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The Effect of Marine Protected Areas on Fishers' Income in the Philippines

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The Effect of Marine Protected Areas on Fishers' Income in the Philippines

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1. INTRODUCTION

Marine Protected Areas (MPAs) have received much attention in recent years as an alternative approach to traditional fisheries management (Roberts et al. 2001, Halpern, 2003 and Mora et al., 2006). The primary goals of MPAs are to protect critical habitat and biodiversity, to sustain or enhance fisheries by preventing spawning stock collapse, and to provide recruitment to fished areas (Roberts et al. 2001 and Halpern, 2003). Recently, MPAs have become a major component of Pacific Island coral reef conservation strategies in Southeast Asia. With their apparent success, studies have shown that marine and coastal management policies can have direct repercussions on the well-being of fishing communities by curtailing economic options (Ban et al., 2015a, Barr and Mourato, 2009 and Bennett and Dearden, 2014). Improving environments, while enhancing human well-being, is critical for MPAs. There are various resource management approaches at the community level that can prevent further environmental degradation without eroding the economic sustainability of households (Allison and Horemans, 2006). The establishment of financial compensations and incentives for fishing households living in close proximity to the no-take zones becomes a necessary instrument to the process.

Conditional Cash Transfer for the environment (CCT) is an incentive mechanism that provides bridge financing to individuals negatively affected by the introduction of MPAs. Using cash transfers to complement re-allocative policies, CCT allows managers to exert a shift in resource pressure among local users. This generates a buffer to substitute harvesting activities with alternative livelihoods, such as ecotourism and educational opportunities, while ecological conditions improve (Forest Trends and Katoomba Group, 2010). However, CCT often operates under the assumption that within a certain time period the spillover effect created by the MPA will outweigh a fisherman’s economic loss. This effect refers to the recovery of fishing stocks within restricted MPA areas and their migration over park boundaries (Roberts, Hawkins and Gell, 2005). By enforcing no-take zones in critical areas for breeding, nursing, and recruitment of fish, the MPA creates potential future benefits in the form of reduction of variability in catches, higher catch levels, and bigger fish (FAO, 2016). CCT mechanisms assume that even when losses in catch and revenues may be incurred in the short term through fishing restrictions, losses will even out or be surpassed by gains

with the recovery of stocks. Unfortunately, next to the spillover effect, there is scarce evidence proving this assumption (Colléter et al., 2014).

Other concerns should also be carefully considered before adopting the CCT approach. For example, coastal communities adjacent to the MPA, and especially those with a high economic dependency upon the fishery, may face an immediate disproportionate impact in revenues (FAO, 2016). The efficiency of MPAs is also affected by the low spatial mobility of small-scale traditional fishers in relation to stocks (Weeks, et al., 2009), the high level of initial capital investment required to participate in the fishery which may dissuade a shift in livelihoods, and the lack of viable alternatives in relation to other economic options. In addition, while recoveries of fish populations in no-take areas may occur within a relatively short span of time, the situation might attract the operation of fishers from other provinces (Reithe, Armstrong, and Flaaten, 2014).

In the Philippines, where dependence on marine and coastal resources is high, conservation measures are key to secure the future of local and national fisheries (Samonte et al., 2016). Establishment of marine protected areas (MPAs) has been practiced since the 1970s, with more than 1,800 MPA sites (Cabral et al., 2014). Considering this comparatively large temporal record, studies have attempted to assess MPA effectiveness in the Philippines by focusing on the fisheries benefits of individual reserves (Horigue, Aliño and Pressey, 2014 and Horigue et al., 2012). Whereas findings demonstrate positive effects on fish density and biomass within MPA boundaries and in adjacent fished areas; loss of access to traditional fishing grounds due MPA establishment has been singled out as factor explaining deteriorating condition of small-scale fisheries in the country (Muallil et al., 2014).

Although the concept of assisting fishers temporarily until stocks rebuild is not a new one, seeing how this can be implemented and how much support is needed while stocks rebuild is rarely discussed in the literature. Most importantly, there are few empirical case studies that demonstrate the potential changes in income faced by fishers due to MPAs (Weigel et al. 2015; Reithe, Armstrong and Flaaten, 2014). By exploring five reserves in the Philippines over the span of five years and by monitoring changes in net fishing revenue, this article provides a concise example of the economic consequences associated with MPA implementation. The objectives are: (1) to determine the variance of net revenues linked with MPA establishment (pre, during, and post implementation); and (2) to

determine the possible range of conditional transfer costs for fishing effort displaced by an MPA. Results provide direct contributions to the planning and implementation of incentive programs for coastal fishing communities. Findings are also relevant to conservation practitioners and resource managers throughout the world and beyond coastal landscapes, and emphasize the importance of on-the-ground socioeconomic assessments of conservation impacts.

2. METHODS

2.1 Sample Size and Survey

A total of 424 households were randomly selected from 18 barangays (villages) in three regions in the Philippines (Table 1). The regions are focus areas of the GIZ's Environment and Rural Development (EnRD) and Integrated Coastal Management (ICM) Program, which has resulted in the designation of close to 400 sq. kilometers as coastal MPAs. To assess the socioeconomic effects of established MPAs, the coastal fishers living near the following reserves were surveyed: Palm Reef MPA, Hinobaan, Negros Occidental; Pilar MPA, Pilar, Cebu; Tubod MPA, Tubod, San Juan, Siquijor; Ambao MPA, Hinundayan, Southern Leyte; and Pelada Rock MPA, Silago, Southern Leyte. These MPAs have been implemented for at least two years, and not exceeding 5 years.

The survey instrument consisted of three sections: general household characteristics and respondent demographics; resource utilization and fishing costs and revenues as affected by MPA establishment; and other MPA effects (e.g., livelihood) experienced during MPA establishment and implementation. Local enumerators were trained to administer the survey instrument by engaging them in the translation to local vernacular and pre-test of the survey instrument, thus providing each enumerator with familiarity and comprehension of the survey instrument.

