four sections describing each of these with regards to the major findings in this study along with possible solutions to help resolve each issue.

Communication

One of the most important components of reserve development and establishment is informing the people that utilize the area being managed about the new regulations. This includes explaining where the boundary of the reserve is, any associated zonation and the regulations associated with the reserve. Fishers were asked questions designed to show their level of awareness of their local MPA, including its delimitation, regulations, and management mechanism.

In the Gulf of Castellammare, fishers were relatively well informed. In other locations, however, there was inconsistent knowledge of the boundary and other details of the reserve, which, as described in the next section, has contributed to dissatisfaction with reserve management (Table 1). Most fishers know of the reserve, however, very few are able to exactly identify the boundary of the reserve. Responses were evenly spread between fishers that could correctly identify the reserve boundary, to a close approximation (meaning within a couple of geographic points of the actual boundary), incorrectly, and those that could not identify a boundary at all. Although local fishers were well informed about the establishment of the fishery reserve, few considered themselves well informed of fishing regulations in general.

Table 1. Level of User Awareness

Level of User Awareness	Gulf of Castellammare	Egadi Islands
Aware of reserve	97 %	100 %
Correctly identified the boundary	21 %	47 %
Identify boundary to close approximation	29 %	17 %
Identify boundary incorrectly	24 %	13 %
Cannot correctly identify the boundary at all	22 %	23 %
Feel very informed of regulations	12 %	23 %
Feel somewhat informed of regulations	42 %	43 %
Feel not at all informed of regulations	46 %	32 %

In the EIMR, however, the majority of fishers do not consider themselves very informed about general fishing regulations or the boundary of the zones within the reserve, but the majority of fishers claim that they know where the boundaries of the reserve zones are. Those fishers that could identify the reserve and zone boundaries of only their island claim that the area they showed on the map was the entire reserve, excluding the zones around the other islands. A fairly equal distribution of responses was seen when respondents were asked how informed they feel of the regulations governing activity in the reserve.

It is important for fishers to understand where all of the zones of the reserve are and what the associated regulations are for two reasons. First, once one fisher understands the regulations, he can pass that information on to anyone that asks. This might include tourists, fishers from outside of the reserve and recreational fishers. Once they understand the regulations, they can pass the information on

acting as a public education conduit. Second, most fishers indicated they only fish around their island or near their village. If a given fisher eventually gains the technology to fish beyond his island and village, he will need to know the entire reserve and zone boundaries and regulations that apply to other parts of the reserve. In order to accomplish this, educational programs could be developed to help inform the fishers of the regulations so that they understand them properly.

Involvement in Decision Making

Fishers in all three MPAs were asked questions with regards to their opinions on the whether they have been involved in local decision making and if their interests are represented. In the case of the GCFR, almost all fishers believe that reserve management is effective and they have never felt excluded from the decision making process. Local fishing cooperatives have always been involved in reserve management. A different story is seen in the EIMR. Frequently, MPAs and fisheries management practices have failed and become ineffective because they do not include local stakeholders in the decision making process (Russ and Alcala 1999). This has caused emotions of alienation and anger, as was seen in the Florida Keys National Marine Sanctuary (Suman et al. 1999), and decrease compliance, in the Sumilon Reserve in the Philippines (Russ and Alcala 1999). This is the scenario we see in the EIMR.

The most noteworthy problem in the EIMR is that fishers' do not think that they have a say in management decisions or that they are listened to when they talk to the director or the Commune. Commercial fishers, especially from Marettimo, repeatedly claimed that the Ministry and local communes were trying to force them out of a job by taking away the most profitable fishing grounds. They claim they have not seen any benefits from the reserve, even though it has been in effect for almost a decade, and have concluded that the reserve is just another way for the government to control their access to resources. Many fishers also believe that over the years their concerns have been completely ignored by the director and Commune. They believe that any promises the director makes to them are never kept and they feel that all trust has been broken between them and reserve managers. Successful management of reserve waters will only occur when complete trust is restored between all stakeholder groups and the reserve director.

Animosity expressed towards the reserve director and the Commune in the EIMR suggests that stakeholders have not been consulted enough in management decisions. Development of a co-management or community based management program could alleviate this. By involving the local fishers and community in reserve management, they can learn to help others appreciate the fragility of the resources that they depend on. Moreover, if fishers have a say in regulatory design they will be less hostile towards management and try to get others to follow them, thus increasing compliance (Russ and Alcala 1999, and Pomeroy et al. 1997). If locals are not in agreement with the management institution in place, then no one

will follow the law. Those locals that do not agree with the regulations will continue to violate them and the institution in place will be overridden (Jentoft et al. 1998).

