Journal of Environmental Science and Management 22-1: 1-12 (June 2019) ISSN 0119-1144

The Perceived Benefits of Marine Protected Areas by Fishers in Batangas, Philippines

ABSTRACT

The study investigated the perceptions of fishers on the relationships between catch, fish sizes and the attitudes of fishers towards marine protected areas (MPA) along the coasts of coasts of selected municipalities of Batanagas Province in the Philippines, their benefits, their benefits to fisheries, and the attitudes of local fishers towards MPAs. Data and information from a select group of 209 fisher respondents from the selected MPAs that represented young MPAs (0-5 years since establishment), moderate (10-15 years since establishment) and old MPAs (more than 20 years since establishment). young, moderate and old MPAs. The catches and fish sizes reportedly dropped after MPA establishment at locations with young, moderate and old MPAs. Nevertheless, attitudes of fishers towards MPAs were positive especially at locations with long-established MPAs. Tourism-based livelihoods accounted for the positive attitude of fishers towards MPAs at the young and old MPA sites where tourism was better developed. At least 65% of the respondents from the young MPA and 35% of the respondents from the old MPA sites were engaged in tourism-related activities.

Key words: *marine protected areas, local perception*

Badi R. Samaniego[1*]
Carmelita M. Rebancos[1]

[1] School of Environmental Science and Management, University of the Philippines Los Baños, College, Laguna, Philippines 4031

*Corresponding author:
badisamaniego@yahoo.com

INTRODUCTION

Properly managed managed marine protected areas (MPAs) can can support biodiversity conservation and fisheries management (*Alcala and Russ 2006*). The conservation and management of marine biodiversity and ecosystems are important because these natural renewable resources support millions of people (*Alcala and Russ 2006*). In the Philippines, reef fisheries support over a million small-scale fishers who depend on coral reef fisheries for their livelihood, contributing close to US$1 B annually to the economy (*White et al. 2000*). A more recent study estimated that a conservative value of about US$ 966.6 billion can be contributed by our marine ecosystems to the national economy (Azanza et al, 2017).

One reason MPAs have enjoyed popular support is due to their ability to deliver financial benefits to local communities through enhanced tourism (*White et al. 2002*). Despite the increase in the numbers of MPAs locally, most are merely official declarations wanting in implementation (*Licuanan and Gomez 2000*). Others suggest that only 10% of about 500 MPAs are effectively managed (*Aliño et al. 2000; Alcala 2001; Christie and White 2007*).

It is not only important to understand the biophysical conditions that determine system structure and processes, but also to appreciate and understand the social and economic conditions, contexts, and motivations that are associated with the use of MPAs (*Orbach and Johnson 1989; Renard 1991; White et al. 1994 as cited in Bunce et al. 1999*). Managers should recognize the importance of understanding the people who depend on coral reefs, including the social and economic conditions, and motivations associated with reef use (*Bunce et al. 2000*). It has been suggested that social factors rather than biological or physical variables, largely determine the success or failure of MPAs (*Kelleher and Recchia 1998; McClanahan 1999 as cited in Mascia 2003*).

Common issues among MPA sites in the country are those related to tourism activities. Issues such as tourism activities (anchor damage and poor diver behavior), fishing or poaching (commercial fishing in municipal waters, cyanide), pollution, coastal development, bleaching and mass predation events are some issues identified (*SEMP 2004; MPDO – Mabini 2009; MPDO – San Juan 2009; MPDO – Bauan 2014; MPDO – Lobo 2014*). As focused in this current study, Batangas is situated at the southwestern Batangas is situated at the southwestern edge of Luzon. It is bordered by the provinces of Cavite in the north, and Laguna and Quezon

in the east, and by the Verde Island Passage in the south (*CIT-CFF 2013*). Its coastline is about 366 km with 13 coastal municipalities. It has about 2,727 ha of coral reefs and and the current municipal fisheries dominate its capture municipal fisheries dominate its capture fisheries with small pelagic species comprising most of the catch composition. Batangas is one of several popular diving destinations in the country. It boasts a total of 42 MPAs, 22 of which are within the study area from the Municipalities of San Luis through San Juan (http://www.batangas.gov.ph). The study area also lies along the Verde Island Passage Corridor, recently considered as the center of the center of marine diversity (*Carpenter and Springer 2005*). These add to the value of understanding the effects of MPAs on the biological and socio-economic conditions and dynamics in the area.

An estimate of when and how the biological and social benefits of MPAs may be realized is important in strengthening the support of local stakeholders in establishing, monitoring and upholding marine protected areas in their locality. It enables managers to develop practical livelihood strategies and envision realistic expectations. An integrated and holistic approach to marine resources conservation, with focus on the biological and social dimensions of resource conservation holds, a higher potential for success. Hence, this study aimed to explore the relationships between enhancements in fish communities within MPAs of different ages, the benefits that fishers receive, and how these influence their attitude towards MPA.

MATERIALS AND METHODS

The study was conducted at Batangas, Verde Island Passage, Philippines (**Figure 1**). This region is identified as the center of the center of marine shore fishes biodiversity (*Carpenter and Springer 2005*). It is a critical marine corridor that facilitates exchange and migration of species and nutrients across corridor waters (*PAWB-DENR 2009*).

Interviews with fishers were conducted in San Luis, Mabini, Lobo and San Juan (**Figure 1**) from the municipalities of San Juan June to August 2014 using structured questionnaires. These municipalities were the locations of the benthic and fish communities within MPAs under three age-categories surveyed prior to this study. The MPA age-categories were arbitrarily selected based on the range of ages of MPAs at the study site. No ecological or biological factors were used to categorize the selected MPAs. Data obtained from respondents from San Luis and San Juan were considered to represent information that pertain to areas with newly established MPAs (i.e., young MPAs of 1-5 years since their declaration). Respondents from Lobo were considered to represent fishers from locations with moderate-aged MPAs (10-15 years since establishment). Respondents