The 18 barangays studied are coastal villages adjacent to or surrounding the five MPAs. Samples of 40-60 individuals (per MPA site) were drawn from the population of fisher households, representing at least 10 percent of the total population of the 18 villages. Of the total surveyed, 350 were fulltime fishers and 74 were seasonal fishers. This breakdown closely represents the municipal fishery in this region of the Philippines as a similar case study in the Central Visayas

region, showed that women, part-time fishers, and gleaners represent 35-55% of fishers and accounted for between 25% and 35% of the total weekly catch mass (Kleiber, et al., 2014). Fulltime fishers are those whose primary occupation is fishing, with fishing income comprising the largest part of household income. Fishing is year round with the use of single and multiple fishing gears. Seasonal fishers are those whose primary occupation is not fishing, with fishing income comprising some amount of household income. Fishing in this case occurs during certain months in the year.

Table 1. Coastal Villages Surveyed in Three Regions in the Philippines.

Region (Province)	Coastal villages (*barangay*) adjacent to marine protected		Number of fulltime fishers	Number of seasonal fishers	All fisher types surveyed
Region 6 (Negros Occidental)	1	Tubod	32	14	46
	2	Napo	19	6	25
	3	Maite	13	2	15
Region 7 (Cebu Siquijor)	4	Pook	32	4	36
	5	Barangay 1	41	0	41
	6	Pilar Poblacion	66	14	80
		Sub-total	203	40	243
Region 8 (Southern Leyte)	1	Laguma	21	0	21
	2	Salvacion	17	10	27
	3	Hingatungan	46	1	47
	4	Sudmon	7	3	10
	5	An-an	6	15	21
	6	Sabang	11	5	16
	7	Ambao	8	0	8
	8	Sagbok	17	0	17
	9	Cat-iwing	3	0	3
	10	Lungsadaan	4	0	4
	11	District 1	4	0	4
	12	District2	3	0	3
		Sub-total	147	34	181
Overall			350	74	424

2.2. Economic Analysis

Net revenue from fishing is the excess of the revenue over costs received by resource users, that is, fishers. Gross revenue is measured by the value of fish caught and costs consist of variable costs (fuel, supplies, repair, packing cost, labor shares) and fixed costs (depreciation of vessel, repair and maintenance). Data on costs and revenues were obtained by interviewing fulltime and seasonal fishers. The net revenue for the ith fisher type- fulltime/seasonal (Ri), gross revenue (GR), and total cost (TC) are calculated, respectively as:

$$NR_i = GR - TC$$
$$GR_i = Q_i P_i$$
$$TC = VC + FC$$

where, Q is quantity of fish caught, P is ex-vessel price, VC is total variable cost and FC is fixed cost.

Considering that MPAs provide a stream of economic rent to coastal fishers over time, the net revenue derived from coastal and marine ecosystem MPAs was calculated as the sum of the present value of the stream of revenues (NPV) over a 20-year period as follows:

$$NPV = \left(\sum_{T}^{T1} Bi - \sum_{T}^{T1} Ci \right) \Big/ (1+r)^{t}$$

where, NPV = net present value, B = benefits, C = costs, i= coastal and marine-based economic activities, t = year, r = social discount rate. The present value of the stream of net benefits derived from the marine resources was calculated over a 20-year period using a 10% discount rate. The government socioeconomic planning agency in the Philippines (i.e., National Economic and Development Authority), uses 10% discount rate, which falls between the range usually suggested for developing countries (i.e., 8–15 %).

For the results to be applied to the CCT approach, this study examined the potential application of an emerging mechanism called payments for ecosystem services (PES) for protecting ecosystem goods and services. This entailed assessing the income effects on household level for full time and seasonal fishers after establishment of MPA by conducting household interviews. In addition, the amount and duration of income dip for full time and seasonal fishers through

MPA establishment based on data collection was assessed to determine appropriate compensation ranges.

2.3 Statistical analysis

To determine the effect of MPA establishment on fishing net revenue over time, the following null hypotheses was tested:

H_0: $\mu_1 = \mu_2 = \mu_3$

where:

H_0 = the null hypothesis
μ_1 = the mean of fisher net revenue before MPA establishment, and
μ_2 = the mean of fisher net revenue after one to three years MPA establishment
$\mu 3$ = the mean of fisher net revenue after 4 years MPA establishment

To compare the changes in mean income of fishing activities by fisher type and by MPA at different points in time before and after the MPA was established, T Tests for parametric and Wilcoxon Signed Rank Tests for non-parametric samples were used. The time periods of comparison were divided in three: before MPA (no MPA), 1 to 3 years after the MPA was established, 4 or more years after the MPA was established. The following hypothesis was tested: The mean income would not vary significantly before and after the MPA was established. All tests were conducted with the software packages JMP Pro 11 and SPSS 21.

3. RESULTS

3.1 Socio-demographic Information

Socio-demographic information gathered included the age, household size, civil status, number of years living in the barangay, and education level. Fishers' ages ranged from 18 to 85 years, averaging 44.3 +/- 12.9 years for fulltime fishers and 42.4 +/- 11.9 years for seasonal fishers. Median household size was at four household members for fulltime fishers and five for seasonal fishers. More than 75% of fishers were male and married. Approximately 70% of fulltime fishers and 50% of seasonal fishers have been living in their barangays since they were born (Figure 1).