Enforcement

In the GCFR, survey questions were asked concerning the adequacy of enforcement and if it should be more severe. Responses showed that 20 - 50 % of fishers in each village believe the trawling ban is not adequately enforced. The majority also feel that enforcement should be increased. These responses reveal that enforcement officials are not properly enforcing the trawling ban and that management officials should reevaluate enforcement practices. However, the Gulf Reserve is unique in that although enforcement seems to be inadequate, illegal trawling seems to be infrequent enough that it does not negate the benefits of the reserve. Although the reserve can already be considered a success due to the support of the local fishers and the overwhelming increase in biomass, 'success' can only improve by up-scaling enforcement.

In the EIMR, the situation is more severe. All fishers see is a lack of enforcement. However, they believe that they will be penalized economically if they follow the law while others do not. The lack of enforcement is one of the main causes of perceived management failure in the reserve for local fishers. Only two vessels are available for patrol in the reserve, one associated with the port authority in Favignana, the other in Marettimo, neither of which is designated solely for reserve patrol. Furthermore, the local port authority and Commune have not designated personnel that are dedicated to reserve enforcement. The reserve is sufficiently large so that two vessels that work only part-time cannot adequately patrol the entirety of the reserve. But although enforcement is clearly not adequate, few fishers suggest that enforcement should be more severe. Understandably, they did not want to criticize enforcement for fear that their response will backfire and enforcement will become more severe towards them.

Following the lack of enforcement and a lack of support by the local community, compliance with the regulations in the EIMR is very low. Illegal fishing is frequently observed. However, many fishers suggested that if the management regime was modified so that illegal trawlers and other illegal activities were stopped through proper enforcement and stricter regulations, they would be in full support of the marine reserve. Because they are left with recurring illegal activities, the fishers are acting instinctively doing whatever it takes to feed their families and make a living, even if it means illegally fishing in the reserve.

In both case studies it is evident that enforcement should be increased to improve the overall 'success' of the reserves and meet management objectives. Without enforcement, compliance will continue to remain low and the expected benefits of the reserves will be difficult if not impossible to achieve. The only case where benefits have been achieved is in the GCFR where fishers have followed regulations enough that an increase in the biomass of local stocks has been successfully reaped.

Performance Measurements

One of the most important aspects of any MPA is determination of success or failure of the management practices. This can take a variety of forms in what we call performance measurements that are unique to each case. Most frequently, such performance measurements are determined *a priori* through previously designed criteria or based on definitions that they have constructed through experience. What they fail to look at is how the 'success' of a protected area is viewed from different perspectives within each case. In order to shed light on true perceptions of success in each of the case studies in this study, fishers were asked questions about their opinions on management effectiveness, perceptions of related impacts and problems they have experienced as a result of an MPA.

Fishers' opinions of reserve management institutions function as an indicator of the effectiveness and overall success of the reserve with regards to the reserve's objective to improve the local fishery. This has been seen in the Apo Island Marine Reserve in the Philippines (Russ and Alcala 1999) and is expected in the Bunaken Manado Tua Marine Park in Indonesia (Alder et al., 1994). By looking at whether fishers see a reserve as effective from the inside, we can begin to develop a true picture of the 'success' of the reserve. Fishers' overall catch can function as an indicator of the health of local stocks. In regards to their opinions about management, fishers in the GCFR were asked questions regarding their general opinion of the success of their reserve, whether their interests are represented, and if the present management scheme is the best way to manage the area. Fishers in the GCFR tended to respond positively to three questions regarding whether the Gulf should be regulated in general, whether they like the trawling ban, and whether they think that the ban should continue. Almost all respondents answered yes to all three. The overwhelmingly positive reaction by fishers is a good indication that the reserve is accepted and supported by the local fishers that are heavily affected by its presence.

Fishers in the EIMR were asked 'Is the reserve a positive thing for the islands?' In the EIMR, Favignana was the only island where the majority of respondents indicated that the reserve is positive (Table 2). Fishers indicated that the reserve is beneficial for the marine environment, increases fish populations, prevents destructive trawling, creates stability, and stops the use of damaging fishing gear. Those fishers in the islands that do not think it is positive think that it has not done anything for the islands, it limits where the fishers can work and extends the distance that the fishers have to go to fish. Some fishers stated that it is saving the sea for future tourism. But the majority indicated that it is not a real reserve because it only prevents trawling activities and limits the amount of work the small-scale fishers can do.

