Coastal Resource Use, Management, and Marine Protected Areas in the Philippines

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Abstract

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This analysis of coastal resource perceptions and behaviors demonstrates that while there are documented successes throughout the Philippines in community-based integrated coastal management projects, opportunities and challenges remain to fully realize the benefits identified by local communities. Using survey data from 40 communities in Bohol, Luzon, Mindoro Occidental, and Mindoro Oriental, marine conservation perceptions and behaviors were evaluated. Coastal resource users were found to perceive resource problems such as a decline in fish and feel that management and conservation are the responsibility of the government. *Barangays* (villages) with a community-based marine protected area (MPA) are more likely to support restrictions on fishing activity, report fishing violations, and be a member of *bantay dagat* (sea guards). Awareness of MPAs in three island provinces was high (70%) with fishing and seaweed farming households having the highest level of awareness. Overall, resource users perceive MPAs as being beneficial and are willing to protect larger marine areas. Their acceptance is complementary to increasing efforts of scaling up marine reserve areas, especially

where MPAs are small. Community participation in marine protected area activities and management in the study sites, recognized as a critical factor in the success of community-based management, is low. This study suggests that given the high community acceptance and perceived benefits of marine protected areas, there is an opportunity to implement more effective management and scale up to ecological and social networks of MPAs. Community-based coastal resource management should involve participatory processes that take into account local needs and expectations, build capacity, and empower community members to manage their resources.

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Finally, thank you to all of the gracious people that welcomed us into their communities and made our work memorable in the many municipalities and *barangays* we visited.

INTRODUCTION

This study examines the role of coastal resource management perceptions and behaviors in a tropical developing country context. Ocean and coastal resources provide substantial ecosystem goods and services including food security and livelihoods for millions of people around the world (MEA 2005, FAO 2005). Declining fish catches in some parts of the world and a high dependence on these resources has led to an active field of research and projects supported by academic institutions, international nongovernmental organizations (NGOs) and foundations, international aid organizations, and others. The growing impact on the world's marine ecosystems has led to increasing concern and support for marine conservation initiatives (Halpern 2008, Toropova et al. 2010). Global initiatives have focused on implementing marine protected areas (MPAs) to protect ocean ecosystems and habitat. At the regional and local level MPAs are used as a tool to protect or recover local fish populations and coral reef habitat. In the Philippines, integrated coastal management (ICM) initiatives and community-based marine protected areas have been implemented to manage marine resources.

While MPA research has focused mainly on biological goals and criteria, recent social science research has investigated factors that lead to successful MPAs and institutional and governance arrangements for scaling up MPAs. Community-level social dynamics and people's perceptions and behaviors related to coastal resource management are commonly excluded. Understanding community perceptions and support for marine management objectives provides a context for implementing management activities. This analysis focuses on people's perceptions of the marine environment and coastal management efforts, specifically marine protected areas and scaling up.

Marine Protected Areas

Community-based MPAs have been used to address problems of declines in fisheries and the destruction of coral reefs (Alcala and Russ 2006, White et al. 2002). The first MPAs were established in the Philippines in the 1970s, two of the best known being the MPAs at Sumilon and Apo Islands (Alcala and Russ 2006). MPAs are defined as "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical, and cultural features, which has been reserved by law or other effective means to protect part of or all of the enclosed environment" (IUCN 1988: 105).

Currently there are more than 1,000 MPAs nationwide. They vary by type and level of protection. In a sanctuary, extractive uses are prohibited and these small no-take areas commonly range in size from 10 to 100 hectares. No-take areas are surrounded or buffered by "traditional fishing reserves" with gear type restrictions. This type of MPA is usually established through a community-based or co-management process (Lowry et al. 2009). Community-based management is a "bottom-up" approach that involves empowerment of the local community to manage their resources. As described in Christie and White (1997: 159), it "usually involves environmental education, an assessment of the coastal environment by specialists and locals, and the development of a coastal resource management plan as a joint effort between local people and outside experts." Co-management is defined by Berkes (2009: 1692) as the "sharing of power and responsibility between the government and local resource users." In practice co-management integrates top-down and bottom-up approaches and a "central element of co-management is the empowerment of the community of local resource users (e.g., fishers) by enabling them to participate, control and influence institutional decisions affecting their lives" (Maliao et al. 2009: 818).

Scaling Up Marine Protected Areas

In the Philippine context, there is a growing body of research examining the feasibility of scaling up management of marine protected areas to include larger areas and link communities managing MPAs (Christie et al. 2009a, Christie et al. 2009b, Lowry et al. 2009, Pietri et al. 2009). Marine protected area networks are:

> A collection of individual marine protected areas or reserves operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels that are designed to meet objectives that a single reserve cannot achieve. An MPA network is also a network of people managing the components of individual MPAs and promoting the network's viability and longevity. (IUCN 2008, 12)

This research on MPA networks focuses on institutional and governance capacities of management from the village to national levels. Less research has been done at the local level to determine individual and household perceptions concerning the implementation and expansion of coastal resource management such as MPAs.

The international conservation community set a goal of increasing the coverage of protected areas to 10% of the world's coastal and marine areas by 2020 (UN CBD 2010). Currently, about 1% of the world's oceans are protected as no-take areas. While international targets for MPAs exist, implementation of these goals at the local level needs to be inclusive of resource users and their dependence on ecosystem goods and services (Christie et al. 2009b).

Community acceptance and support have been found to be integral to the success of community-based MPA management (Christie 2004, Oracion et al. 2005, Pietri et al. 2009). Christie and Pollnac (2011) describe successful MPAs as including the following factors:

> (1) empowerment of community members; (2) compliance with MPA rules; (3) maintenance of a set of MPA attributes (e.g., marker buoys, guard house, community sign boards); (4) perceived increased marine resources; and (5) directly observed improved biological conditions.

The question of scaling up and networking protected areas is an important one because many community-based MPAs in the Philippines are small (10-100 hectares) and may be ineffective at providing fundamental benefits valued by the community or provide limited protection to associated ecosystems or fish (Lowry et al. 2009). A better understanding of community receptiveness to scaling up marine protected areas can help tailor management interventions to local community needs.

Study Area Context

The Philippine Archipelago

The 7,100 islands that make up the Philippine archipelago extend over an area of 1,000 miles with a total coastline stretching 33,900 km (24,233 mi), making it one of the longest in the world (Burke et al. 2002, McCoy 2003). Located within the Pacific Ocean and the Coral Triangle, which is the epicenter of marine biodiversity, the islands are home to more than 103 million people with 62% of the population living in coastal areas (defined as within 1 km of shoreline at high tide) (Armada et al. 2009, Carpenter and Springer 2005, CIA 2012, DENR et al. 2001). About 1 million artisanal fishers depend directly on ocean resources for their livelihoods and fish is the main source of protein for most residents (World Bank 2006). Recent fisheries declines, threatened coral reefs, poverty, and rapid population growth threaten the long-term sustainability and resilience of coastal communities (White et al. 2007).