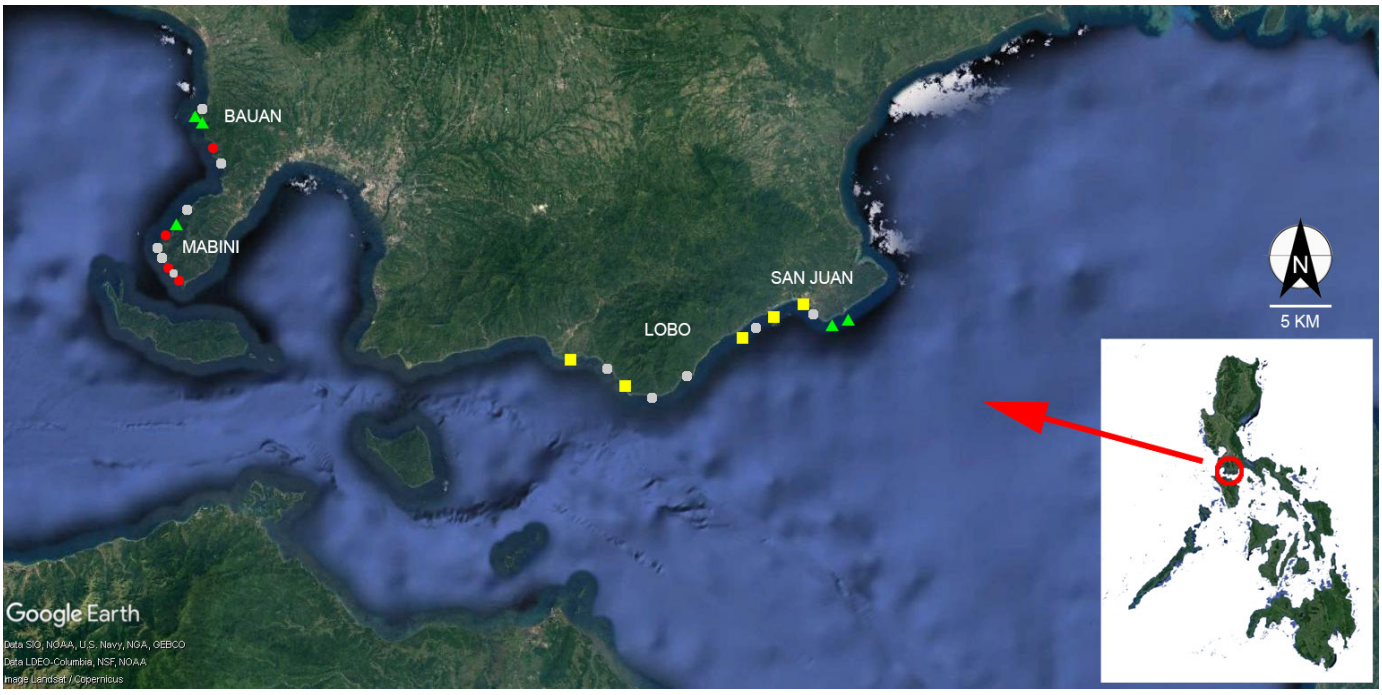

Figure 1. Location map of the 25 coral reef survey sites, Batangas, Verde Island Passage (2014). Color codes: red circle = Old-age MPA; yellow square = Moderate-age MPA; green triangle = Young-age MPA; grey circle = control sites.

from Mabini represented areas with Old MPAs (over 20 years of protection). San Luis was a fourth class municipality (PhP 25 to 34.9 M annual income), Lobo is a third class municipality (35 to 44.9M annual income), while Mabini and San Juan were considered to be first class municipalities (>55M). Although answers to some questions were qualitative in nature (ranking, Likert scale), quantitative data were obtained whenever possible. Information on fisheries and fishers perceptions used in the analyses were obtained from a select set of respondents. Respondents were selected to best represent reef fishers and to capture data pertinent to coral reef MPAs. The perceived changes in the catch and quality of catch by the respondents were measured in terms of the changes in the estimated volume of their catch (kg) and the lengths (cm) of the fish they caught, respectively.

The survey instrument was developed based on initial interviews with local fishers and government representatives during a previous study by the first author on MPAs in the area. Information on fishing practices and catch profiles were gleaned from the informal interviews. During the conduct of this study, much support was given by the Municipal Government of Lobo, San Juan and San Luis. Volunteer enumerators from these government units assisted in the conduct of the interviews. In Mabini, hired enumerators administered the questionnaire. In all cases, the focused-group discussion were conducted with the enumerators prior to the conduct of the interviews in order to standardize their understanding of the instrument.

Complete enumeration of the target respondents was conducted. Criteria for selecting respondents were:location of fishing grounds; fishing gear used-hand-lines, small-scale gill nets, and spear guns; species caught - reef fish (groupers, snappers, breams, etc.); and age of respondent (older than MPAs). Fishers from 20 barangays in the four municipalities were interviewed. The total number of municipal fishers in the study areas of San Luis-San Juan, Lobo and Mabini was 1,609 (1,129 in San Luis-San Juan, 200 in Lobo and 280 in Mabini). The sample size was limited to the number of fishers who specialized in reef fishing with the use of hook and line, spear, and gill nets. Three hundred twenty-eight (328) fishers were interviewed, and information obtained from 209 respondents representing 13% of the municipal fishers were considered for the analyses based on the pre-set criteria. This still constituted majority of the respondents at each of the locations: 54% of the respondents at San Juan, 66% at San Luis, 64% at Lobo, and 70% at Mabini. Information on catch rates and perceptions were summarized for each location.

RESULTS AND DISCUSSION

Socio-demographic Characteristics of Fishers

Only 2% (n = 5) of the total interviewed respondents were females and the majority (98%) were males (**Table 1**). The ages of the respondents ranged from 24 to 77 years old. Forty percent of the respondents had between 1-3 children, and 32% had between 4-6 children (**Table 1**). Eighty-five percent of the respondents used hook and line as their primary fishing method while the rest of the respondents used gill nets and a single individual used spear gun. About 9% of the fishers used a combination of hook and line and gill nets (**Table 1**). The reported catch rates ranged from 0.5 to 50 kg.

Alternative sources of income of the respondents were varied that could be arbitrarily arbitrarily categorized into six major groups: business, employment, farming, government service, skilled workers, and tourism-related activities (**Table 1**). Forty-eight percent of the respondents depended on farming as their alternative income source. Many of these farmers were from Lobo, some were from San Luis, and a few were from San Juan and Mabini. Employment was the second most common alternative source of income reported (10% of respondents), followed by skilled workers and tourism-related sources of income (8% each). Business enterprises and government services were the least common income source with only about 3% and 2% of the respondents, respectively.

The very high prevalence of farming as a secondary income source in Lobo may indicate the scarcity of other income generating opportunities. Its tourism industry is only beginning to develop and the variety and number of related industries will likely build up in the future. There were relatively few respondents who were engaged in tourism-related income generating projects at Mabini and San Juan, despite a well-developed tourism industry in these two municipalities.