Closely correlated with opinions about management were perceptions about the increase or decrease in the amount of fish they catch as a result of a given reserve. From the artisanal fishers' vantage point, the reserve is only successful to the extent that they benefit personally and as a user group. Fishers tend to be content if they

perceive these benefits. Yet where fishers do not perceive or reap benefits from the MPA, they tend to express negative opinions about the reserve and comment on large negative impacts they have experienced.

Table 2. Is the reserve a positive thing for the islands? As answered in the EIMR.

		Favignana	Levanzo	Marettimo	Overall
Is the reserve a positive thing for the islands?	Yes	83 %	50 %	25 %	50 %
	No	13 %	50 %	75 %	35 %
	Don't know	19 %	0 %	0 %	12 %
Enforcement is adequate	Yes	19 %	0 %	63 %	31 %
	No	75 %	100 %	38 %	65 %
Enforcement should be more severe	Yes	25 %	50 %	0 %	19 %
	No	13 %	0 %	63 %	27 %
	Don't know	56 %	50 %	0 %	31 %
	Didn't Answer	6 %	0 %	38 %	15 %
Interests are represented	Yes	13 %	0 %	13 %	12 %
	No	83 %	100 %	88 %	73 %

In the GCFR, fishers were asked if the amount of fish they catch has changed at all since the creation of the fishery reserve in the Gulf (Table 3). The majority of respondents indicated that the amount of fish they catch has increased at least somewhat. Fishers were also asked if they believed that this variation was due to the ban (Table 4). A notable characteristic of the GCFR is that the small-scale artisanal fishers of each village tend to fish directly in front of their village or to one side. This in turn creates a build-up of biomass in the center of the Gulf because no fish are being caught there. Because the majority of fishers from the villages in the interior indicated that their catch has increased at least some since the creation of the fishery reserve, it seems that the trawling ban has worked to increase their catch.

Conversely, the majority of the fishers from Terrasini reported that their catch has decreased since the creation of the reserve. Although Badalamenti et al (2000) showed that there have been dramatic increases in the harvest of almost every species in the Gulf of Castellammare; the fishers in Terrasini still are not content. If we look at the geographic placement of Terrasini (Figure 1), we see that it is located to the immediate north of the reserve boundary. Traditionally, in the context of no-take marine reserves, those not allowed to participate in the fishery line up on the boundary in order to catch any biomass spillover that may occur. Off the coast of Terrasini, where the reserve boundary crosses the mouth of the Gulf, this scenario occurs often, eliminating any benefit of the marine reserve to the fishers of Terrasini. Often, trawling vessels from Terrasini, Palermo and villages in between come to the eastern edge of the reserve to trawl because fish from within the reserve move across the boundary line (pers. comm. with Fabio Badalamenti 2001). Consequently, fishery resources along the reserve boundary in front of Terrasini are more heavily exploited than in the interior of the Gulf, leaving very little fish for the

artisanal fishers registered in the port of Terrasini. As a result, many have recently stopped fishing activities because they feel that there are no fish left for them.

Table 3. Responses in the Gulf of Castellammare to the question: How has the amount of fish you have caught changed since the trawling ban started?

	San Vito Lo Capo	Castellammare del Golfo	Balestrate	Trapetto	Terrasini	Overall
Increased a lot	15%	32%	67%	10%	10%	27%
Increased some	46%	36%	22%	50%	10%	34%
Not changed	0%	8%	0%	0%	10%	5%
Decreased some	8%	24%	11%	40%	40%	24%
Decreased a lot	0%	0%	0%	0%	20%	3%
Don't know	23%	0%	0%	0%	10%	6%
No response	8%	0%	0%	0%	0%	2%

Table 4. Responses in the Gulf of Castellammare to the question: Is the variation due to the trawling ban?

	San Vito Lo Capo	Castellammare del Golfo	Balestrate	Trapetto	Terrasini	Overall
Yes	54%	64%	100%	80%	30%	64%
No	8%	20%	0%	10%	40%	16%
I don't know	23%	16%	0%	10%	30%	16%

Turning to the EIMR, a similar question was asked: Were your fishing activities affected by the creation of the reserve? Overall, there were an equal number of fishers that indicated that their activities were or were not affected by the reserve. In Favignana, three-quarters of fishers indicated that their fishing activities were not affected by the creation of the reserve (Table 5). Those fishers indicated that they fish more now with the reserve. The affected fishers, however, said that they now have to go farther from the coast to fish and commented that now there are more dolphins in the area that destroy nets while looking for fish. Moreover, they stated that competition has increased between boats in the islands and those that come from mainland Sicily to fish in the reserve.

Table 5. Responses in the Egadi Islands to the question: Were your fishing activities affected by the reserve?