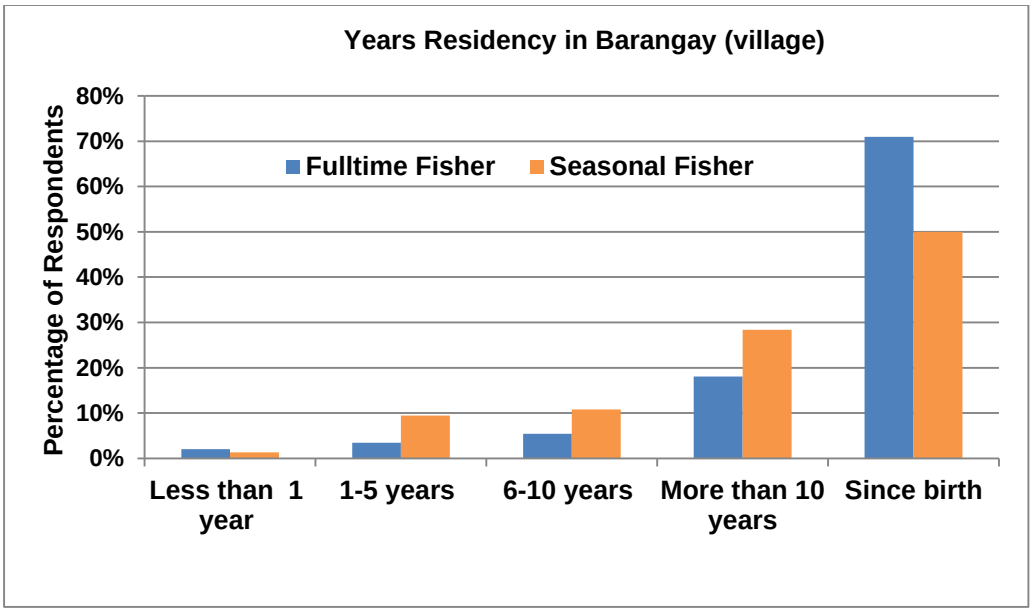

Figure 1. Fishers' number of years of residence in Barangay in the Philippines, n=424.

In terms of educational level, the fishers achieved elementary and high school degrees for at least 25% and 20% of all fishers surveyed, respectively (Figure 2). In addition to primary and secondary education, about 20% of all the fishers surveyed had taken a vocational course. Besides fishing as a primary livelihood, fishers are engaged in other economic activities to supplement their household incomes, especially during the lean months of fishing. Secondary livelihoods included farming and land-based businesses for 40% of all fishers surveyed. Over 80% of fulltime fishers and 70% of seasonal fishers have been engaged in fishing for more than 10 years (Figure 3).

Fishers' household expenses were primarily for food (90%), followed by school tuition for their children (at least 40%). When asked whether their household income was sufficient, at least 70% of the fishers indicated that their household income was usually not enough to cover their major expenses.

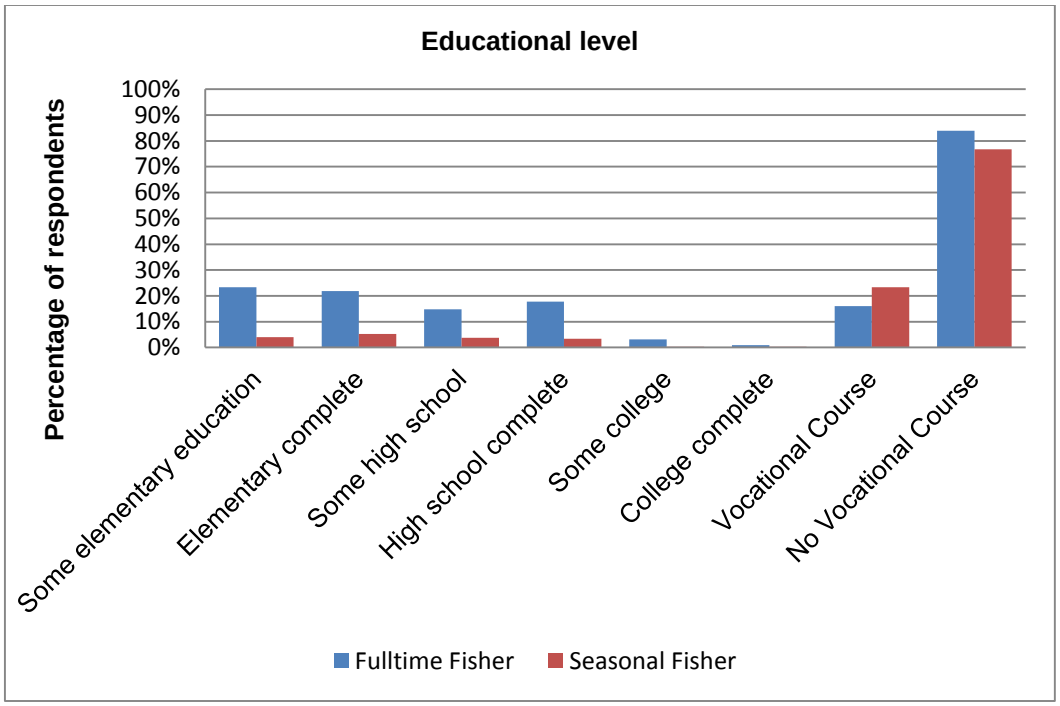

Figure 2. Fishers' educational level, n=424.

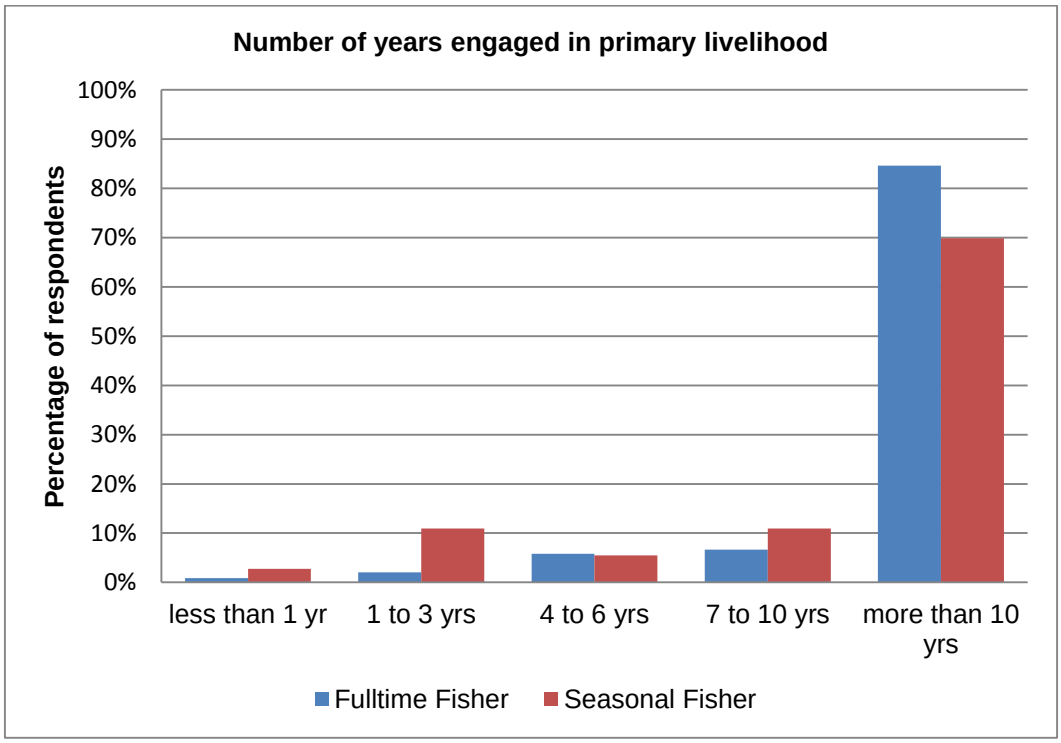

Figure 3. Number of years fishers are engaged in primary livelihood, n=424.