The coral reefs of the Philippines have a high diversity of species including 915 species of fish and 400 species of scleractinian coral (Burke et al. 2002). The archipelago is also a center of endemism, with many marine species being found nowhere else on Earth (Carpenter and Springer 2005). Other key ecosystems include seagrass beds and mangrove communities which protect the islands from storms and provide habitat for critical fisheries. The North Equatorial

Current in the Pacific circulates warm water westward. It divides upon reaching the Philippines, into the southward flowing Mindanao Current and the northward flowing Kuroshio Current (Qu et al. 1998). Warm water, abundant sunlight, and low sediment loads contribute to optimal conditions for coral reef ecosystems to thrive (World Bank 2006).

Coral reef and mangrove ecosystems provide habitat for many organisms, including nurseries and feeding sites for many of the region's commercial fish species, refuges from storms, and recreation and aesthetic value (Cesar et al. 2003, Farley et al. 2009, World Bank 2005). Estimated annual economic net benefits of coral reef ecosystem goods and services (direct and indirect use values) for the Philippines and Indonesia are: $2.2 billion from fisheries, $782 million from coastal protection, and $258 million from tourism (Burke et al. 2011).

Coral reefs and mangrove communities in the Philippines are in a highly degraded state (World Bank 2005). A study assessing coral reef condition found that less than 1% of reefs are in excellent condition (over 75% live coral cover) and 41% are in poor condition (less than 25% live coral cover) (Nanola et al. 2006). Mangrove communities have little systematic protection and have been removed for coastal development (human settlement and aquaculture). Since the early 1900s an estimated 300,000 hectares of mangroves, one-third of the original area, have been lost. There is evidence that mangrove cover for the nation is now stable, but most mangrove forests are second growth (White and de Leon 2004).

Well-Being, Poverty, and Population Growth

Economic and social factors such as poverty and a history of colonization play an important role in resource use and management. The long colonial history of the Philippines has led to institutional dependence as well as political and economic inequities (Christie 2005a). Poverty is a driver of overfishing since people depend directly on this resource for daily survival.

Poverty can have cascading effects on well-being; as more time is spent on daily survival, less is spent on education and other opportunities (Chapin et al. 2009). At current levels of fish consumption, increases in demand for fish from a growing population, (approximately 1.9% annually), place a greater burden on an already taxed system (CIA 2012, World Bank 2005).

Fisheries Practices, Management, and Governance

The Philippines ranks 9th in world fish production with marine and inland capture fisheries estimated at 2.6 million tons in 2008 (FAO 2010). Yields from commercial and artisanal fishing began to decline in the 1990s (World Bank 2006). Historically fishing has provided the main source of livelihood for Filipinos, and artisanal fishers comprise 70% of the one million fishers nationwide (World Bank 2006). Destructive fishing practices, such as using explosives and cyanide, have provided short-term income for fishers, but have created long-term ecological and social consequences (World Bank 2005). Open-access fishing regimes, poverty and population growth are causing declines in fisheries yields and a declining catch per unit effort. Open-access regimes are a principal driver of ecosystem degradation and fisheries collapse (Christie et al. 2007, Green et al. 2003, World Bank 2006). In open-access fisheries, fishers are free to fish anywhere except where no-take areas have been established, and beyond some gear restrictions, there is no effective management of fishing effort or yield (Lowry et al. 2009). The Local Government Code (LGC) and the Philippine Fisheries Code shape fisheries policy and jurisdictions. Since 1991 with the passage of the Local Government Code, coastal resource management authority was devolved to the municipal level (White et al. 2006). Under the LGC and reaffirmed by the Fisheries Code of 1998, jurisdiction of municipal waters (from the shoreline out to 15 kilometers offshore) lies with municipal governments (Republic Act 8550). Commercial fishing in this zone without a permit from the municipal government is

illegal (Lowry et al. 2005, World Bank 2006). While a decentralized governance system has supported the proliferation of community-based and municipal-level projects, the threat of illegal fishing lingers due to lax enforcement (World Bank 2006).

METHODS

Study Design

This study is part of a broader research project on integrated population, health, and environment (PHE) programs led by the PATH Foundation Philippines (PFPI), the Coastal Resources Center at the University of Rhode Island, and Conservation International with funding from the United States Agency for International Development (USAID). The primary objective was to collect baseline data in "new project sites" and "maintenance project sites" in Bohol, Luzon, Occidental Mindoro, and Oriental Mindoro. Maintenance sites are those which have been involved in previous PHE projects. New sites are *barangays* (smallest political unit in the Philippines roughly equivalent to a village) that have been targeted for PHE project implementation. PHE projects are ongoing and are implemented by in-country NGOs with support and coordination from PFPI. Past PHE activities varied between sites, but the overall strategy was to build local capacity for reproductive health and coastal resource management initiatives. Data were used to evaluate the effectiveness of past projects at maintenance sites and to provide baseline information at the new sites to guide future projects (D'Agnes 2009).

This study analyzes a subset of the data collected to gain a better understanding of community resource use and perceptions. Support for community-based marine protected areas and scaling up to MPA networks was analyzed. The aim of this study is to address the need for a better understanding of coastal resource users' and community leaders' perceptions of marine resources and management.

Data Collection

Two independent samples were taken from a list of 297 project sites (Figure 1). These sites are located in the Danajon Bank region of Bohol, and the Verde Island Passage region of Batangas, Luzon, Occidental Mindoro, and Oriental Mindoro.

Structured survey interviews were administered to each of the following: (1) community members, (2) *barangay* leaders, (3) *Barangay* Fishery and Aquatic Resource Management Council (BFARMC) members, and (4) municipal officers. Surveys were conducted in 21 municipalities and 40 *barangays* over a period of 3 months from July-October 2011. All surveys were administered in face-to-face interviews by a team of four Filipino enumerators in the local dialect, either Cebuano or Tagalog.

Within each *barangay*, structured survey interviews were administered to at least 40 community members. *Barangay* leaders, and BFARMC members were also interviewed in each of the 40 *barangays*. For the community member surveys, 20 women and 20 men were interviewed. The distribution of the sample is based on the occurrence of multiple sample sites within each municipality (Table 1). At each site, respondents were chosen using convenience sampling (Henry 1990). Surveys covered household information, general health and reproductive health questions, perceptions of resource changes, knowledge of and involvement in marine protected areas, opinions on issues related to population and the environment, and coastal resource perceptions and behaviors.

