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Role of Extension Services with Special Reference to Livelihood Projects for Supporting a Community-based Marine Protected Area in Northern Luzon, Philippines

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Abstract

Community-based management of marine protected areas (MPAs) is widely carried out in the Philippines as a coastal resource management initiative. However, the restrictions to areas used for this conservation programme have caused loss of job opportunities to villagers who mainly depend on coastal resources for a living. As an alternative, extension services with livelihood projects (e.g. aquaculture and hog raising) have been provided to the villagers. For investigating the role of extension services specifically as a support policy to the participation of villagers in MPA management, a household survey in the Casitan village in Cagayan Province, Philippines was carried out in March 2015 through one-on-one interviews facilitated by trained enumerators. A total of 100 respondents were selected by random sampling from the List of Registered Household Heads. Key informants' interviews were also conducted to harness the information gathered. The study revealed that support policies such as extension services with livelihood projects increase the tendency of villagers to participate in MPA management activities. The results imply that there is a need to strengthen strategies and programmes such as livelihood projects which can motivate the villagers' willingness to participate in MPA activities.

Keywords: Cagayan, coastal resource management, community-based marine protected areas, extension activities, livelihood project

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Introduction

Coastal and marine resources, being a common-pool resource, are subjected to continuous overexploitation which leads to degradation of resources. The Philippine coasts are not spared from this condition as most of the residents depend on the coastal resources for a living. To respond to the decline of fisheries productivity and coastal habitat destruction, the establishment of marine protected areas (MPAs) as a coastal management initiative has been practised in the country for the last three decades (White et al. 2002). By virtue of the Local Government Code of 1991, the local government units (LGUs), particularly the municipal or city governments, were authorized to promote the establishment of MPAs (e.g. reserves, sanctuaries and parks) as a way to manage the resources in the coastal areas where coral reefs and seaweed beds widely exist. A typical community-based MPA model established by the LGUs is a marine reserve with a fish sanctuary or "no-take" zone. A marine reserve is an area where fishing and other activities are allowed, but regulations are set to control access while a sanctuary is a zone where all extractive practices, such as fishing, shell collection, seaweed gleaning, collection of anything else, as well as human access, are prohibited (DENR et al. 2001). Due to these circumstances, many villagers were deprived of fishing opportunities for generating a daily income. To guarantee the interest and involvement of the community, a MPA is basically managed by the residents in a voluntary manner with the support of LGUs through a community-based approach. Crawford et al. (2000) defined community-based as a co-management scheme participated in by the residents and LGUs or other external agents working together in the planning and implementation phases. Several studies in the country have highlighted the importance of rural people's involvement for the success of MPA programmes (Pomeroy and Carlos 1997; Uychiaoco et al. 2000; Pollnac et al. 2001). Further, some researchers documented the effect of selected socio-economic factors on the perceptions of fishers towards MPAs in the country (Launio et al. 2010; Hamilton 2012; Fernandez and Subade 2015).

Since residents take part in managing the MPA (i.e. monitoring of the MPA, enforcement of regulations, dissemination of information, sourcing of funds), it is indispensable to assure extensive support from the LGUs and the national government agencies through the provision of extension support services. In many cases, *payao* (fish aggregating devices) are set up in anticipation of the spill-over effects (net movement of juvenile fishes into adjacent fishing grounds) of MPAs, but the coastal areas in Northern Luzon, Philippines situated at the sides of the Babuyan Channel endure strong water currents in addition to being located in a typhoon path, hence the establishment of *payao* is not always effective. Instead, extension services with special reference to livelihood projects (e.g. aquaculture and hog raising) have been provided to the villagers. Alternative and supplemental livelihood projects work towards the provision of subsidiary and diversified income to fishers thus contributing to the success of the protected area. However, the role of extension services specifically as a support policy to the participation of villagers in MPA management is not yet clearly investigated. This study, therefore examines the role of extension services with special reference to livelihood projects to clarify their effect in encouraging the involvement of villagers in MPA management.

Materials and Methods

Cagayan Province, located in northern Philippines, has established seven municipal and one national marine protected areas since 1994 following its developmental process. The Casitan MPA was selected as a case study as it is situated in a typical village with condensed and compact population with an economy that is highly dependent on fishing and farming.