MPA Impacts on Fishers' Catch

Based on the information obtained from all the respondents interviewed, the marine species caught varied greatly. Finfish species included pelagic or reef-associated species (i.e., tuna, mackerel, fusilier), primary or coral reef fish (i.e., groupers, snappers, breams, threadfins, parrotfish, surgeonfish, rabbitfish, jacks), secondary or low-value reef fish (i.e., butterflyfish, damselfish, lizardfish, cardinalfish), and non-bony fish such as squid and octopus. Only data on primary reef fish were considered in the analyses as these species were of

Table 1. Socio-economic characteristics of respondents from San Juan, San Luis, Lobo and Mabini, Batangas, Verde Island Passage (2014).

	Attributes	Total interviews	Total used	Remarks
Respondents		328	209	
Gender	male	323	205	
	female	5	4	
Marital Status	married	326	208	
	single	2	1	
Number of Children	0 Children	1	1	
	1-3 Children	133	84	
	4-6 Children	103	67	
	7-9 Children	18	9	
	>10 Children	7	3	
	no answer	66	45	
Fishing Gear	hook and line	264	178	
	gill net	23	11	
	spear gun	2	1	
	combination	37	19	
Catch Rate		0.5 - 120	0.5 - 50	
Other Income Sources	1. business (computer shop, poultry production, fish vendor, buy and sell)	7	7	4 Mabini, 1 San Luis, 1 Lobo
	2. employment in private enterprises (laborer, caretaker, helper, contruction worker, cargo, factory worker)	44	21	4 Mabini, 6 San Luis, 2 Lobo, 9 San Juan
	3. farming (coconut, kaingin, charcoal production)	133	101	3 Mabini, 21 San Luis, 71 Lobo, 6 San Juan
	4. gov't service (bantay dagat, brgy councilor, brgy police, brgy tanod)	9	5	
	5. skilled worker (boat maker, carpenter, maghahayuma, electrician, painter, utility worker, welder)	38	17	all municipalities
	6. tourism related (boatman, resort staff, dive master, guide, lifeguard)	29	17	6 Mabini, 5 San Luis, 6 San Juan
	no answer	68	42	

high value and were often the main target of reef fishers in the area. Groupers and snappers in the market can fetch prices up to PhP 450 to 600 (10 to 13 US$), while the prices of jacks can reach PhP 340 to 400 (8 to 9 US$). Furthermore, since the MPAs in the study were established mainly in coral reef areas, these coral reef fish species may particularly reflect the potential effects of protective management such as increased abundance and fish sizes. The mean total seasonal catch rates of fishers before the establishment of young MPAs (San Luis and San Juan) were from 0.5 to 70 kg season^{-1} with a mean of 8.5 kg; moderate MPAs (Lobo) with 3-100 kg and a mean of 38 kg; and old MPAs (Mabini) from 1-10 kg and a mean of 4.2 kg season^{-1}. High catch of 25-70 kg in Young MPAs were from gill nets and a combination of net and hook and line gear. Species caught included groupers, snappers, goatfish, emperors and jacks. Low catches of less 0.5 kg to less than 20 kg were all from hook and line. The majority of the fishers in moderate MPAs that reported the highest catches (50-100 kg) used hook and line with a few combined with gill nets. The catches included groupers, snappers, jacks, goatfish, emperor, rabbitfish, parrotfish, threadfin breams and wrasses. Low catches of less than 50 kg were from Hook and line and spear fishers. At Old MPAs (Mabini), only hook and line was reportedly used. High catches at Old MPAs (5-10 kg) included groupers, snappers, jacks, and threadfin breams. Low catches of less than 5 kg included emperor, parrotfish, surgeonfish on top of the four already mentioned.

The volume of catch reported by the respondents

decreased after the establishment of marine protected areas compared to prior to their establishment across all the MPA age categories, regardless whether young, moderate or old MPAs. Catch rates varied widely among respondents from the three MPA age categories and were expressed as the average catch of each fisher on a seasonal basis of six months (kg mo^{-1} $fisher^{-1}$). Fishing effort also varied greatly with some respondents fishing two to five days a week. Respondents generally reported "moderate" (about 25-30 kg) catches that deteriorated to "poor" (about 1-2 kg) or "very poor" (about 0-1 kg) after the establishment of MPAs. The majority of the respondents across the three MPA age categories indicated that their catches were "moderate" before the establishment of MPAs. Forty-five percent of the respondents in Mabini, 60% in Lobo and 70% in San Juan-San Luis reported this. Perceptions of "poor" or "very poor" and "high" (about 30 kg) or "very high" (about >30 kg) catches priorto MPA establishment in San Juan-San Luis were low. In Lobo, 35% of the respondents felt that their catches were "high" before MPAs establishment (**Figure 2**). In contrast, only 8% of the respondents in Mabini thought that their catches were "high". Instead, about 48% of the respondents in Mabini (13% "very poor" and 35% "poor") thought that their catches were below moderate levels.

Negative changes in the perceptions of catches of the respondents were reported after the establishment of MPAs in their respective localities. Overall, more respondents reported that their catches decreased after the establishment of MPAs. This agrees with the findings of *Samonte et al.* (*2016*) claiming that fishers' incomes decreased one to three years after the establishment of MPAs. They added that the fishers' incomes appeared to improve over time but did not reach initial estimates from their study after five years. In this study, however, catch rates did not appear to recover even after 20 years since MPAs were