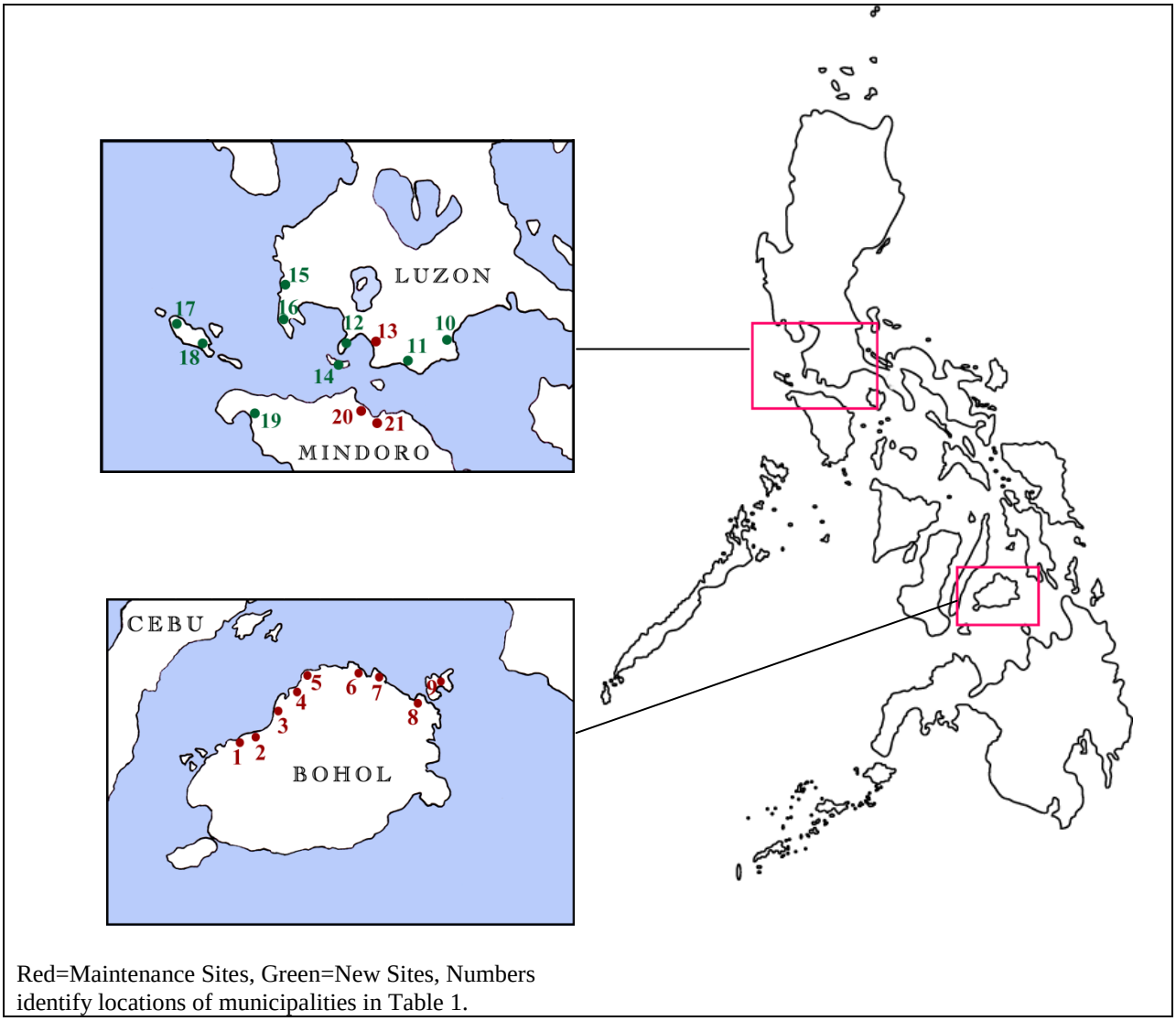

Figure 1. Location of municipalities in the sample.

Table 1. Distribution of sample by municipality.	
MUNICIPALITY	**TOTAL**
Bohol	
1 Tubigon	82
2 Clarin	40
3 Inabanga	81
4 Buenavista	81
5 Getafe	80
6 Talibon	80
7 Bien Unido	81
8 Ubay	80
9 Carlos P. Garcia	80
Batangas	
10 San Juan	120
11 Lobo	120
12 Mabini	40
13 Batangas City	40
14 Tingloy	80
15 Nasugbu	120
16 Calatagan	120
Occidental Mindoro	
17 Lubang	80
18 Looc	40
19 Palauan	80
Oriental Mindoro	
20 San Teodoro	40
21 Baco	40
Total	1605

Structured survey interviews were also conducted with *barangay* leaders (Table 2). Information gathered covered a wide range of topics including *barangay* demographic information, MPA management, illegal fishing, tourism, reproductive health, community involvement, community conflict, and climate change. Due to the extensive information collected, one survey was administered to a group of leaders in each *barangay* usually consisting of the *barangay* captain, councilors, secretary, and *barangay* health specialist.

A third survey was administered to a coastal management committee member, usually a BFARMC member (Table 2). This survey focused on coastal resource management activities and community involvement.

A fourth survey was given to three municipal officers or staff in each municipality: the Municipal Health Officer (MHO), the Municipal Agricultural Officer (MAO), and the Municipal Environment and Natural Resources Officer (MENRO) (Table 2). Interviews were conducted face-to-face using a survey tailored to their position. Surveys were focused on PHE project activities and coordination between the municipal officers. Surveys for the MAO and MENRO also included a section on observed long-term patterns of climate change and environmental impacts. For this study, only information collected from community members and *barangay* leaders was analyzed and results are reported below.

Table 2. Distribution of sample by respondent.

Respondent	**Total**
Barangay leaders	40
BFARMC	40
MAO	21
MHO	21
MENRO	21

Data Analysis

This analysis uses a quantitative approach to assess survey data from individuals and *barangay* leaders in the sample. Data were analyzed using standard statistical software (SYSTAT). Variables from survey questions were chosen, and results were averaged over all *barangays*. Chi-square tests were used to analyze the relationship between MPA presence or absence and coastal resource management variables. A t-test was used to compare means of selected socioeconomic variables and MPA awareness.

ANALYSIS & DISCUSSION

Demographic and Socioeconomic Characteristics of the Sample

Barangay population varied greatly with a range of 630 to 14,000 people (Table 3). The average age of respondents was 43 years; they had an average of 7.2 years of education and lived in households with an average of 5.2 people.