The Casitan MPA (Fig. 1) is located in the municipality of Gonzaga, Cagayan. It is situated in Casitan village, which is one of the 11 coastal villages of the municipality. The village lies along the riverbank and the mouth of the Mission River and along the shores of the Babuyan Channel. It has a land area of about 949 ha and is about 9.5 km away from the town proper.

Based on the strong consensus of and appeal from the villagers, the Municipal Ordinance No. 09 s. 1999 was enacted for the establishment of the MPA. However, the developmental process was only completed and the MPA finally launched in 2007. The MPA has a total area of 146 ha with a sanctuary of 42.32 ha. It is managed by the Casitan MPA Development Association (CAMPADA) in coordination with the village council and the Municipal Agriculture Office (MAO). CAMPADA is a registered rural association with 41 members at present.

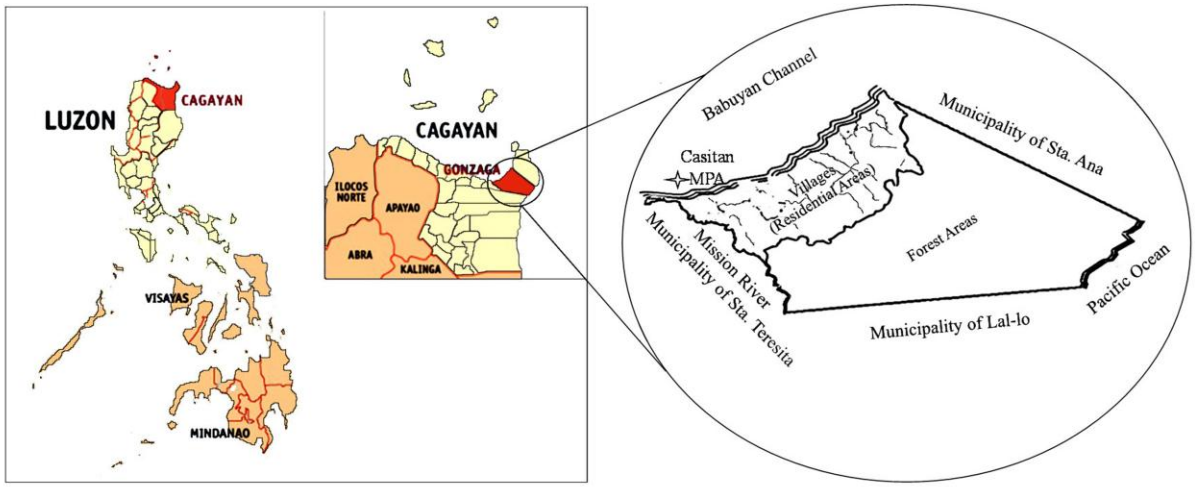

Fig. 1. Map showing the location of the Casitan MPA in Gonzaga, Cagayan, Philippines.

A questionnaire was carefully developed to acquire information about the respondents' demographic structure, household income sources, fishing activities, knowledge and awareness on the MPA, participation in MPA management activities and extension activities relating to MPA. Participation in MPA management means taking part in one or more of these activities: (1) overseeing the security of the MPA from illegal activities and enforcement of the laws; (2) conducting monitoring and assessment of the coastal and marine resources inside and outside the MPA; (3) assisting in sourcing of funds for the sustainable management of the MPA; and (4) organising an information drive in the community on MPA concepts and guidelines.

One hundred respondents were randomly selected through methodical sampling of 171 registered households. The sample size was calculated using the formula:

$$\mathrm{n} = \frac{N}{(\frac{e}{z})^2 - \frac{N-1}{P(1-P)} + 1}$$

where n = sample size; N = total household number; e = acceptable error; z = normal distribution point corresponding to the confidence level and P = ratio to the population. For this calculation, the acceptable error is set at 5%, 95% confidence level; hence z = 1.96 and expected population rate at 20%.

Face-to-face individual interviews were conducted in March 2015 with the assistance of trained enumerators. The interviews were conducted in the local dialect (*Ilocano*) for coherence and comprehensibility among the respondents. To supplement and confirm the information gathered, key informants such as village officials, officers of the CAMPADA and technical experts from the MAO, Provincial Agriculture Office (PAO) and Bureau of Fisheries and Aquatic Resources (BFAR) were consulted. Documents related to the legal basis and processes of the establishment of the MPA were also gathered to heighten the accuracy and quality of knowledge acquired from the survey.