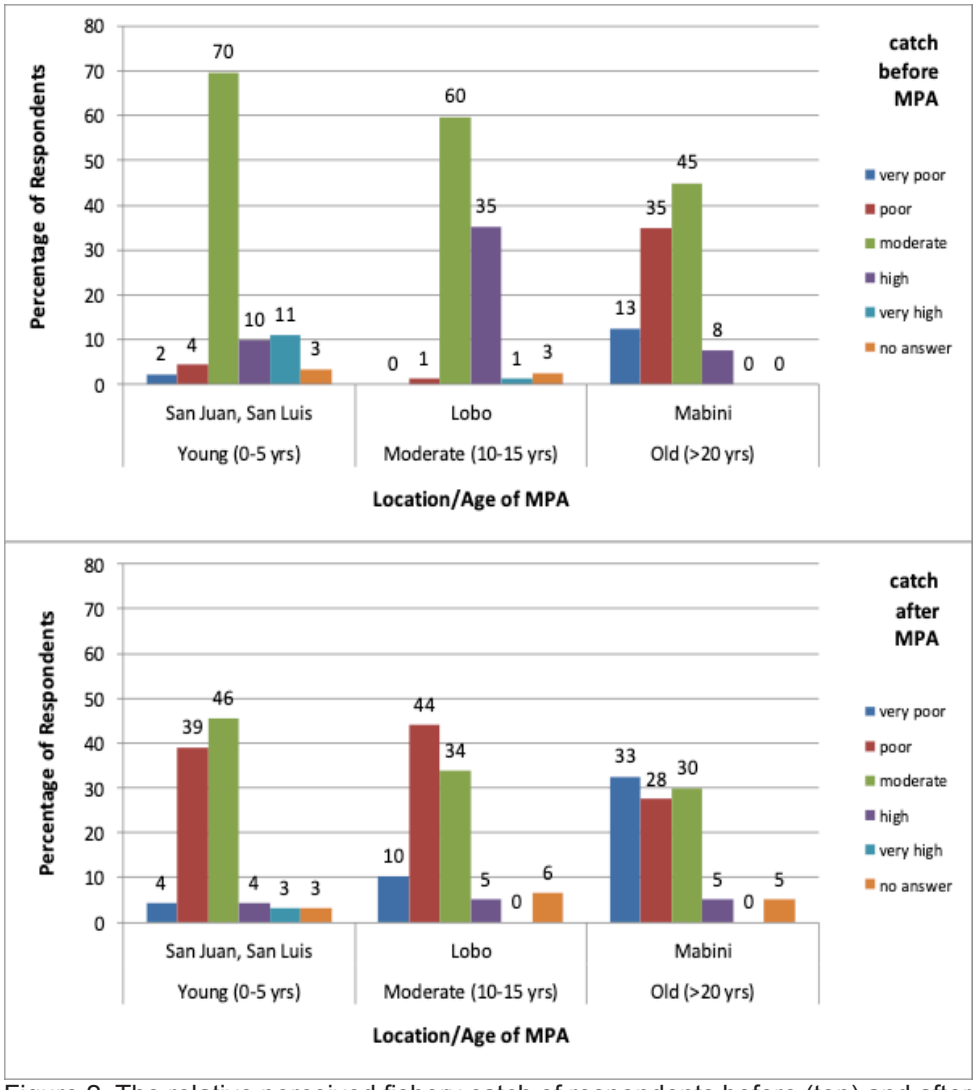

Figure 2. The relative perceived fishery catch of respondents before (top) and after (bottom) the establishment of marine protected areas at San Juan-San Luis, Lobo and Mabini, Batangas, Verde Island Passage (2014).

established. In San Juan-San Luis, respondents that reported "moderate" catches dropped from 70% to 46% after MPAs establishment, while those that reported "poor" catch increased from only 4% before MPAs to 39% after MPAs (**Figure 2**). The same patterns were observed in Lobo (Moderate MPAs) where the relative number of respondents that reported "moderate" catches before MPA establishment dropped from 60% to 34% after MPAs were created, and those that reported "good" catches decreased from 35% to only 5%. Respondents who thought catches were "poor" increased from only 1% before the MPAs to 44% after MPAs. In Mabini, a similar trend emerged but to a lesser degree of magnitude. The number of respondents that reported "moderate" catches decreased from 45% to 30%. Although those that reported "poor" catches decreased from 35% to 28% after MPA establishment, the relative number of respondents that felt that catches became "very poor" after MPA establishment increased from 13% to 33% (**Figure 2**).

Fishes caught that were reported by the respondents included reef fish species such as groupers, snappers, breams, jacks, parrotfish, rabbitfish, emperors, wrasses, and goatfish (**Figure 3**). The fish sizes reported by the respondents were not species-specific but were rather generalized average sizes caught. As with the volume of fish caught, the reported sizes of fish that the respondents caught were also smaller after MPA establishment. The majority of the respondents from the three municipal groups indicated that the sizes of fish they caught were "moderate" (c. 40-60 cm): 45% of the respondents each from San Juan-San Luis and Mabini, and 69% of the respondents in Lobo. Many of the respondents in the young MPAs (27% in San Juan-San Luis) and old MPA (38% Mabini) reported "small" fish sizes (c. 20-40 cm). Only 20% in the Young and 13% in the old MPA localities reported that the fish caught before MPA establishment were "large" (c. 60-75 cm). In contrast to this pattern, there were a greaternumber of respondents (27%) at Lobo or the moderate MPA locality who reported that they caught "large" fish while only 4% reported catching "small"-sized fish. The patterns in the perceived sizes of fish caught by the respondents from the three localities did not change very greatly after MPAs were created. Catches of "moderate"-sized fish were still prevalent in all locations. However, there were increases in the number of respondents who reported catching "small" fish across locations, and with some respondents even reporting "very small" (c. 10-20 cm) fish sizes. The number of respondents who reportedly caught "large" fish in Lobo and Mabini decreased considerably after the establishment of MPAs.

Related to the perceive changes in the volume of catch (**Figure 2**) and the sizes of fish caught (**Figure 3**) before and after MPA establishment, inquiries into the perceptions of the fishers of the directions of changes in the catch were also conducted. Fishers' perceptions onchanges in their catch were rated with a scale of 1-2-3-4-5: "1" was "highly decreased", "3" was "moderate", and "5" was "highly increased". In general, the perceived changes in their catches agreed with their reports of less volume and smaller sizes of fish caught. Majority of the respondents across the locations indicated that their catches either "slightly decreased" or "highly decreased" (**Figure 4**). Forty-five percent and 62% of the respondents in the young MPA locality of San Juan-San Luis, and the moderate MPA locality of Lobo reported that their catches "slightly decreased", and 30% at San Juan-San Luis and 28% at Mabini reported that their catches "highly decreased". At Lobo and Mabini, a good number of the respondents also indicated that their catches did not change even when MPAs were established. Positive changes in catch were mostly only found by respondents from San Juan-San Luis (10%), and Mabini (8%).