3.2 Fisher's Characteristics and Fishing Effort

Gill net, hook and line, spear gun were the most common gears of municipal fishers. In terms of distribution of fishers' harvest, fulltime fishers sold 75% of the catch with the remaining capture destined for home consumption. This information is important as it indicates that fulltime fishers are highly dependent on their harvest or household income. For seasonal fishers, fish harvest was an even divide (50:50) between home consumption and capture that was sold at the local market.

In terms of fishing effort, for fulltime fishers the number of hours fishing per day decreased within one to three years of MPA establishment for all fishing gears surveyed (Figure 4). Significant decreases are only observed for hook and line (T: -3.45, p <*.000*). While non-significant differences have no statistical value, findings need to be considered next to reported captures to better understand their impact. For example, for gill net fishermen, the decrease in hours fishing per day corresponded to a decrease in catch from an average of 11 kg/day to five kg/day within one to three years of MPA establishment. Whereas catch falls by over 50%, revenues decreased only about 20%. This might suggest an increase in prices, and with decreased fishing effort a reduction of fishing costs.

At the 4th year of MPA establishment, the number of hours fishing per day increased in comparison to one to three years of MPA implementation. However, increases do not reach the level of fishing effort before the MPA was introduced. The difference in matched means for gill net between before implementation and four years after MPA enforcement is significant and suggests a reduction of two thirds of an hour of daily effort (T: -2.5, p <*.007*). The catch and value of catch also seemed to stabilize four years after the MPA was established. Similar results for hook and line and spear gun were observed.

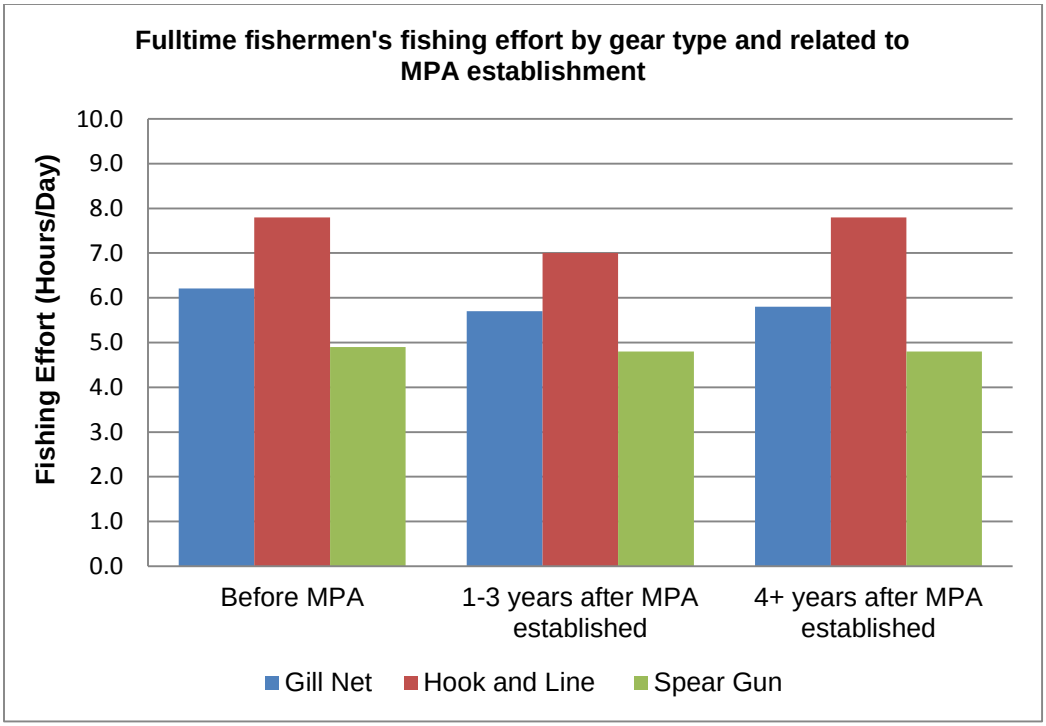

Figure 4. Fulltime fishers' fishing effort relative to MPA establishment, by gear.

For seasonal fishers the number of hours fishing per day decreased very slightly (less than one hour per day) within one to three years of MPA establishment for all fishing gears surveyed (Figure 5). But, significant differences were only observed for hook and line (T: -2.6, p <.*006*). For gill net fishers, although hours fished per day only decreased slightly and the difference was not statistically significant, this change had an impact on fishing returns. With a reduced effort, catch decreased from an average of 10.2 kg/day to 5.8 kg/day within one to three years of MPA establishment, which represents a 43% decrease in fish harvest per day. By year 4 of MPA establishment fish harvest further decreased to three and a half kg/day. Consequently, the revenue from fishing decreased from an average of Php 714/day to Php 464/day within one to three years of MPA establishment.

Fish harvest continued to decrease for gill net seasonal fishers as a result of significant reductions in fishing hours (close to three hours), four years after MPA establishment. The difference in effort from before implementation and after four years of establishment is highly significant for gill net (T: -4.47, p <.*000*) and also for hook and line fishers (T: -3.75, p <.*000*). The latter had a reduction in daily

effort of one and a half hours. The value of fish harvest trend resembled that of the fish harvest, except for hook and line where the value of catch increased even though hours fished and catch fish per day decreased.