The response data were structured as binary: 1 if a respondent participates in any of the four MPA management activities and 0 if there is no participation at all. Interrelationship of variables was evaluated by probit regression analysis whereby the dependent variable (y), participation in MPA management, is a function of several explanatory variables (x). Following Wooldridge (2006), the probit model was derived from an underlying latent variable model:

$$y^* = \beta_0 + \beta x + u$$

where y^* is the unobserved, but what we do observe is,

$$y = 0 \text{ if } y^* \leq 0,$$

$$= 1 \text{ if } y^* > 0$$

β is the observable component which is a function of measurable factors and u are certain unobservable factors. Assuming that u is normally distributed across observations, we normalize the mean and variance of u to 0 and 1, and we can calculate the response probability for y^* is less than or equal to y from the standard normal cumulative distribution function.

For the individual independent variable coefficients (βx), the sign conditions were used for interpretation. A positive coefficient means that an increase in the predictor leads to an increase in the predicted probability while a negative coefficient means that an increase in the predictor leads to a decrease in the predicted probability.

It is postulated that the conceptual relationship among factors that influence the participation of respondents to community-based MPA management is shown in Fig. 2. It is contemplated that limiting factors (demographic characteristics, personal commitment and dependency on marine resources) and support policy (capability building and alternative livelihood project) affect the participation of respondents in MPA management. It is hypothesized that respondents who have access to the support policy activities of the government are more likely to participate in MPA management.