Fishers' Attitude Towards MPAs

Overall, there was high positive attitude towards MPAs at the locations where moderate and old MPAs were established (Lobo and Mabini, respectively). In general, the locals supported MPAs by complying with the no fishing policies within MPAs. In contrast, the respondents in areas where young MPAs were divided and unsure. In the young MPA locality (San Juan-San Luis), 46% of the respondents were neutral and did not have any negative or positive opinion about MPAs. The remaining respondents were evenly distributed among those that agreed and those that did not agree with the MPAs. In Lobo, where moderate-aged MPAs were mostly found, there was a positive attitude towards MPAs. Seventy-four percent of the respondents "highly agree" with the establishment of MPAs and 18% indicated that they "slightly agree". Only 7% of the respondents reported that they were either neutral, "slightly disagreed" or "highly disagreed" with MPA establishment in Lobo. The remarkable support MPA establishment experienced from the respondents in Lobo was surprising especially since majority of the respondents reported negative changes in their fisheries catches after MPAs were declared (**Figure 4**), with less volume (**Figure 2**) and smaller sizes (**Figure 3**) of fish caught. In Mabini where the Old MPAs were situated, majority of the respondents also supported the MPAs with 38% of the respondents indicating that they "highly agree" and 20% "agree" with the MPAs (**Figure 5**). However, it was also at this

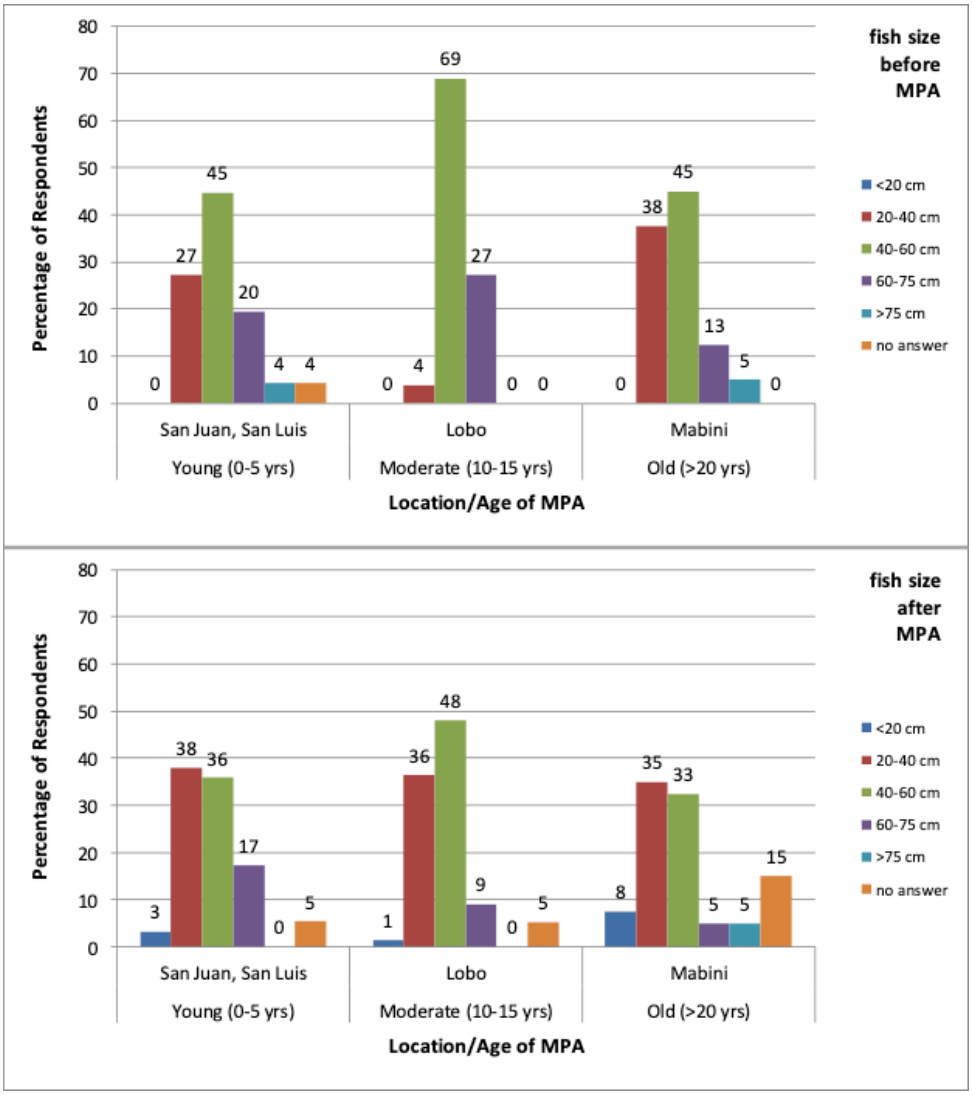

Figure 3. The relative perceived size of fish caught by respondents before (top) and after (bottom) the establishment of marine protected areas at San Juan-San Luis, Lobo and Mabini, Batangas, Verde Island Passage (2014).

location where the highest relative number of respondents "highly disagreed" with the MPAs (23%) and 13% "disagreed".

With the numerous ecological benefits that MPAs promise (i.e. reduced macroalgal cover and increased coral cover, increased abundance and sizes of target fish species, and increased fisheries catches (*PDT 1990; Roberts et al. 2005*), it is logical to assume that the improved ecological benefits that may be derived from protected areas will inevitably result in positive attitudes of fishers that directly depend on coral reefs for sustenance and income. However, it is important to bear in mind that detecting the effectiveness of marine protected areas is dependent on a variety of site-specific factors such as the potential for spill-over effects, the level of enforcement by managers and compliance by stakeholders, as well as identifying appropriate controls sites for comparability (*Samoilys et al. 2007*). The results of the perception surveys across locations that represented areas with young, moderate-aged and old MPAs indicated reduced volume of catches, smaller sizes of fish, and an overall decline in the fisheries across locations (**Figures 2, 3** and **4**). Remarkably, despite all these perceptions, stakeholders were still supportive of MPAs especially at those locations where moderate-aged and old MPAs were situated (**Figure 5**). This underscored the assertion that benefits from MPAs may go beyond improved fisheries catches to profit communities and gain acceptability from the stakeholders. While some fishers may indeed benefit from higher volumes and quality (biomass and sizes) of catch due to the enhancing effects of MPAs on fish community structure, others may indirectly benefit from the presence of these protected areas through