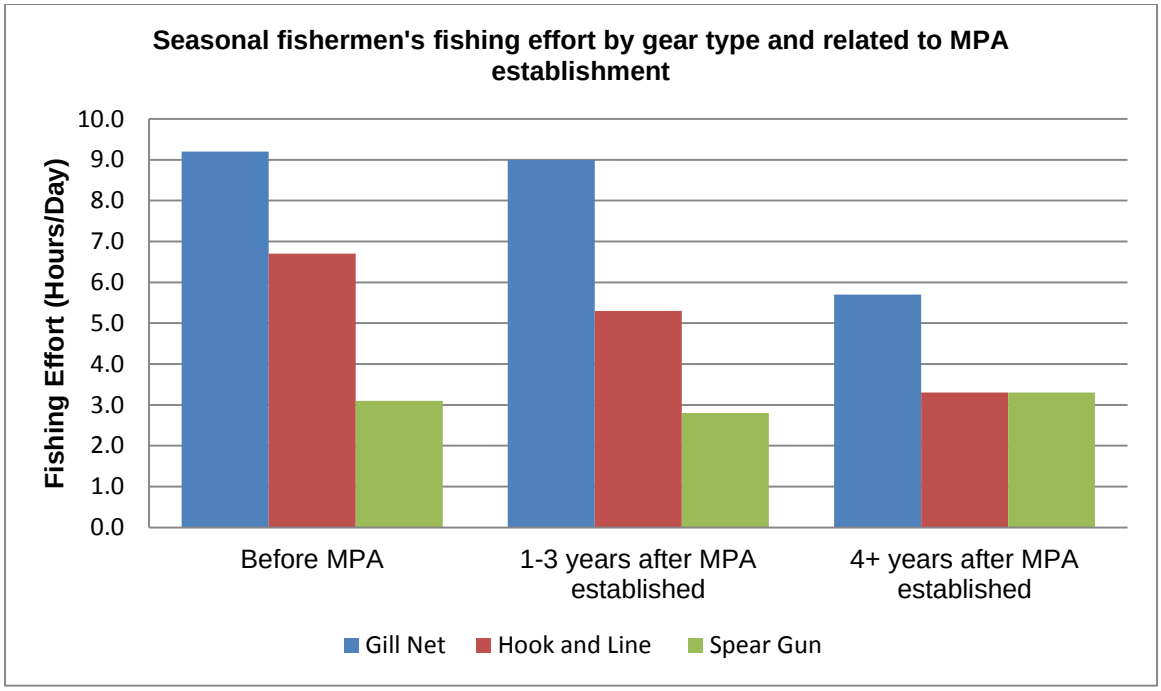

Figure 5. Seasonal fishers' fishing effort relative to MPA establishment, by gear.

3.3. Net Revenue from Fishing

Municipal fishers are dependent on reefs, mangrove areas, and marine waters for seafood (subsistence) and viable marine-based ventures. For fulltime fishers, gross revenue from fishing showed a decrease from Php 200/day to Php 138/day within one to three years of MPA establishment (Table 2). By year 4 of MPA establishment, gross revenue increased. This is the trend for all fishing gears. Within one to three years of MPA establishment, gross revenue per month decreased by 60% for gill net fishers and 33% for hook and line fishers.

Table 2. Fishing Income at Various Stages of the Marine Protected Area, Fulltime Fishers, n= 350.

Fulltime fishers	Before marine protected area (MPA)	Between 1to 3 years after MPA established	More than 4 years after MPA established
Gross revenue from fishing (Php[a] /day)			
Gill Net	200	138	150
Hook and Line	200	120	100
Spear Gun	170	158	174
Number of fishing days /month			
Gill Net	20	16	16
Hook and Line	20	16	16
Spear Gun	17	16	15
Gross earnings from fishing per month (Php[a]/month)			
Gill Net	4,500	1,800	2,250
Hook and Line	3,000	2,000	1,600
Spear Gun	2,100	2,100	2,252

[a]US$1 = Php 43.7 (2014)

For seasonal gill net fishers, gross revenue per month decreased by 46.6% from Php 155/day to Php 112/day within one to three years of MPA establishment (Table 3). The decrease was also steep for hook and line fishers, approaching 50%. By year 4 of MPA establishment, gross revenue increased for all kinds of gear. However, increases are still below figures reported before the MPA was implemented. Only Spear Gun fishers saw gross revenues that were higher before and more than 4 years after implementation.

Table 3. Fishing Income at Various Stages of the Marine Protected Area, Seasonal Fishers, n=74.

Seasonal fishers	Before marine protected area (MPA)	Between 1 to 3 years after MPA established	More than 4 years after MPA established
Gross earnings from fishing (Php[a] /day)			
Gill Net	155	112	150
Hook and Line	141	118	122
Spear Gun	97	85	103
Number of fishing days /month			
Gill Net	18	16	15
Hook and Line	20	14	12
Spear Gun	11	10	10
Gross earnings from fishing per month (Php[a] /month)			
Gill Net	3,000	1,600	1,440
Hook and Line	2,400	1,200	1,000
Spear Gun	375	3	440

[a]US$1 = Php 43.7 (2014)

3.4 Changes in Mean Fishing Incomes

Results of t tests and Wilcoxon Signed Rank Tests rejected the initial hypotheses of no differences in income (Tables 4 and 5). For example, incomes decrease significantly for both types of fishers after one to three years of MPA establishment. Except for two MPA communities in Region 7, as more time passes, income tends to increase but it does not recover initial values (Figure 6).

Table 4. MPA Effect on Fishing Income Fisher Type, n=424.[a]

Fisher Type	Before MPA vs one to three years after MPA	Significance	More than 4 years after MPA vs one to three years after MPA	Significance	More than 4 after MPA vs Before MPA	Significance
Full time	-1182.7	<.0001	231.1	ns	-951.6	0.001
Seasonal	-1040.3	.0014	770.8	.0046	-269.5	ns

[a]The p values reported here are in the direction of the difference found. NS indicates no significant difference.