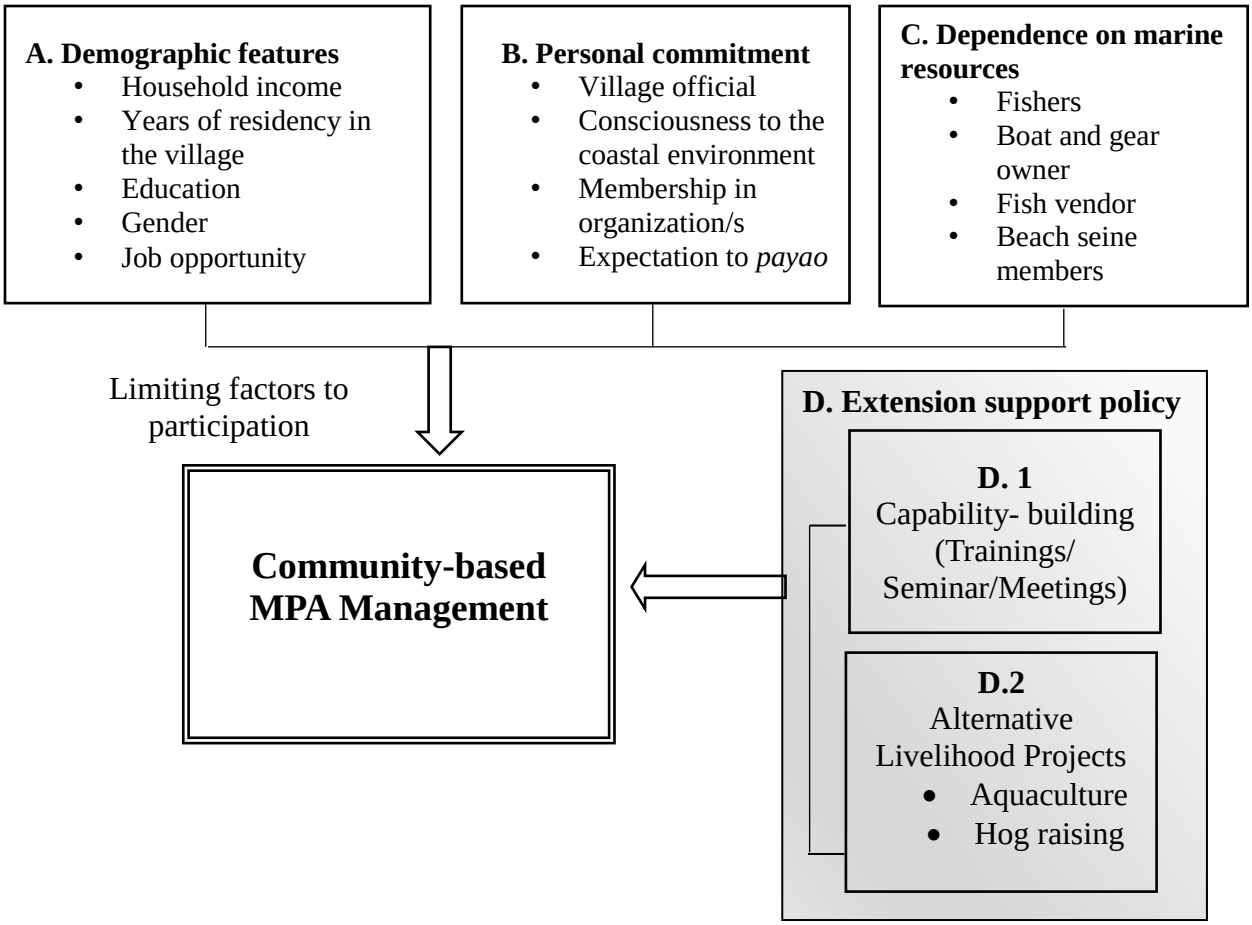

Fig 2. Conceptual relationships by category among factors that influence participation of villagers towards MPA management.

Three models were then specified using (1) all respondents' and (2) fisher respondents' data sets. Using all respondents' data set, the dependent variable (y) is regressed on all theoretically and exploratory important predictors (x) (Model 1). Non-correlated variables (not significant at 5% level) were deleted and regression analysis was shown as Model 2. Using the same set of variables which showed strong correlation, fishers' data set were analysed as Model 3. Data sets were examined using the statistical software R.

Results

Socio-economic and demographic characteristics of respondents

The demographic characteristics of the respondents are shown in Table 1. With respect to economic situations, average annual household income of respondents was ₱114,500 (US$1 = ₱44.64 in March 2015). Income in the village was 51% lower than the national (₱235,000) and 41% lower than the regional average (₱195,000) (FIES 2012) with income disparity of 0.3983. The Philippines has a Gini coefficient of 0.4605 while Cagayan Valley has 0.4096 (FIES 2012).

Table 1. Demographic profile of respondents from Casitan Village who participated in the one-to-one interviews

Parameters	Value
Gender (%)	
Male	77
Female	23
Average household size	4-5
Average age (years)	45
Educational attainment (%)	
No education	1
Elementary graduate and below	47
High school level and higher	52
In-migrants (%)	19
Average years in the village (years)	41

Fishing profile and practices

Table 2 summarizes the profile of fisher-respondents. Among the fishers, 37.14% worked on a full-time basis while the rest had other part-time jobs to supplement their earnings, but at least 38% of household income came from fishing. Only 18.57% of them owned fishing boats and 32.86% possessed fishing gears such as beach seine, gill net, cast net, single and multiple hook and line and spear. Boats used were either motorized (73.3%) or non-motorized (26.7%). Motorized boats were equipped with 3-12 HP gasoline or diesel powered engines while non-motorized boats used the paddle as a means of propulsion. Seventy percent of the fisher-respondents also worked with beach seine owners in the community. A beach seine ("*daklis*" in the local dialect) is an active gear, but considered as a traditional fishing gear in the community hence its operation is authorized. The beach seine was used by several people in the village, hence close and cooperative relationships were developed among residents. A total of seven beach seine units were operating from the village with permits to fish in municipal waters (15 km from the shoreline) of Gonzaga outside its MPA and nearby municipalities.

The number of fishers involved in single beach seine operation ranged from 30 to 40 including the people needed for towing the seine to the shore. Beach seine fishing became a tradition and fostered cooperation as well as collective action among villagers as many of them joined the activity for their source of income. The gear owners even developed patron-client relationship among their workers. Credit tying or advance payment ("*bale*" in the local dialect) had been a part of this system.

The fishers felt that the increase in fish catch was due to the spill-over effect of the MPA. The results of this survey revealed that around 69% of the fisher-respondents opined that the fish catch became better; 67% agreed that fish catches improved and 54% observed that fish diversity was enhanced. In totality, 63% of the fisher-respondents felt that fish production became better with the establishment of the MPA. The major species caught, based on the know-how of the respondents, included big-eyed scad (*Local Name (LN): Mataan; Family (F): Carangidae*), short mackerel (*LN: Kabalyas; F: Scombridae*), trevally (*LN: Talakitok; F: Carangidae*), anchovies (*LN: Dilis; F: Engraulidae*), tuna (*LN: Dumadara/Butnugan; F: Scombridae*), mackerel scad (*LN: Galunggong; F: Carangidae)*, slip mouth (*LN: Sapsap; F: Leiognathidae*), moonfish (*LN: Cadis; F: Menidae*) and largehead hairtail (*LN: Espada; F: Trichiuridae*).