	Favignana	Levanzo	Marettimo	Overall Egadi Islands
Yes	19 %	50 %	100 %	46 %
No	75 %	50 %	0 %	50 %

The number of fishers in the EIMR has decreased dramatically in recent years. For example, within the past two years, at least five fishers from Levanzo have stopped fishing and changed occupations or left the island to find work, leaving only two active fishers left. In Marettimo, fishers have grounded their vessels and changed occupations or they have converted their vessels for the tourism trade. While this has encouraged tourists to visit the islands, which benefits the local economy, it has left fishers very bitter.

Another aspect of the EIMR is that there seems to be no build up of biomass within the reserve. Generally, one of the central objectives of a marine reserve is to augment the growth of local fisheries resources and/or local biodiversity that have been threatened. As seen in the GCFR, fishers generally fish only around their island, meaning that the fishing grounds around Levanzo and Marettimo, where no-take zones exist, have been limited more than those at Favignana. The central complaint is that since the most productive fishing grounds have been taken away, the catch per unit effort (CPUE) has decreased substantially. Fishers are now fishing for the same amount of time, but catching substantially less. In the areas where they are allowed to fish, resources are further being exploited by long distance trawling fleets that illegally work within the reserve and contribute to the overexploitation of the fishery's resources. Because foreign fishing vessels are allowed to fish within the waters of the reserve, the fishing fleet is exhibiting overcapitalization (Fairlie et al, 1995).

A final consideration in determining the level of performance in an MPA is the analysis of the problems and conflicts that local stakeholders perceive to be created by the MPA. A recurrent issue in MPA management is conflict between stakeholders. In many, if not all MPAs, there are conflicts and problems between different resource users in the area and general resistance to the reserve itself.

In the GCFR, fishers identified a number of problems associated with the local fishery and the reserve. Due to differences in dynamics in the structure of each village in the Gulf, fishers in each village identified different problems that were the most important to them. Fishers from all villages indicated that there is a problem with recreational fishers taking resources and filling up the ports and the lack of regulations that apply to them as compared to commercial fishers. Over the past decade, the number of recreational fishers in the Gulf has substantially increased, placing enormous pressure on the fishery resources. This has created enormous animosity and conflict between the commercial and recreational fishers in the area. The other nemesis of the artisanal fishers is the trawling fleet. Trawling vessels are frequently seen illegally fishing inside the Gulf reserve boundaries at night. The purpose of prohibiting trawling in the Gulf was because of its destructive effect on the mid-water and benthic ecosystems and the local fishery. Artisanal fishers are consequently angered that there is not enough enforcement of the 'no trawling' regulation. However, when asked if they would turn in someone that is in violation of the regulations, the majority of fishers claimed that they would not. This conflict is a product of the *legge dell'omertà*, a long standing value of Sicilian culture that says that even if you are aware of something wrong that another has done, you may not divulge that information without retaliation from the Mafia if the illegal activity was done by an associate of the Mafia, of whom there are reputed to be many in Sicily. With this problem, fishery management can become ineffective simply because of the fishers themselves: the illegal fishers as well as the ones unwilling to speak about the illegal activities of their friends. In order to by-pass this situation, the management regime for the GCFR should step up enforcement so that individual fishers are not put in the position of having to decide whether to turn someone in. In the EIMR, fishers identified a number of similar problems. These include poor enforcement of the law, the continued presence of trawling vessels, fishing for juveniles, decrease in earnings due to bad weather, and decreasing amounts of fish throughout the reserve. Most fishers indicated that they have a big problem with recreational fishers and the absence of local fish markets. Fishers in Levanzo indicated that their biggest problem is the poor quality of the port. Those in Favignana indicated that trawling still exists, and that they must travel further from land to fish now. Many also stated that there are no problems. Most Marettimo fishers claimed that there is nowhere for them to fish anymore or that the amount of fish they catch has diminished substantially.

In the EIMR, there are many more recreational fishers located in each port than there are commercial fishers. As discussed above, commercial fishers feel that there are not as many regulations for recreational fishers and more and more recreational fishers have been claiming space in the ports, consequently squeezing the artisanal fishers into smaller areas of the port. By combining the abundance of recreational and artisanal fishers and illegal trawlers, without proper management and increased enforcement within the reserve, the central objectives of the reserve management plan to protect local biodiversity and augment local fisheries are not being met. This

is undoubtedly contributing to the overexploitation of local fish stocks.