The material style of life scale has been used to measure household wealth as an alternative to income (Pollnac and Crawford 2000). The distribution of material wealth, measured by presence and absence of household structural items, sanitary facilities and other items such as computers and cell phones is shown in Table 4. Categories are not mutually exclusive. Over half of the residents live in a house with cement walls (52%), a majority (71%) have tin roofs and half (50%) have cement floors.

Perceived change in income through time was analyzed from community member surveys. This was assessed using a 14 point ladder-like scale in which respondents were asked to describe both level of income and condition of the resource today and five years ago (Appendix 1). Perceived changes are based on the difference between today and five years ago with negative values representing a perceived decrease in the variable through time. Overall, 75% of respondents indicated that their income had decreased in the last 5 years. A majority of respondents (79%) also indicated that resource abundance, measured in amount of fish, had declined in the last 5 years (Tables 5 and 6). These perceived changes, although small, could influence other environmental perceptions and behaviors. Perceived change in income gives an indication of household well-being and the socioeconomic conditions under which people are living. Rather than an absolute measure of income, the ladder scale asks respondents to report their perceptions on how this factor has changed through time (Pollnac and Crawford 2000).

Table 3. Total population and presence of MPAs at sample sites.					
SITE	**PROVINCE**	**MUNICIPALITY**	***BARANGAY***	**POPULATION**	**MPA**
1	Bohol	Tubigon	Matabao	1242	No
2			Mocaboc Island	630	No
3		Clarin	Bonbon	1705	Yes
4		Inabanga	Cagawasan	1397	Yes
5			Tungod	1107	No
6		Buenavista	Bato	721	No
7			Cruz	1062	No
8		Getafe	Jandayan Norte	967	Yes
9			Alumar	938	Yes
10		Talibon	Guindacpan	2569	Yes
11			San Isidro	3343	No
12		Bien Unido	Pinamgo	2409	Yes
13			Bilangbilangan Diot	846	Yes
14		Ubay	Humay-Humay	2090	Yes
15			Tipolo	2652	Yes
16		Carlos P. Garcia	Aguining	2398	Yes
17			Lapinig Island	1057	Yes
18	Batangas	San Juan	Calubcub II	3228	No
19			Bataan	1880	Yes
20			Laiya aplaya	5577	Yes
21		Lobo	Sawang	2280	Yes
22			Lagadlarin	2226	No
23			Balibago	3081	No
24		Mabini	Anilao Proper	3000	No
25		Batangas City	San Agapito IV	1846	Yes
26		Tingloy	San Isidro	1700	No
27			San Pedro	605	No
28		Nasugbu	Papaya	2543	Yes
29			Pantalan	3700	No
30			Wawa	14000	No
31		Calatagan	Bucal	959	No
32			Baha	1730	No
33			Talibayog	1626	Yes
34	Occidental Mindoro	Lubang	Ninikat ng Pag-asa	504	No
35			Maligaya	1068	No
36		Looc	Kanluran (Poblacion)	1053	Yes
37		Palauan	Barangay 6	747	No
38			Barangay 4	497	No
39	Oriental Mindoro	San Teodoro	Poblacion	1929	No
40		Baco	Putican	520	No

Table 4. Distribution of material wealth over entire sample area.

Material Possessions	Distribution	Material Possessions	Distribution
Walls		Wooden	12.8%
Cement	52.2%	Tile	5.7%
Wood	40.8%	***Sanitary facilities***	
Bamboo	35.6%	Water piped to home	33.1%
Salvage House	2.3%	Indoor toilet	63.9%
Tin	1.5%	***Miscellaneous***	
Window		Chairs	78.7%
Wood shutter	53.7%	Electricity	77.4%
Glass	28.8%	Cell phone	62.2%
Open	26.7%	Television	57.1%
Nipa	0.6%	Radio	52.2%
Roof		Benches	47.2%
Tin	71.9%	Display cabinet	39.8%
Nipa	35.6%	Cupboard	37.0%
Wood	5.8%	Living room set	27.7%
Tile	3.1%	Refrigerator	24.4%
Floor		Modern stove	17.7%
Cement	50.1%	Computer	6.8%
Dirt	16.0%	Generator	3.5%

Table 5. Perceived income and marine resource abundance 5 years ago and today.

Variable	N	Mean	Standard Deviation
Income Past	1,605	4.5	2.5
Income Today	1,605	4.4	2.5
Resource Past	1,601	6.1	3.3
Resource Today	1,602	5.2	3.3

Table 6. Perceived changes in income and marine resource abundance over past 5 years.

Variable	N	Mean
Income Change	1,605	-0.134
Resource Change	1,601	-0.902

Coastal Resource Management Perceptions and Behaviors

Marine Environment and Governance

It is essential to understand community perceptions of coastal resource management institutions and governance because local ownership and involvement have been found to be central to successful management (Christie et al. 2009b, White et al. 2002, White et al. 2006). Respondents were asked a series of questions about their perceptions of the marine environment and governance evaluated on a 1-5 Likert Scale. Results showing the percentages of responses for each of the statements are shown in Table 7. Almost 95% of respondents agreed or strongly agreed with the statement "Mangrove forests can provide protection against the effects of strong currents and big waves." About 90% of respondents disagreed or strongly disagreed with the statement "If we throw our garbage on the beach, the ocean takes it away and causes no harm." More than 75% of respondents agreed or strongly agreed with the statement "There has been a decline in fish availability in this *barangay* over the past few years." And, about 70% of respondents disagreed or strongly disagreed with the statement "Our community is helpless in protecting the environment." Slightly more than 50% of respondents disagreed or strongly disagreed with the statement "Only the government is responsible for conservation."

Table 7. Perceptions of coastal resources, management, and governance.

Opinion Statement	Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
Mangrove forests can provide protection against the effects of strong currents & big waves	47.3	47.3	1.4	3.7	0.2
If we throw our garbage on the beach, the ocean takes it away and causes no harm	1.4	7.7	0.7	47.2	43.0
There has been a decline in fish availability in this *barangay* over the past few years	24.0	52.0	2.6	19.9	1.5
Our community is helpless in protecting the environment	2.7	25.0	1.9	58.4	12.0
Only the government is responsible for conservation	4.5	37.4	0.9	44.6	12.6

Overall, respondents perceive the importance of mangroves in protecting the coasts of the islands where they live. They also perceive garbage as a problem that is not washed away by the waves on their beaches. This may explain the high participation in community beach clean-ups (68% of community members). Only 30% of respondents thought that their community is helpless in protecting the environment, and less than half reported that only the government is responsible for conservation. Thus, there are some community members who do not feel empowered to protect and manage their resources and perceive the government as the sole provider of coastal management as a service. The finding that almost half of all respondents feel that only the government is responsible for conservation is noteworthy because it may be a major challenge for the successful implementation of community-based management.