Table 2. Profile of fisher-respondents from Casitan.Village who participated in the one-to-one interviews.

Parameters	Value/Information
No of fisher-respondents[a] (%)	70
With fishing boat[b]	18.57
Motorized fishing boat[c]	73.30
Non-motorized boat[c]	26.70
With fishing gears[b]	32.86
Full time fishers[b]	37.14
Part time fishers[b]	62.86
Average years in fishing[b]	20
Average household income from fishing[b] (₱)	62,400
Minimum	1,600
Maximum	420,000

[a]from all respondents
[b]from fishers respondents
[c]from fishers with fishing boats

MPA management activities and participation of respondents

An implementing structure was established at the village level to guarantee the operation of the MPA goals and objectives in the area. Components of the structure were defined and precise roles and functions were explicated. To achieve this end, four components within the MPA management board were formed.

These committees include: (1) Law Enforcement Team; (2) Core Monitoring Group; (3) Income Generating Project (IGP) Unit and (4) Information Education Campaign (IEC) Team. Community members participated in MPA management by taking part in any of these groups voluntarily (i.e. non-mandatory and non-compulsory participation).

The Law Enforcement Team comprised of the members of CAMPADA and village officials who were deputized as fish wardens and therefore acted as *Bantay Dagat (BD)*. *Bantay Dagat* or sea guards, is a term coined to describe the participatory approach of coastal law enforcement, which has existed in the Philippines since the 1970s (Gesellschaft fur Technische Zusammenarbeit (GTZ) 2003 as cited in Rosales 2009). In the case of Casitan MPA, the LGU provided a patrol boat and covered the cost of fuel, but members did the patrolling voluntarily as no payment is provided. They grouped themselves into small teams of 4-5 members with a specific schedule of 3–5 h for land surveillance or seaborne patrolling. However, membership of the committee was not sustained and a gradual withdrawal of fish wardens from their duty was observed. Despite this circumstance and absence of monetary incentives, active *BD* members determinedly perform their jobs. The Core Monitoring Group on the other hand, assisted the technical experts from the MAO and BFAR in the conduct of periodic monitoring and assessment of the coastal and marine resources within the MPA. They were also in the forefront of the implementation of conservation activities such as stock enhancement. The IGP Unit was in-charge of the formulation of mechanisms for income generation to support the implementation of the MPA (e.g. ecotourism activity, collection of membership or user's fee) while the IEC Team led the conduct of the information drive in the community.

Ninety three percent of the respondents mentioned that they have knowledge of the concepts of MPA and 99% were aware of the presence of the MPA in the village. Eighty one percent of the respondents affirmed support for the establishment of the MPA in the community because they believed it would facilitate the increase of fisheries production and maintenance and conservation of the resources; 6% were undecided as they were not aware of the concept of the MPA and 13% disagreed because they claimed that MPA caused reduction of fishing grounds and only selected fishers benefited in the programme causing some social conflicts. Despite the high level of support shown by the villagers to the establishment and the presence of the MPA, only 19% of the respondents participated in any of the committees of the MPA management. They disclosed that understanding the long-term benefits of the resource management initiatives which translated to the advantage of the future generations stimulated them to participate in MPA management.

Extension services as MPA support policy

MPA management was principally undertaken in a voluntary manner by villagers in the community. However, to ensure that the MPA meets its management objectives, the LGU promoted and facilitated community participation by providing necessary support. Extension services in the form of capability building programmes (e.g. trainings, seminars, meetings) and livelihood projects were presumed as key strategies to ensure the realization of MPA programmes.

Table 3 records the extension services provided to the villagers during the planning and establishment of the MPA, including continuous support in its implementation phase. These were done to increase the interest and motivation of the community in resource management and to help them understand the concepts and benefits of MPA programmes. Experts from BFAR, Department of Environment and Natural Resources (DENR), PAO and MAO incessantly rendered extension services for the establishment and maintenance of livelihood projects in support of MPA.

Table 3. Extension services conducted by external agents in relation to Casitan MPA.