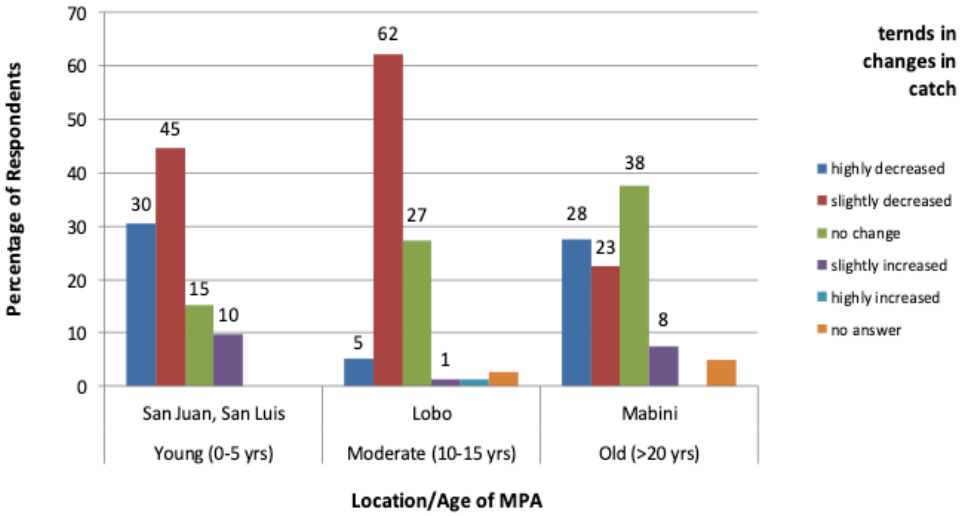

Figure 4. The relative perception of changes in fishery catch of respondents after the establishment of marine protected areas at San Juan-San Luis, Lobo and Mabini, Batangas, Verde Island Passage (2014).

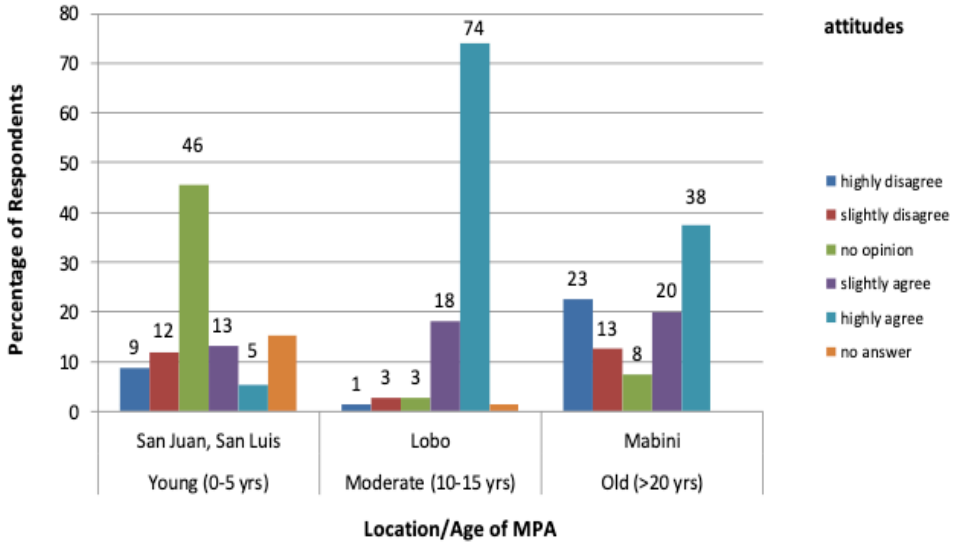

Figure 5. The relative levels of support towards MPAs by fishers from San Juan-San Luis, Lobo and Mabini towards MPAs, Batangas, Verde Island Passage (2014).

the natural emergence and development of alternative income sources. As in the case of Mabini where Old MPAs were located, water-based tourism was very well-developed and has been sustained for over two decades. Concurrent with its growth was the increase in the number and variety of tourism-related enterprises such as resort development, dive boat operations and rentals, supply markets, food industries, and the employment opportunities that all of these generate. The availability of alternative sources of income for the constituents of the coastal barangays in Mabini was a major factor that drove the tremendous support for MPAs. The stakeholders were aware that the presence of MPAs that maintain the coral reefs, in turn helped support and sustain their tourism-related income.

Despite the high acceptance of MPAs in Mabini, respondents that "highly disagree" with MPAs was highest at this location (**Figure 5**). It is very likely that the protracted periods (>20 years) of the presence of MPAs in Mabini has also intensified the negative attitudes that some stakeholders have had since the inception of the sanctuaries. The respondents that disagreed with MPAs in Mabini were mostly those that did not indicate any alternative sources of income, and who presumably still depended highly on fishing for their livelihood.

A different scenario was found in Lobo where moderate-age MPAs were situated. Majority of the respondents indicated negative changes in their volume of catch and in the sizes of the reef fish that they caught

(**Figures 2** and **3**). However, there was still a very high positive attitude towards MPAs (**Figure 5**). This may be attributed to the very high awareness of the locals of the importance of MPAs. During field surveys in Lobo, it was observed that locals were well-aware of the locations of the MPAs and observed the no-take policies. There was a strong presence from the LGU through activities from the Office of the Municipal Agriculturist. Activities included continual and regular reef monitoring activities, crown-of-thorns seastar collection, and marine conservation-related workshops. Since the dive-tourism in Lobo was not yet as well-developed as that of Mabini, any diving activities that were witnessed by the locals were inevitably assumed to be tied-up with the MPAs and the LGU. Many of these activities were largely supported by non-government organizations, and their support of the activities of the LGU has largely contributed to their success.

In the San Juan-San Luis localities where young MPAs were located, negative changes in catch were also perceived (**Figure 4**), but the large majority of the respondents did not have any strong opinion about the establishment of MPAs in the area (**Figure 5**). Despite the active presence of NGOs that helped establish MPAs, especially in San Juan, results of the perception surveys revealed that the respondents/fishers were still unsure about the potential benefits of the establishment of the MPAs. It is likely that since the MPAs in these locations were still relatively new (< 5 years), the potential benefits on reef fisheries have not yet been realized. Furthermore, it was observed that the MPAs in the area were not very well demarcated except for one located in front of a private resort (i.e., Hugom). While San Juan has recently become a major tourist destination, its tourisms was largely based on the white sand beaches along itscoastline, and not on coral reefs and diving activities. This may be another factor why the benefits that are being derived from the tourism industry in San Juan are not directly attributed by the respondents to the establishment of coral reef protected areas.