Table 5. MPA effect on fishing income by coastal community/village.[a]

MPA Village	Before MPA vs one to three years after MPA	Significance	More than 4 years after MPA vs one to three years after MPA	Significance	More than 4 after MPA vs Before MPA	Significance
Ambao	-436	.0007	316.3	ns	-119.6	ns
Hingatungan	-1560.1	.0001	-177.1	.0001	-1737.3	.0001
Laguma	-485.2	ns	-300	.0176	-785.2	.0029
Sabang	-1182.1	.0032	-284.2	.0313	-1466.3	.0011
Sagbok	-1938	.0048	-444.5	.002	-2382.5	.0015
Sudmon	-1208.3	.0234	-166.6	ns	-1375	.0156
Tubod	-1916	.0321	3121.8	ns	1205.8	ns
Maite	-820.5	ns	2082.7	ns	1262.2	ns
Poblacion	-887	ns	271	ns	-615.9	ns
Palm Reef	-608	.0444	-1693.8	.0002	-2301.9	.0001

[a]The p values reported here are in the direction of the difference found. NS indicates no significant difference.

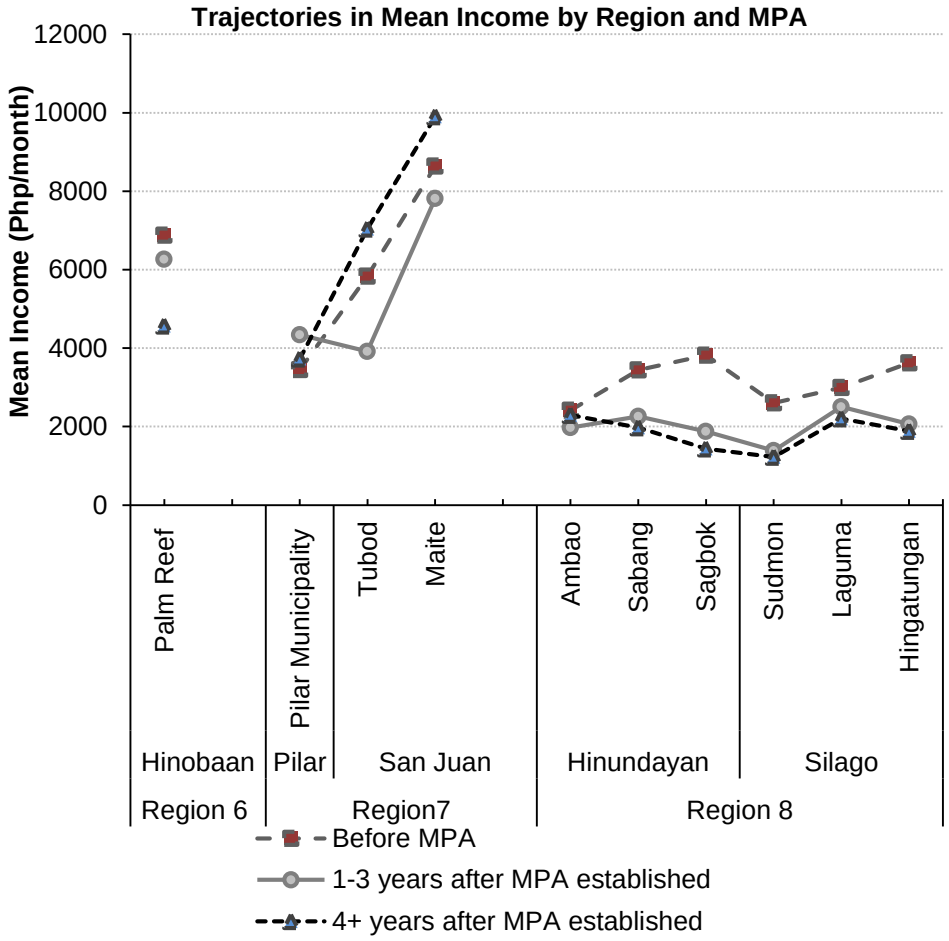

Figure 6. Mean fishing incomes by MPA community.

Between initial MPA establishment and one to three years thereafter, only Laguma, Maite and PMMPA show positive differences. In the case of four or more years after the MPA was established, decreases in income in comparison to values of one to three years of MPA establishment are significant for half of the MPAs tested. MPAs within Region 7 showed the highest amplitude of income change, while Region 8 displayed a more moderate progression. For the rest of these MPAs, changes in means are positive but suggest a statistically insignificant increase in income. Overall, when looking at how means change from the initial period to 4 or more years after MPA establishment, 6 out of 10 MPAs show a significant decrease. Of the ones not showing significant values, Ambao and PMMPA indicate a decrease in their means. Only in two cases the differences in mean income are positive (Tubod and Maite).

In general, fulltime and seasonal fishers fished year round (every month), with fulltime fishers fishing more days per month than seasonal fishers. The number of days spent fishing by a fulltime fisher decreased from 64% to 38% within one to three years of MPA establishment (Figure 7).

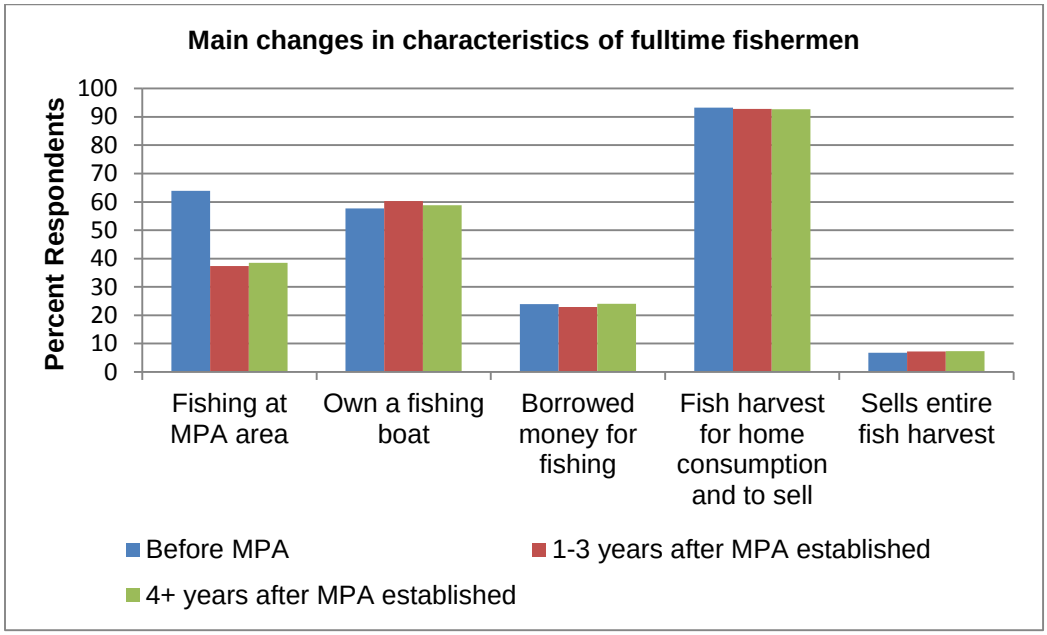

Figure 7. Fulltime fishers' main characteristics. The only changes observed in relation to MPA establishment are in the accessibility to fishing activities within the MPA area.