Extension Activities	Lead Agency	Remarks
Phase I: Initial and establishment stage		
1. Consultative meeting and presentation of Coastal Resource Management Project	Provincial Local Government - Provincial Agriculture Office (PLGU - PAO)	Organized the Casitan Fisherfolk Association which was later named as Casitan MPA Development Association (CAMPADA)
2. Conducted training on MPA establishment and management	DENR/ PLGU/LGU-Gonzaga	Training was participated in by 57 fisherfolk. MPA was assessed and delineated
3. Conducted training on Fisheries Law Enforcement	BFAR/PLGU	Training was participated in by 54 fisherfolk. Constitution and by-laws of the CAMPADA were crafted
4. Conducted training on construction and deployment of *payao*	BFAR/PLGU	Constructed and deployed 40 units of artificial reef modules
5. Installation of MPA signboards	LGU- Gonzaga	Installed signboards along the highway
Phase II – Implementation stage		
6. Conduct of various technology trainings for livelihood projects (Mushroom culture; sea urchin and lobster culture in cages; hog raising; sea cucumber culture and milkfish culture in cages)	BFAR/ DENR/ LGU-Gonzaga	Established livelihood projects
7. Rendering of technical assistance for the maintenance of MPA and livelihood projects	BFAR/DENR/ LGU-Gonzaga	Maintained MPA and livelihood projects

Source: Casitan MPA Management Plan

Continuing advice from the implementing organization and continued engagement of outside facilitators or extension agents contributed to the success of the MPA (Crawford et al. 2000). Table 4 lists the kind and description of livelihood projects that were provided to support the community. Initially, the PAO assisted in the provision of *payao* and mushroom culture. *Payao*, a kind of fish aggregating device, was constructed for the purpose of facilitating the aggregation and attraction of fish for harvest. However, the *payao* which were set up twice were at both times destroyed by typhoons. The Integrated Coastal Resources Management Project, which aimed for sustainable management of coastal resources and increased income for coastal communities, was implemented by DENR and BFAR and paved the way for the establishment of projects on hog raising and fattening, sea cucumber culture and cage culture of milkfish.

Earnings from these projects, although not yet conclusive, were expected to provide additional income to household participants. Further, about 67% of livelihood beneficiaries claimed that fishing activities remained the same and 78% affirmed to have increased their support to coastal resource management due to these interventions.

Table 4. Livelihood projects provided in Casitan village from 2007- present in relation to the establishment of MPA.

Name of Project	Project Duration (Year)	Remarks
Payao Project	2007; 2011	1 unit bamboo-*payao* with functional parts: floater, mooring, anchor and attractant
Mushroom culture	2008	1 unit mushroom house with 2 units of seedling beds
Lying-in cage culture of sea urchin and lobster	2012 - present	Stocked berried sea urchin and lobster in cages
Hog raising and fattening	2012 - present	Constructed pig pen and started with 30 piglets
Sea cucumber culture	2013 - present	Collected stocks from wild and culture in cage
Marine fish cage culture	2014 - present	Milkfish; 1 unit cage 5m x 10m x 2m; 35 m^{-3}

Source: Municipal Agriculture Office, LGU- Gonzaga

Factors influencing participation of respondents to MPA management

For assessing the effect of extension services, especially livelihood projects and influence of other related variables, a probit regression analysis was applied. The results of all the data sets (Models 1 and 2) and fisher-respondents' data sets (Model 3) are shown in Table 5. Model 1 displays the results of the model with all necessary variables while Model 2 exhibits the result of eliminating non-significant variables in Model 1. Variables from Model 2 were used to analyse the determining factors for fisher respondents (Model 3).

For all respondents' data sets (Model 1 indicated better fitness), the result of the probit analysis showed that income, years of residency, educational attainment, gender, village leader, participation in extension services, members of livelihood projects and expectation from *payao* displayed significant results. Annual total household income showed negative sign condition implying that less affluent respondents tend to participate in MPA management. Eighty nine of the respondents had a household income below the average of the sample respondents and 35% solely depended on fishing. This denotes that respondents with meagre income tend to be more interested to support conservation measures since they depend more on the coastal resources than better-off respondents. The positive sign condition observed in respondents with longer years of residency in the village implied that they developed a sense of attachment to the area and wanted to preserve it for the future generations, hence they took part in coastal resource management. The result of this research also disclosed that respondents with higher levels of education were inclined to participate in MPA activities.