Finally, fishers noted the presence of outside fishing fleets. These vessels are mainly long-distance trawlers from Trapani, Marsala and Palermo. Very few trawlers that actively fish in the EIMR are officially registered in the Egadi Islands. Due to the lack of enforcement within the reserve, these trawling vessels are constantly seen in violation of the regulations. On many occasions, trawlers will come within 300 m of the shoreline consequently interfering with dive sites and destroying fishing gear set by artisanal fishers (pers. obs.). Moreover, not only has trawling been shown to damage the benthic ecosystem (Dayton et al. 1995, Jennings et al. 2001), but it acts as a dangerous hazard to fishing gear and divers. The port authority has not stopped all of the trawlers from entering zones A, B and C. This could be the cause of decreasing fish catch for local fishers.

CONCLUSION AND POLICY RECOMMENDATIONS

In general, marine reserves have had varied success. The success of a reserve is often determined *a priori* through criteria that are determined through previous experience and natural resource management theory (e.g. increased stock biomass, economic efficiency, etc) (Russ and Alcala 1999, Scovazzi 1999, Chiappone and Sealy 1998). What is often missed is whether resource users internal to the reserve believe it is a success. Marine reserves commonly are termed paper parks because stakeholders do not follow regulations and the area that was to be protected is as disturbed and overexploited as before the reserve was instated, in some cases even more so (Bohnsack 1993).

The two case studies presented here show different scenarios that exist for MPAs. The first, the Gulf of Castellammare Fishery Reserve, is demonstrative of a reserve that is widely supported and accepted by fishers, scientists and managers, where all groups believe that the reserve is helping the local fishery and biological studies show enormous increases in biomass. Second, the Egadi Islands Marine Reserve represents a situation where neither the management staff nor the fishers believe that the reserve is successful, but both support it and believe that it would be good for the islands if managed properly.

While both reserves are at different stages in working towards true functionality, interviews indicated that each could benefit from four common modifications to current management strategies. First of all, communication in both reserves has not been sufficient enough to inform resource users of reserve boundaries and regulations. A new line of communication must be created to effectively disseminate this information, theoretically resulting in increased compliance as fishers would be able to better identify the boundaries of where they are allowed to fish.

Second, managers must increase involvement of local communities in the decision making process. This is more the case in the EIMR where stakeholders feel completely isolated from reserve management; however, relations between

stakeholder groups in the GCFR could also be improved through increased involvement. Marine resource managers must recognize that the development of community based or co-management programs can dramatically increase the successfulness of marine reserves through improved compliance and increased support of the reserve by user groups. Resource users frequently do not understand why certain regulations are needed and, when stakeholders are not included in management development, they become agitated and angry towards reserve managers. Fishers, especially, can provide invaluable information to the management process and can share responsibility and authority to promote effective fisheries and reserve management. In the process they become much more supportive. As representatives of the fishing community, fishers' cooperatives in each of the reserves in this study could take on this collaborative role consequently improving their working relationship with managers. Furthermore, managers need to recognize the need to educate the local community about the importance of their resources. By developing a common interest in reaching the objectives of the reserve, the local community can become enthusiastic about the reserve, help others appreciate the environment more and increase compliance with non-fishing regulations.

Third, increasing enforcement in the GCFR and EIMR should decrease the number of violations because resource users will fear being caught. Consequently, compliance will increase and the objectives of the reserve will come closer to being met. In the case of the Egadi Islands, the existing management institution and enforcement regime are inadequate to deal with the special management needs of the area. With the multiplicity of city governments and agencies that management has at one time or another been delegated to, successful management has been ignored and virtually no enforcement exists. By increasing enforcement, especially to catch illegal trawlers, the majority of fishers would view the reserve much more positively and trawling, the most detrimental activity occurring in the reserve would be substantially decreased. To a lesser extent, the same would be true in the Gulf of Castellammare.

Finally, a commonly agreed definition of 'success' must be created and additional performance measurements must be designed and tested in each reserve to verify the overall success of each reserve. The present study showed that overall fishers' catch increased in the GCFR as a result of the reserve, but that fishing activities have generally been negatively impacted by the EIMR. In addition, conflicts exist between resource users in both MPAs, specifically with the trawling fleet, recreational fishers and outside fishing fleets. However, more information is needed in order to determine the true success of these protected areas. This could take the form of ongoing monitoring and in-depth research into the individual definitions of success and relevant measures of success given by different stakeholder group associated with each reserve.

These management institutions, however, will never be perfect unless all scientific information is known about the ecosystems that they seek to protect.

While much research has been done to characterize the environment in the Gulf of Castellammare and determine the reserve's overall success, very little has been done in the Egadi Islands. Scientists and managers must recognize the need for such biological research as well as socio-economic research characterizing the impact of regulations and the reserve on local environment and communities.

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