Similarly, for seasonal fishers, the number of days spent fishing decreased from 68% to 5% within one to three years of MPA establishment (Figure 8). The number of fishing boats owned, money borrowed, distribution of fish harvest (that is, for home consumption or for market), changed only slightly as a result of the MPA.

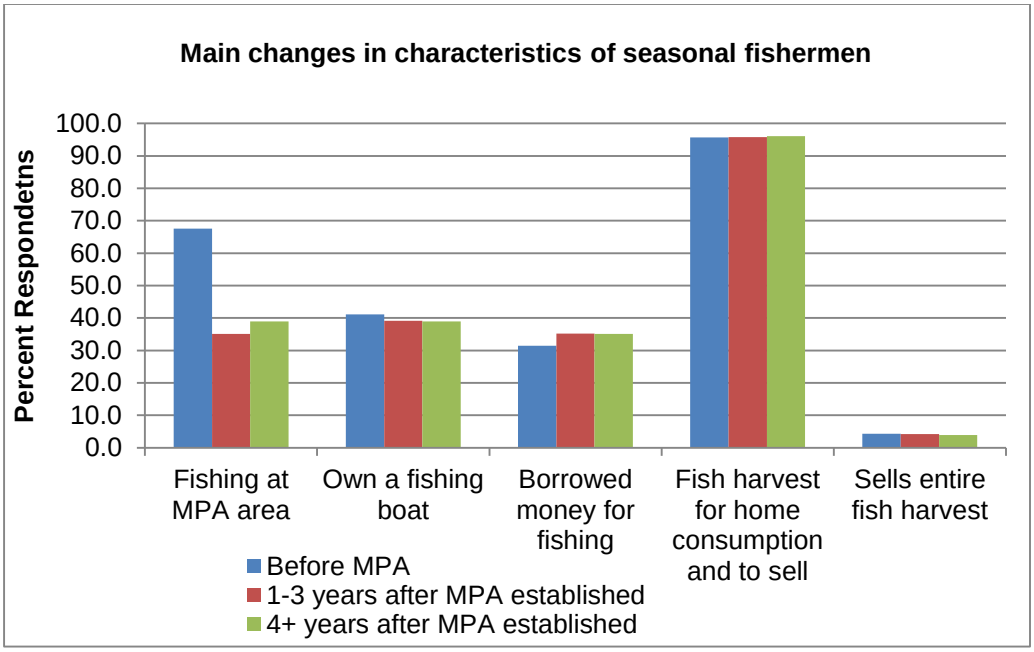

Figure 8. Seasonal fishers' main characteristics.

4. DISCUSSION

Although MPAs vary in their management strategies, a large proportion of the management policies they implement include the introduction of new restrictions or the designation of no-take zones within critical areas (i.e., spawning aggregations, nursery grounds). Restricted access poses a challenge to local communities as it may result in income losses during the initial stages of MPA establishment. Results from this study confirm this assertion. Approximately 50% of fishers reported a decrease in fishing income one to three years after MPA establishment, with about 40% indicating that their income remained the same, and 10% reporting an increase. Likewise, in six out of 10 MPAs, results showed a significant decrease in mean income when comparing returns before implementation and one to three years thereafter. Only in two cases were differences in mean income positive.

MPAs' effects are not constrained to losses of income. When fishers were asked, 'How have the following socioeconomic factors (that is, fishing boats and gear owned) changed after the MPA was established?' it was determined that over 90% did not acquire more fishing boats and/or fishing gears. This is consistent

with the reduction of number of days fishing per week, which was 'less' for almost 35% of the sample of fulltime fishers and 'remained the same' for 53% of respondents. The decreasing trend in effort for this type of fisher continued; four years after the MPA was established the number of days fishing per week was 'less' and 'remained the same' for about 30% of survey participants. While reduction of fishing activities might be a desirable effect in terms of minimizing conservation pressures, and down the road it may be compensated by the benefits of a sustainable fishery, it may also entrench poverty structures further. For example, within one to three years of MPA establishment almost 40% of fulltime fishers noticed an increase in fish abundance, a proportion that exceeded 60% of respondents four years after the MPA was implemented. But, at the same time, 70% of fishers reported no changes in fishing income. A few (10%) still continued to have less fishing income than before MPAs were introduced and only 20% experienced an amelioration of economic conditions. Comparatively, the improvement of revenues before and after four years of MPA implementation was only 10%.

In all, results suggest that perceived benefits of MPA introduction might be overly optimistic if no socioeconomic monitoring is conducted to evaluate changes and anticipate negative effects (Bennett and Dearden, 2014). Implementation of policies regarding resource management and access are deemed to have an impact on the independence of livelihoods that rely on said resources for economic sustenance (Ban et al., 2015a). A clear example of the changes in livelihoods is observed in the decrease of the number of days spent fishing. Next to differences in hourly effort, changes in the amount of days spent fishing can indicate an adjustment in patterns of resource extraction that accommodates modifications in access (Ramenzoni, 2015). Further research into livelihoods options needs to be conducted before making this assertion.

To choose sustainable management and conservation of marine biodiversity and natural habitat, resource users and decision makers need to see tangible rewards for changing resource use behaviors (Niesten and Gjertsen, 2010). For this reason, conservation agreements in many instances will need to incorporate alternative livelihood investments into the overall strategy. In the meantime, and to prevent the further erosion of local economies, potential loss of income that derives from restricted access to resources must be offset. CCT, a temporary

government-financed payment for ecosystem services alternative (PES)1, can help assuage the costs of restrictive policies and ultimately contribute to asset building within households. As described above, the payment for services concept is applied to coastal and marine areas to address externalities and institutional issues in marine conservation.