With positive sign condition, male respondents displayed a higher probability of participating in MPA activities compared with females in this village. This could be associated with the assumption that most fishers were male. This case study further showed that village officials positively supported the MPA through participation in its management. Village officials were involved in the MPA developmental process as key promoters of sustainable management of coastal resources. Participation of the villagers seemed to increase as village officials supported the programme.

The positive sign condition of the participation in capability-building signifies that formal or informal environmental education could be instrumental in increasing the disposition of villagers to participating in MPA activities. Recipients of livelihood projects showed a tendency to participate in MPA management. The extension support system such as capability building and livelihood projects appeared to increase the probability of villagers to support conservation programmes. Further, respondents who recognised the necessity to keep *payao* in the area also showed positive reactions to MPA management. Respondents who experienced fishing within the *payao* area claimed that its presence made fishing easier for them as it lessened the time taken looking for fishing grounds.

On the other hand, boat ownership and consciousness to the coastal environment showed no significant difference in MPA participation. Although not significant, the negative sign condition in boat ownership manifested a lesser tendency of participation. A possible explanation could be most boat owners either fished in farther fishing grounds and spent several days in the area, hence had no time to participate in MPA activities. The positive sign condition of the consciousness to the coastal environment suggested an increasing tendency to participate, however, the result showed only little evidence on this factor as it showed no significant difference. We think that income and gender served as proxy variables for fishers in this model.

For fishers' data set, Model 3 shows significant differences and positive sign conditions on variable levels of education, participants in capability building, members of livelihood projects and expectation from *payao* and negative sign condition on total household income. No significant differences but positive sign conditions were observed on variables years of residency in the village, gender and village leader.

Table 5. Probit estimates on the determinants of participation by villagers on MPA management.

Variable	Type of variable	Model 1	Model 2	Model 3
Intercept		-16.41	-6.997***	-6.834**
		(-0.029)	(-2.970)	(-2.574)
A. Demographic feature				
Total household income(peso/year)	Numerical	-0.00001057*	-0.00001125**	-0.0000133**
		(-1.883)	(-2.312)	(-2.054)
Years of residency in the village	Numerical	0.08583**	0.0542**	0.04695
		(2.498)	(2.104)	(1.584)
Educational attainment	Dummy (1 = if at least high school level; 0 = Elementary Graduate and below)	1.399*	1.259*	1.466*
		(1.950)	(1.792)	(1.898)
Gender	Dummy (1 = male; 0 = female)	2.517*	1.795	2.024
		(1.784)	(1.409)	(1.328)
B. Personal commitment				
Village official	Dummy (1 = yes; 0 = no)	4.706**	3.740**	8.829
		(2.454)	(2.368)	(0.018)
Consciousness to coastal environment	Dummy (1 = yes; 0 = no)	5.697	-	-
		(0.010)		
Expectation to *payao*	Dummy (1 = yes; 0 = no)	2.683***	2.831**	3.010**
		(2.606)	(2.685)	(2.496)
C. Dependency on marine resources				
Fishers	Dummy (1 = yes; 0 = no)	1.485	-	-
		(1.606)		
Fishing boat owner	Dummy (1 = yes; 0 = no)	-1.781	-	-
		(-1.545)		
D. Extension support policy				
Participants in capability-building trainings	Dummy (1 = yes; 0 = no)	2.633***	2.021**	2.117**
		(2.838)	(2.515)	(2.445)
Recipients of livelihood project	Dummy (1 = yes; 0 = no)	2.803**	3.212***	3.383***
		(2.160)	(2.782)	(2.702)
Loglikelihood		-13.5387	-16.5814	-12.6454
McFadden's R Square		0.703	0.6362	0.6523
AIC		51.077	51.163	43.291
Nos. of observations		100	100	70

***Statistically significant at the 1% level or better; **at the 5% or better, * the 10% level or better.
value in parenthesis is z-value

Discussion

High marine and coastal resource reliance, low household income and apparent insufficient livelihood opportunities characterized the study village. Despite the economic situation, villagers (both fishers and non-fishers) supported the establishment and the presence of the MPA in the community. However, the level of participation is not yet fully achieved.

With a clear understanding of how support policies, particularly extension services with livelihood projects, influence the involvement of villagers in MPA participation, resource managers can attune their strategies towards this initiative. Results from this study can therefore provide insights for better management of MPAs.