Coastal Resource Use and Management

Community Members

Respondents were asked a number of coastal resource use, management, and enforcement questions (Appendix 2). Analysis of respondents' perceptions and behaviors is shown in Figure 2. More than 50% of respondents reported that they support MPAs, pick up garbage on the beach, have knowledge of the law regarding reporting illegal fishing practices, tell their kin to register with the government to fish, participate in community clean ups, and support limits on the number of fishers. While a high percentage (85%) reported they were aware of local laws to report illegal fishing practices, only 10% said they have reported violations (Table 8).

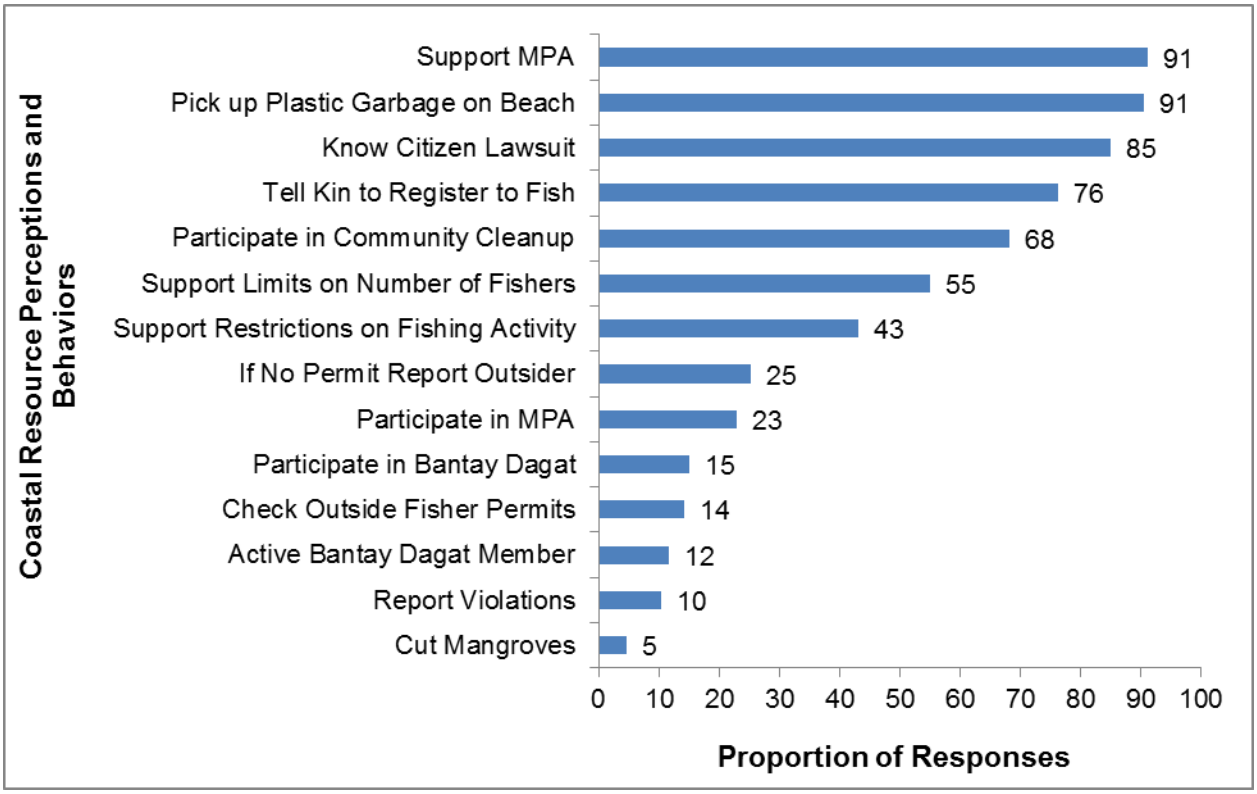

Figure 2. Community members' responses to coastal resource management questions.

Table 8. Awareness of illegal fishing practices.		
Variable	**N**	**Percentage**
Cyanide	1603	25.4%
Dynamite	1603	27.5%
Commercial fishing in municipal waters	1605	21.9%
Building fish pond without permit	1590	5.7%

Understanding current community coastal resource management perceptions and behaviors can aid in management initiatives. As described in Launio et al., when people "have a high cognizance and appreciation of the value of marine resources, they are more likely to act in support of marine conservation initiatives" (2010: 403). This study shows that a majority of respondents support MPAs and associated restrictions such as limiting fishing effort, while few participate in enforcement activities. Enforcement of fisheries and MPA rules in the Philippines is recognized as a challenge to successful management and one that was confirmed by participants in this study (Aswani and Christie et al. 2012).

Community Leaders

Marine protected area management questions were asked of *barangay* officials in the 40 sample villages (Appendix 3). For communities with MPAs, officials were asked if there was a management committee, if *barangay* officials were members of the committee, and if the MPA provided benefits to the community (Figure 3). Of the 18 communities with MPAs, 71% have an MPA management committee and 89% have *barangay* officials on the management committee. Overall, 83% of *barangay* officials feel that the MPA benefits the community. They were asked to name as many different benefits as they thought were relevant to their MPA. The maximum number of distinct benefits accrued by any community was four. Benefits were ranked based on

the number of times they were mentioned as a benefit. The top ranking MPA benefits were improves income and protects and/or increases fish (56%).