It has been suggested that the socio-economic well-being of the stakeholders, together with the biological integrity of reefs, are keys to the success of marine protected areas. By elevating the social and economic status of fishers, their dependence on fishing is alleviated, resulting in reduced extractive pressure on the reefs. This creates a positively self-reinforcing cycle wherein improved coral reef health induces socio-economic well-being, resulting in reduced reef resources extraction that in turn helps sustain reef health. This scenario appears to be the case in locations where moderate-aged and Older MPAs have been established (i.e., Lobo and Mabini). The establishment of MPAs is a long-term project. Return on investments in terms of biological responses may not be immediately realized (*Russ and Alcala 2004*; *Stockwell et al. 2009*). However, it is critical that support from the stakeholders are gained by the proponents in order to sustain the impetus for the MPAs and allow these efforts to perform its function of rehabilitating and maintaining coral reefs, hence returning and enhancing the ecosystem services that these reefs may provide. It is in this context that the roles, commitment and resolve of the local community, local government, conservation groups, and academia are highly regarded and necessary in the success of protected areas.

SUMMARY AND CONCLUSION

The study presents a rough estimate of the duration of protection required before any benefits are perceived by stakeholders. Positive ecological changes can be limited by various intervening factors such as the baseline condition of the reefs when protection commenced, and the occurrence of intense and periodic disturbances such as typhoons, bleaching events and coral predation among others. Hence, changes in the coral and fish communities may be delayed and only detected after period of time, 20 years in the case of Mabini. On the other hand, positive attitude and support towards MPAs may be gained even before biological and fisheries benefits are realized, and this may be a function of education and the provision and availability of alternative income sources to the stakeholders. As shown in Lobo, there was a high support for MPAs despite negative changes in the quantity and quality of catches reported by the respondents, at least within 10 years after the establishment of the MPAs. Education and the active involvement of the LGU were theprimary drivers of the positive attitude of the respondents towards MPAs in Lobo. While in Mabini, the support of the stakeholders for the MPAs was a function of the availability of alternate income sources.

Despite the disagreement between the perception of fishers regarding the catch and the estimated improvements in the fish communities within MPAs from the biological surveys, majority of the fishers still highly agreed with the establishment of the MPAs. This finding mirrors the results of the investigations of *McClanahan et al.* (*2005*) on the factors that influenced the perceptions of stakeholders towards MPAs. The fishers found that employment was the strongest factor that effected positive attitudes towards MPAs, and added that fishers adjacent to the oldest MPAs had significantly higher positive attitudes towards MPAs than those adjacent to

the newest MPAs. In another study, *McClanahan et al.* (*2006*) found that "effective conservation" was positively correlated with the duration of time management had been implemented. In this study, high support and positive attitudes towards MPAs were expressed by respondents in the localities with moderate-aged and Old MPAs. This may be explained by the relatively high awareness of the stakeholders of the benefits they may derive from protecting their reefs. The high level of awareness and resulting compliance of the stakeholders may have resulted from several factors. There was an obvious and consistent presence of the local government through the Bantay Dagat (ocean watchers) in Lobo and Mabini. High investments in information and education activities regarding coral reef protection and MPA establishment have been committed by both the government, non-government organizations and academic institutions at these localities (i.e., the Haribon Foundation, Conservation International, World Wide Fund for Nature, and other institutions have all contributed to establishing MPAs and enhancing the awareness and capacity of the locals especially in Mabini since the early 1990s to 2010). All these have increased the appreciation and understanding of the locals of the importance of MPAs, hence the generally strong support it enjoyed at these areas. Another major factor that drove the strong support for MPAs among the respondents was the development to the tourism industry in Mabini where the Older MPAs were located. Many of the respondents from Mabini were engaged in tourism-related employment as an alternative source of income. The availability of alternative livelihoods in the area emerged as an important factor that contributed to the high positive attitude and support for MPAs. It provided an alternative income source for fishers and locals who otherwise would have been fully dependent on reef fisheries. The reduction in thedependence on reef fisheries by the locals may have resulted in an overall reduction in fishing pressure, hence enhancing the recovery and maintenance of fish and coral communities within and beyond the boundaries of sanctuaries. It has been reported that the maintenance of the reef habitats in Mabini has driven the willingness to pay of divers and tourists who visit the area (*Arin and Kramer 2002*). At least in the case of Mabini where the dive tourism industry was well-established, revenues obtained from users' fees were used in the management and protection of these reefs, thereby achieving a self-sustaining mechanism that simultaneously promoted coral reef conservation and enhanced human well-being.

The study underscores the importance of setting realistic goals in terms of the time required before any quantifiable improvements in fisheries catches and the condition of the resources being protected and managed. It may guide both local and regional managers and policy makers in designing effective education strategies for stakeholders to better grasp the goals and importance of protective management, as well as in the development of appropriate alternative livelihood programs to support fishers. Both of which are necessary to gain the support of the stakeholders for MPAs in order to maintain the momentum of the project before biological and fisheries benefits are gained.

REFERENCES

Alcala, A.C. 2001. Marine reserves in the Philippines: Historical developments, effects and influence on marine conservation policy. Makati City: The Bookmart Inc.

Alcala, A.C. and Russ, G.R. 2006. "No-take Marine Reserves and Reef Fisheries Management in the Philippines: a New People Power Revolution." *Ambio* 35(5): 245-254.

Aliño, P.M., Palomar, N.E., Arceo, H.O. and Uychiaoco, A.T. 2000. "Challenges and Opportunities for Marine Protected Area (MPA) Management in the Philippines." A paper present at the 9th International Coral Reef Symposium., Bali, Indonesia, 2: 635-640.

Azanza, R.V., Aliño, P.M., Cabral, R.B., Juinio-Meñez, M.A., Pernia, E.M., Mendoza, R.U. and Siriban, C.S. 2017. Valuing and managing the Philippines' marine resources toward a prosperous ocean-based blue economy. Public Policy, 18: 3-26.in the Old MPA localities

Arin, T. and Kramer, R.A. 2002. "Divers' Willingness To Pay To Visit Marine Sanctuaries: An Exploratory Study." *Ocean and Coastal Management* 45: 171-183.

Bunce, L., Gustavson, K., Williams J. and Miller, M. 1999. "The Human Side of Reef Management: A Case Study Analysis of the Socioeconomic Framework of Montego Bay Marine Park." *Coral Reefs* 18: 369-380.

Bunce, L., Townsley, P., Pomeroy, R. and Pollnac, R. 2000, Socioeconomic Manual for Coral Reef Management. Australian Institute of Marine Science. PMB No. 3, Townsville Mail Center, Townsville Q 4810, Australia, pp. 251.