The first point relates to the effect of the level of household income to MPA management. Income is distributed in an uneven manner among the village population with the small-scale fishers as the low-income earners. As these fishers engage in daily fishing and fishing-related activities such as fish vending, they felt that protecting the resource is a way to secure their means of livelihood, thus they approved the MPA programmes. Villagers, especially artisanal fishers, who mainly depended on marine resources, showed a higher tendency to participate in MPA management activities. This is in contrast to the findings of Fox et al. (2012) which showed that greater dependence leads to an increased likelihood that local people would not comply with restrictions on marine resource extraction. Pollnac et al. (2001), however, pointed out that the more important the fishing occupation is to the community, the more interested and committed they are in attaining fish production benefits by supporting MPA programmes. A sustainable source of income for villagers is therefore necessary for their involvement in coastal resource initiatives.

Second, this study has clarified that the livelihood project played a major role in encouraging local residents in MPA management. As the fishing grounds become selected as a sanctuary and/or no-take zone due to the establishment of the MPA, fishers may temporarily lose their livelihood opportunities in the area, hence the implementation of alternative livelihood projects is an important consideration. It should be noted that conservation policies, at the very least, should not adversely affect and where possible should contribute to poverty alleviation (CBD 2008). Nevertheless, comprehension of the social dynamics and existing livelihood in the community are essential in designing effective and acceptable livelihood projects. In this case study, the villagers showed strong expectations for the setting up of *payao* in their municipal waters despite the difficulty of maintaining them due to geographical conditions. This implies that they preferred to work more in the sea through their fishing activities under the sustainable use of the marine and coastal resources. This preference was further demonstrated by a non-decrease of fishing activities despite the presence of alternative livelihood projects. To cope with this situation and in addition to the present livelihood projects, technology development for establishing a durable *payao* system is suggested. However, the impacts of utilizing payao to prevent collapse of resources due to high fishing pressure need to be verified in relation to the spill-over effects in the MPA. Further enhancement of the livelihood projects in the village is expected by most of the dwellers.

Third, the findings from this study showed that capability building as an output of extension services by external agents increased participation of the villagers in MPA management. Capability building is essential to develop the skills and capacity of members and a clear understanding of project objectives brings active participation among stakeholders (Christie et al. 1999).

While analysing the governance of coastal resources in Southern Iloilo, Philippines, Boeh et al. (2013) suggested that strengthening of the community through capacity building and empowerment is needed in order to achieve a successful co-management arrangement. Education and empowerment are potential ways to increase awareness and understanding of coastal resource management. Leisher et al. (2012) demonstrated that investments in MPA education and outreach can generate improvement in local knowledge and positive attitudes which contribute to long-term compliance with MPA regulations. It is, however, vital to ensure a highly participatory procedure that ensures maximum input from the community members to guarantee successful empowerment (Crawford and Kasmidi 2004).

Fourth, although MPA management was highly supported by the LGU as part of its devolved duties and responsibilities to mainstream coastal resource management at the local level, sustaining interest of key officials is important to ensure allocation of financial resources for supporting MPA programmes. Strong political will and persistent funding are important considerations in MPA implementation (Courtney and White 2000; Ibrahim 2013). Funding mechanisms (e.g. user fee system in relation to eco-tourism development) for the sustainable management of the MPA is therefore necessary to be taken into consideration.

Conclusion

A marine protected area is voluntarily managed by the local residents, however, standpoints toward MPA management are still not fully affirmative, but rather moderate or conservative. The local residents participate in the conservation initiatives under support policies such as extension activities including livelihood projects. As a sustainable source of income is necessary for strong support in MPA programmes, alternative livelihood projects should be in place to ensure long-lasting involvement of the community. The results confirmed that livelihood projects boosted support and participation of villagers to the MPA programme. However, in order to assure an effective role for livelihood projects as an approach to conservation initiatives, it is suggested that (1) the economic viability of the livelihood projects be considered; (2) a participatory approach in careful selection of livelihood projects by the villagers be deliberated on and (3) a monitoring scheme and continuous capability building be accessible. This study, though, was conducted in only one village along the long coastline in Cagayan Province, hence, further investigation into the diverse ways in which MPAs are being implemented in other fishing villages along the Babuyan Channel, is suggested to provide comparative studies.

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