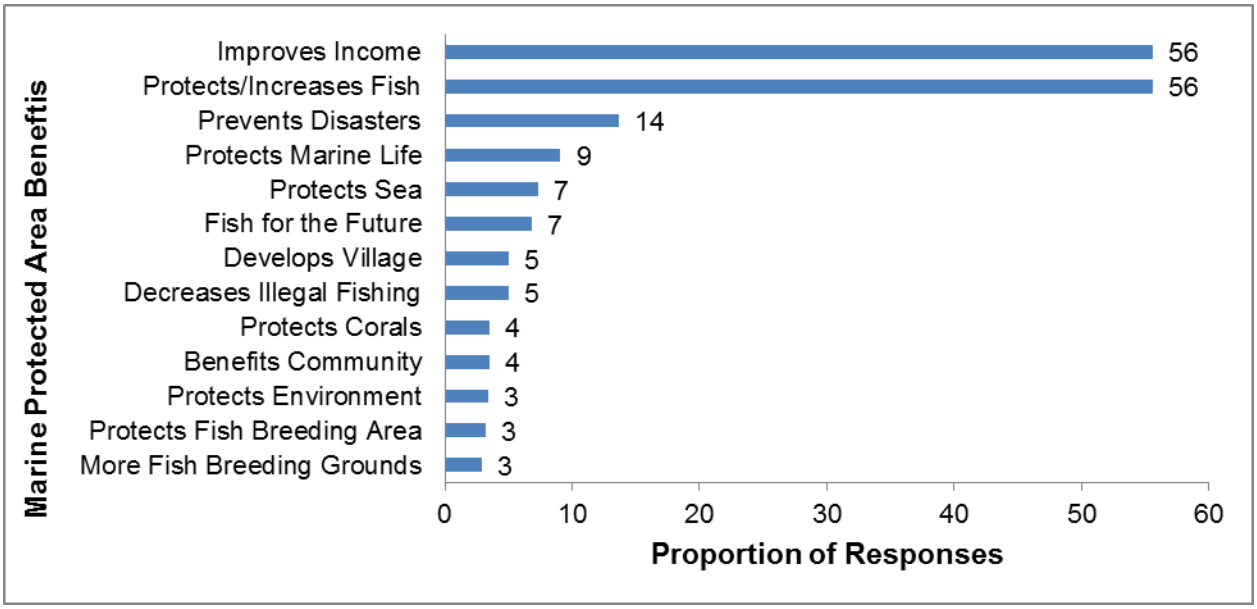

Figure 3. Community benefits of MPAs given by *barangay* officials.

Community Awareness of MPAs

Respondents were asked a series of questions to assess MPA awareness. Overall, 70% of the respondents with a marine protected area in their community were aware of it. Only 23% claimed that they were involved in MPA activities. Relationships between socioeconomic variables and awareness were analyzed and include gender, age, education level, and household size (Table 9). None of the relationships were statistically significant except household size (t-test, $p<0.01$) with larger households having a greater awareness of an MPA in the area. Larger households may have been more aware of the MPAs because there are more people to relay information to the household.

Table 9. Relationships between MPA awareness and selected socioeconomic variables.						
Variable	**Aware**	**N**	**Mean**	**Standard Deviation**	**t-value**	**p-value**
Age	No	214	43.7	14.1	1.046	0.296
	Yes	508	42.6	12.8		
Education	No	213	6.3	4.2	-0.633	0.507
	Yes	508	6.5	3.5		
Household Size*	No	214	4.9	2.1	-2.766	0.006
	Yes	508	5.4	2.3		
*=p<0.01 based on t-test						

Awareness of MPAs by Occupation

An analysis was performed to determine if household occupations were correlated with MPA awareness. More than 75% of respondents with fishing as a primary or secondary household occupation (χ^2=14.198, df=1, p<0.001), and 100% of seaweed farmers (χ^2=30.600, df=1, p<0.001) were aware of MPAs in the area. Also, about 70% of *barangay* employees were aware of an MPA in the area.

MPA awareness was high in the sample *barangays* which is similar to the findings of Launio et al. (2010). They found that 80% of fishers were aware of MPAs in northern Luzon. In the sample sites, it is not surprising that seaweed farmers were aware of the MPA since in at least one of the areas with seaweed farming, *Barangay* Alumar, seaweed was grown in the MPA. Fishers are also commonly involved in marine management activities and fishers' organizations are often the management committee for the MPA, as was the case in *Barangay* Tipolo. Similarly, *barangay* employees such as the *barangay* captain (village head) and councilors are frequently involved in MPA management activities.

Influence of MPAs on Perceptions and Behaviors

Coastal resource management (CRM) perceptions and behaviors were analyzed based on the presence or absence of a marine protected area in the community (Table 10). Respondents from villages with MPAs were more likely to report the use of illegal fishing methods in their community, participate in *bantay dagat*, check to see if an outsider has a permit to fish in the community, and cut mangroves ($p<0.001$). Respondents from villages without an MPA were more likely to support restrictions on fishing activity, although there was only about a 7% difference ($p<0.01$). In villages with MPAs there are already restrictions on fishing so community members may be less likely to support further restrictions.

Table 10. CRM perceptions and behaviors in communities with and without MPAs.

Variable	MPA	N	Percentage	Phi	P-Value
Support Restrictions on Fishing Activity*	Yes	720	39.4	-0.067	0.007
	No	882	46.1		
Report Violations*	Yes	722	14.4	0.118	0.000
	No	883	7.1		
Participate in *Bantay Dagat**	Yes	722	19.5	0.114	0.000
	No	880	11.3		
Active *Bantay Dagat* Member*	Yes	721	14.6	0.080	0.001
	No	883	9.4		
Tell Kin to Register to Fish	Yes	718	79.1	0.063	0.041
	No	880	73.9		
Check Outside Fisher Permits*	Yes	721	18.3	0.104	0.000
	No	883	11.0		
Cut Mangroves*	Yes	722	7.1	0.106	0.000
	No	883	2.6		

Chi-square tests, df=1, *$p<0.001$

Support for enforcement in MPA villages may be related to the fact that community members with MPAs are more aware of the problems caused by illegal fishing and have established enforcement measures such as *bantay dagat* patrols. Coastal resource management activities such as MPAs implemented by NGOs and local governments or national agencies, such

as the Bureau of Fisheries and Aquatic Resources (BFAR), include Information, Education, and Communication (IEC) campaigns which are considered integral to the success of community-based MPAs (FISH Project 2010, Lowry et al. 2009, Pietri et al. 2009). This greater awareness and concern could be linked to awareness and education programs in villages with coastal resource management activities. MPAs might have a positive learning impact on communities by raising awareness about coastal resource issues and building capacity for local management (Fox et al. 2012).

Marine Protected Area Perceptions

Openness to Scaling Up MPAs

Respondents in villages with MPAs were asked if they would support creating more MPAs or making the existing MPA larger (Figure 4). 85% of respondents answered "yes" to creating more or larger MPAs and their reasons were coded into 13 categories of higher frequency responses (>2.5%). Respondents identified ecological outcomes as well as socioeconomic and governance outcomes. The top 8 reasons given accounted for more than 90% of the responses. The most frequently identified response was protecting or increasing fish. Other ecological responses included protecting marine life and coral, protecting the sea and the environment, and protecting and increasing fish breeding areas. Governance and socioeconomic responses included decreasing illegal fishing, improving income, benefitting the community, developing the village, providing fish for the future, and preventing coastal disasters. These responses are similar to ecological and socioeconomic effects of MPAs documented by Pomeroy et al. (2004), Russ and Alcala (2011), and Walmsley and White (2003).