Carpenter, K.E. and Springer, V.G. 2005, "Center of the Center of Marine Shore Fish Biodiversity: The Philippine Islands." *Environmental Biology of Fishes* 72: 467-480.

Christie, P. and White, A.T. 2007. "Best Practices For Improved Governance of Coral Reef Marine Protected Areas." *Coral Reefs* DOI 10.1007/s00338-007-0235-9.

Coral Triangle Initiative on Corals, Fisheries and Food Security

(CTI-CFF). 2013. Climate Change Adaptation Plan for Coastal Resources in Batangas Province (2014 – 2020). Conservation International, 25p.

Kelleher, G. and Recchia, C. 1998. "Lessons From Marine Protected Areas Around the World." *Parks* 8(2): 1-4.

Licuanan, W.Y. and Gomez, E.D. 2000. Philippines Coral Reefs, Reef Fishes, and Associated Fisheries: Status and Recommendations to Improve Their Management. Global Coral Reef Monitoring Network, Australian Institute of Marine Science, 51p.

Mascia, M.B. 2003. "The Human Dimension of Coral Reef Marine Protected Areas: Recent Social Science Research and Its Policy Implications." *Conservation Biology* 17(2): 630-632.

McClanahan, T., Davies, J. and Maina, J. 2005. "Factors Influencing Resource Users and Managers' Perceptions Towards Marine Protected Area Management in Kenya." *Environmental Conservation* 32(1): 42-49.

McClanahan, T.R., Marnane, M.J., Cinner, J.E. and Kiene, W.E. 2006. "A Comparison of Marine Protected Areas and Alternative Approaches to Coral-Reef Management." *Current Biology* 16: 1408-1413.

Municipal Planning and Development Office of Bauan. 2014. San Pablo de Bauan Marine Protected Area and Fishery Reserve Management Plan. Municipal Planning and Development Office, Municipality of Bauan, Batangas. Unpublished material.

Municipal Planning and Development Office of Lobo. 2014. A Management Plan: Biga Fish Sanctuary and Refuge, Sawang/Olo-olo Fish Sanctuary and Refuge, and Malabrigo Fish Sanctuary and Refuge. Municipal Planning and Development Office, Municipality of Lobo, Batangas. Unpublished material.

Municipal Planning and Development Office of Mabini – 2009-2014. 2009. Marine Protected Area Management Plan – Mabini, Batangas. Municipal Planning and Development Office, Municipality of Mabini, Batangas. Unpublished material.

Municipal Planning and Development Office of San Juan. 2009. Marine Protected Area Management Plan – San Juan, Batangas. Municipal Planning and Development Office, Municipality of San Juan, Batangas. Unpublished material.

Orback, M.K. and Johnson, J.C. 1989. "The Transformation of Fishing Communities: a Public Policy Perspective. In: Marine Resources Utilization: A Conference In Social Science Issues (eds. Thomas, J.S., Maril, L. and E.P. Durrenberger). University of South Alabama Publication Services, Movile, Alabama, pp. 63-67.

Plan Development Team. 1990. The potential of marine fishery reserves for reef fish management in the US Southern Atlantic. NOAA Technical Memorandum NMFS-SEFC-261, 40 p.

Protected Areas and Wildlife Bureau – Department of Environment and Natural Resources. 2009. The Verde Framework. Protected Areas and Wildlife Bureau, Department of Environment and Natural Resources, Ninoy Aquino Parks and Wildlife Center, Quezon City, Philippines.

Renard, Y. 1991. "Institutional Challenges for Community-based Management in the Caribbean." *Nature and Resources* 27(4): 4-9.

Roberts, C.M., Hawkins, J.P. and Gell, F.R. 2005. The roles of marine reserve in achieving sustainable fisheries. *Philosophical Transactions of the Royal Society* B, doi: 10.1098/rstb.2004.1578, 360: 123-132.

Russ, G.R. and Alcala, A.C. 2004. "Marine Reserves: Long-Term Protection is Required for Full Recovery of Predatory Fish populations." *Oecologia* 138: 622-627.

Samoilys, M.A., Martin-Smith, K.M., Giles, B.G., Cabrera, B., Anticamara, J.A., Brunio, E.O. and Vincent, A.C.J. 2007. "Effectiveness of Five Small Philippines' Coral Reef Reserves for Fish Populations Depends on Site-Specific Factors, Particularly Enforcement History." *Biol. Conserv.* 136: 584-601.

Samonte, G.P.B., Ramenzoni, V.C., Dacles, T.U. and D. Fortenbacher. 2016. The effect of marine protected areas on fishers' income in the Philippines. *Journal of Ocean and Coastal Economics,* 3(1): 1-27.

SEMP. 2004. Strategic Environmental Management Plan 2005-2020 – Province of Batangas. Provincial Government of Batangas / PG-Environment and Natural Resources Office (PG-ENRO), GEF/UNDP/IMO Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), WorldWildlife Fund-Philippines (WWF-Phils.), Conservation International-Philippines (CI-Phils.). 128 p.

Stockwell, B., Jadloc, C.R.L., Abesamis, R.A., Alcala, A.C. and Russ, G.R. 2009. "Trophic and Benthic Responses To No-Take Marine Reserve Protection in the Philippines." *Marine Ecological Progress Series* 389: 1-15.

White, A.T., Courtney, S.A. and Salamanca, A. 2002. "Experience With Marine Protected Area Planning and Management in the Philippines." *Coastal Management* 30: 1-26.

White, A.T., Hale, L.Z., Renard, Y. and Cortesi, L. 1994. Collaborative and Community-based Management of Coral Reefs: Sessons From Experience. Kumarian Press, West Hartford.

White, A.T., Vogt, H.P. and Arin, R. 2000. "Philippines Coral Reefs Under Threat: The Economic Losses Caused By Reef Destruction." *Marine Pollution Bulletin* 40(7): 598-605.

ACKNOWLEDGMENT

The author would like to thank the following for their support and assistance:

Office of the Mayor of San Luis, Bauan, Mabini, Lobo and San Juan through the Office of the Municipal Agriculturist.

Bryan Mendoza, Regor, Alvin Magpulhin, Suzmetha Asilo, Jayzard Morales, Jeasette Sulit, Prince Espina, Gervy Dimaano, Glenda Mamano, Bernard Asi, Mae Maderoso, Ronald Godoy, Mae Maderoso, Ronald Godoy, Karlo Miguel F. Santos, and Joshua Marco U. Santos.