By supporting the creation of MPAs, CCT can play a critical role in advancing the nationwide objective of 15% of MPAs in municipal waters2. Section 81 of the Fisheries Code of the Philippines (Republic Act 8550) mandates that at least fifteen percent (15%) of total coastal areas in each municipality shall be identified, based on the best available scientific data and in consultation with the Department of Agriculture, and automatically designated as fish sanctuaries by Local Government Units. Within this context, GIZ-EnRD and its partners in government have launched an initiative called "Conditional Cash Transfers for Environmental Services" (CCT). With that goal, Table 7 provides the payment levels to properly incentivize the fishing households in accordance with a CCT for this case study. The table shows the fishing net revenue required as a result of fisher income loss due to MPA establishment. Fishers' stream of net revenue is discounted over 10 years, with a 10% discount rate; US$1 = Php 43.7 (2014).

1 PES for sustaining ecosystem goods and services has been extensively applied in terrestrial environments in both developed and developing countries (Wunder, 2008), The PES provides direct payments for the continued provision of a well-defined ecosystem service. The particular aim is to procure the provision of those services that benefit society more broadly, as compared to many of the direct, or marketable, ecosystem goods. The number of PES schemes in terrestrial environments is increasing rapidly, and payment systems have been based on the provision of watershed services, carbon sequestration, biodiversity conservation, eco-tourism and landscape beauty.

2 The Local Government Code (Republic Act 7160) included in its definition of "municipal waters", inland waters and marine waters up to fifteen (15) kilometers from the coastline (Section 131) and gave municipalities/cities exclusive authority to grant fishery privileges in municipal waters.

Table 7. Present Values of Decrease in Fishing Income.

Region	MPA Name	Province	Adjacent Coastal Communities	Annualized Present Value[a] of Fishing Income (Php)	Application to Conditional Cash Transfer (Php/month)
Region 6 Western Visayas	Palm Reef Marine Reserve and Sanctuary	Negros Occidental	Hinobaan	7,037	586
Region 7 Central Visayas	Tubod MPA	San Juan	Siquijor: Tubod	940	78
			Maite	1,828	152
	Pilar Municipality MPA	Cebu	Pilar	1,869	156
Region 8 Eastern Visayas	Ambao Marine Sanctuary	Southern Leyte	Hinundayan: Ambao	674	56
			Sabang	3,641	303
			Sagbok	2,329	194
	Pelada Rock MPA		Silago: Sudmon	1,407	117
			Hingatungan	2,836	236
			Laguma	1,466	122

[a]Fishers' stream of net revenue discounted over 10 years; US$1 = Php 43.7 (2014). A conservative estimate of 10% of discount rate is used. The discount rate range usually suggested for developing countries is eight to 15 percent (Medalla, 2014). The National Economic Development Authority (NEDA) uses a discount rate between 10%-12%. Ten years is used as the time horizon where income loss is most evident with MPA establishment. The net present values correspond to the 16-41% income dip that fulltime fishers incur within one to three years after the MPA establishment and 4 years after MPA establishment.

For adequate adoption of CCT approaches, important limitations need to be acknowledged (Wong 2014). The CCT concept relies on the assumption that sustainable resource use is financially viable in the longer term, but residents are

locked into unsustainable practices due to the temporary income depression they face when transitioning to sustainable practices. When this assumption is not accurate in a given site, CCT is unlikely to be an appropriate policy response. The temporary CCT incentives should be partly directed at helping these households find new sources of livelihood. Once fisher households for CCT are identified, the level of incentives they require to be moved to sustainable practices based on beneficiaries' opportunity costs needs to be determined. As opportunity costs differ from household to household, a system offering several payment levels based on household profiles would help ensure higher success rates. This must be balanced with resource constraints and implementation costs.

Overall, this article reinforces the notion that a thorough consideration of socioeconomic scenarios and how they relate to the provision of ecosystem services should preclude the planning and execution of any conservation initiative (Gruby et al., 2015 and Cárcamo et al., 2014). Within marine and coastal habitats, the term "ecosystem services" describes the provision of goods and amenities, such as food and raw materials, and numerous other environmental, economic, and sociocultural services (Yoskowitz and Russell 2015, Daily, 1997 and Costanza et al., 1997). Through the use of valuation techniques, approximations of the monetary value of ecosystem services are gaining preeminence in biodiversity conservation arenas. Despite advances in metrics, constraints in data accessibility have impeded the explicit valuation of some ecosystem services within economic markets—i.e. the benefits produced by the spatial connectivity to fishing stocks through the spillover effect (Samonte et al., 2016). In addition, ecosystem services approaches have yet to make a stronger and more effective connection to human and societal well-being (Yoskowitz and Russell, 2015).

The importance of connecting ecosystem services and societal well-being rests on the idea that all resource policies are intricately linked and made possible by socioeconomic scenarios. The efficiency of policies that often rely on a modification of access to resources is defined by how users understand and react to changes in services (IUCN, 2008). Values, perceptions, knowledge, and behaviors of local communities and other key stakeholder groups such as local authorities affect which areas are managed, the extent to which they are managed, and the level of compliance with management objectives (Bennett and Dearden, 2014). If researchers, managers, or users remain unaware of the concrete benefits and roles that ecosystem services play in human systems, they might support

resource policies or practices that can ultimately result in non-optimal use and unsustainable activities (Kremen, 2005). Studies of ecosystem service benefits and goods that explicitly consider how non-traditional services such as spillover effects are perceived by local households and how they can constrain livelihoods in monetary terms, are central to advance the success of long-term biodiversity conservation (Cárcamo et al., 2014).

5. CONCLUSION

The results show that the loss occurring through MPA is higher than expected and at least in the short run (up to four years) the spillover effect does not compensate for said loss. The results show that fishers' net revenue significantly decreases within the first three years of MPA establishment. This is, at the minimum, the amount that fulltime fishers should be compensated for the decrease in their net revenue. This information is useful in developing an incentive support program—the conditional cash transfer, which local governments can implement to compensate for displaced fishing effort in coastal communities adjacent to MPAs being established.

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