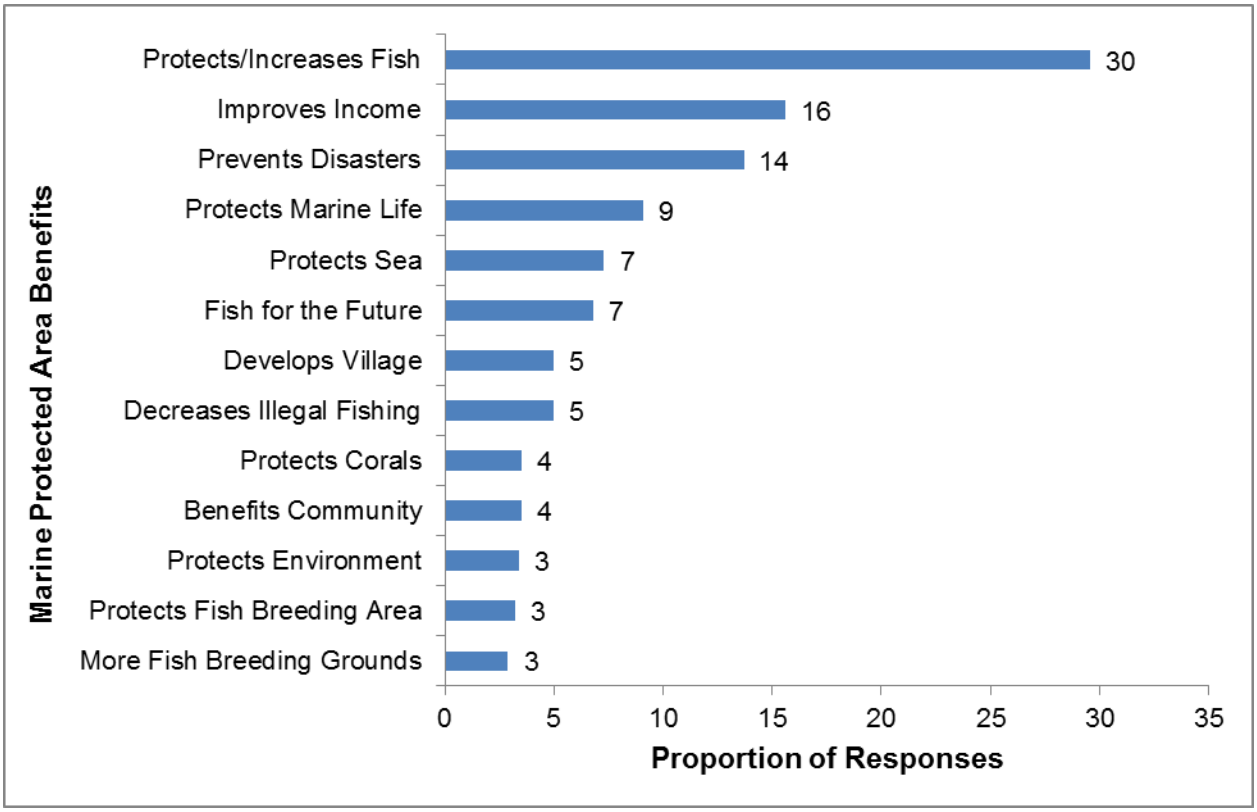

Figure 4. Percent distribution of reasons for supporting the scale up of MPAs.

Openness to Establishing New Marine Protected Areas

Respondents in the 22 communities without marine protected areas were asked if they would support the establishment of an MPA (Figure 5). Almost 90% of respondents would support creating one in their community and identified potential benefits. Benefits were coded into 10 categories of higher frequency responses (>2.5%). More than 30% of respondents gave protecting or increasing fish as the reason for establishing an MPA, which is similar to the responses given for scaling up. Respondents who did not support scaling up or creating new MPAs identified reasons such as loss of income/livelihoods, poor management of the current MPA, does not increase fish, unequal benefits within the community, and allowing fishing by people outside the village.

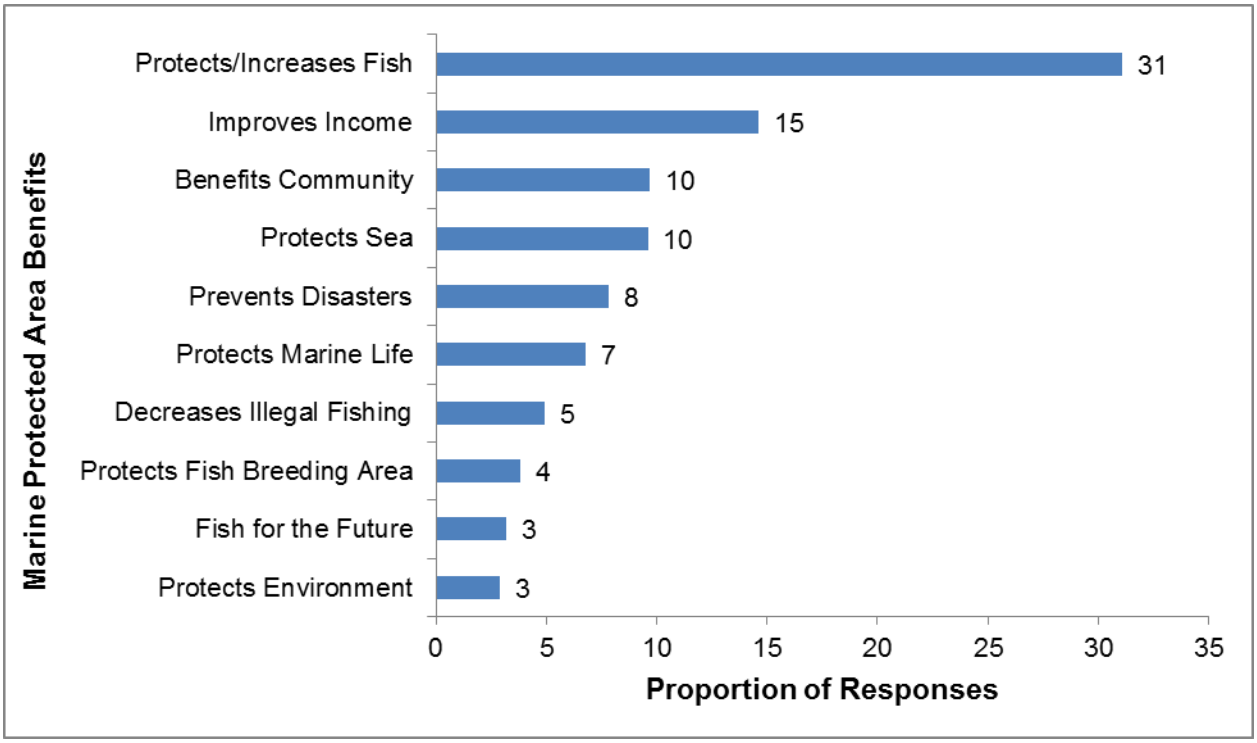

Figure 5. Percent distribution of reasons for supporting establishment of an MPA.

Barangay officials from the 22 communities without MPAs were asked if they want one in their village and to identify reasons why. A majority of leaders (68%) said they would like to establish an MPA and some gave up to five different benefits of MPAs. The number of times a benefit was given was counted and the highest frequency answers are shown in Table 11. Reasons given for not supporting MPAs were based on restrictions they impose on the community and included restricting fishing, causing a loss of livelihoods, and restricting the planting of the *Nipa* palm.

Table 11. Ranking of top reasons for creating an MPA given by *barangay* officials.	
Benefit	**Count**
Increases Fish and Coral	10
Improves Income	8
Increases Fish Breeding Grounds	5
Control Illegal Fishing	5
Attracts Tourists	3
For Future Generations	3
Environment Protection	2
Protects the Sea	2

A majority of respondents across the four provinces sampled support MPAs as a coastal resource management tool. Potential benefits identified include ecological, socioeconomic, and governance outcomes. These responses offer insights into local perceptions and expectations of MPAs. In other areas where fishers have accepted MPAs, particularly in northern Luzon, a majority of fishers agreed that MPAs were needed to preserve the environment and 80% recognized their economic benefits (Launio et al. 2010).

Receptiveness to the creation and expansion of MPAs could be based on the long history of community-based coastal management initiatives in the Philippines. White et al. (2006: 288) describe the evolution and spread of Integrated Coastal Management (ICM) in the Philippines since the 1970's and state that "support for development of ICM is rooted in the tangible benefits that are accruing to local stakeholder communities and local governments alike such as enhanced fisheries, revenues from user fees and improved coastal environmental quality, among others." MPA success stories have also played a part in increasing their acceptance. MPA establishment is part of broader resource management programs that develop through time and are commonly facilitated by national and international NGOs (White et al. 2002). This process often involves community organizing, education, and training to build capacity to manage resources within the community (Christie 2005b, Christie et al. 2009b, Pietri et al. 2009, White et al. 2006).

There is growing support in the marine conservation community for scaling up small MPAs to cover larger areas through expansion and networking. Networks can increase ecological connectivity as well provide socioeconomic benefits to communities. This study suggests that local communities support scaling up MPAs, and emphasizes that the opportunity is ripe for advancing coastal management in the Philippines.

CONCLUSION

Community perceptions of coastal resources and management provide valuable insights into the opportunities and challenges of resource sustainability and protection. In this study, conducted in 4 provinces in the Philippines, there was overall support for creating and expanding marine protected areas. There is a general acceptance of MPAs for providing community benefits of increased fish and income. Overall MPA awareness is high, which is encouraging for expanding coastal resource management in the Philippines. Based on these observations and the growing effort to expand and network MPAs, it appears that the time is ripe for scaling up marine management, however, challenges still exist.

To build on community receptiveness to scaling up MPAs, practitioners should look to lessons learned and research on factors that influence MPA effectiveness (Christie and Pollnac 2012, White et al. 2006). To increase the likelihood of success for scaling up projects it is necessary for current MPAs to be functional, so efforts to increase management effectiveness are suggested. To meet ecological and social goals, management activities that increase MPA size and networking MPAs should take into account local community perceptions, awareness, and social capacity.

A challenge in all community-based projects is to build social capacity (local human and institutional capacity) to manage resources. Building local awareness through stakeholder education is necessary to build community ownership and empowerment. Strong local participation and influence over the planning and implementation process is essential to MPA success and sustainability. Thus, local context and community needs should shape coastal resource management initiatives. With community support for increased MPA coverage, coastal

communities may be able to maximize the ecological and social benefits of enhanced fisheries management and biodiversity conservation.

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Appendix 1. Ladder diagram questions concerning change in income and resource condition.

Income
[1] You have no income whatsoever and don't have enough money to buy food or shelter.

[15] You are rich. You have enough money to buy whatever you want or need.

[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15]

Condition of resource
[1] There are little or no fish in the sea. One can go out fishing for days and catch nothing.

[15] There are so many fish in the sea that a fisherman can go out fishing for a very short time and fill his boat with the fish he wants.

[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15]

Appendix 2. Questions concerning coastal resource management behaviors.

1. Would you support regulations limiting the number of fishermen allowed to fish in municipal waters? Yes [1] No [0]
2. Would you support regulations restricting fishing?
Yes [1] No [0]
3. Have you ever heard of someone using illegal fishing methods or coastal activities in this community? If yes, which of the below? Yes [1] No [0]
   cyanide
   dynamite fishing
   commercial fishing in municipal waters
   fish pond development without a permit
   cutting healthy mangrove areas
3. Have you ever reported someone using illegal fishing methods or coastal activities?
Yes [1] No [0]
4. Have you ever participated in *bantay dagat* patrols? Yes [1] No [0]
5. Are you an active member of *bantay dagat*? Yes [1] No [0]
6. If you have a relative from another municipality who wants to fish here, would you tell him to register? Yes [1] No [0]
7. Do you check to see if municipal fishermen from other communities have a permit to fish in your waters? Yes [1] No [0]
8. If the non-local fisherman did not have a permit, would you report him to the *bantay dagat*? Yes [1] No [0]
9. Did you know that Philippine law allows a citizen to file a lawsuit against illegal fishermen? Yes [1] No [0]
10. Do you cut mangroves? Yes [1] No [0]
11. Would you support development of an MPA (if none) or more or larger MPAs (if there is one)? Yes [1] No [0]
12. Have you participated in a coastal clean-up? Yes [1] No [0]
13. Do you pick-up and properly dispose of plastic garbage you see on the beach or in front of your house? Yes [1] No [0]

Appendix 3. Questions for *barangay* officials on MPA management.

1. Is there a sanctuary management committee? Yes [1] No [0]

2. Are there members of the sanctuary management committee that are also *barangay* officials (e.g., *Barangay* Councilors, *Barangay* Captain, *Tanods*)? Yes [1] No [0]

3. Has your *barangay* benefited economically from the sanctuary project activities? Yes [1] No [0]

4. If yes, from which activities? (Please list and describe in what way they benefited).

Appendix 4. Questions concerning MPA awareness and receptivity to scaling up.

1. Are you aware if there is a fish, mangrove or sea grass sanctuary/reserve in this area? Yes [1] No [0]

2. Would you support development of an MPA (if none) or more or larger MPAs (if there is one)? Yes [1] No [0] Why or why not?