

A Livelihoods Analysis of Two Marine Protected Areas in Belize

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ABSTRACT

The sustainable livelihoods approach (SLA) is a fairly recent addition to the tools for evaluating management and other initiatives. Used primarily in rural development, often in the context of activities with poverty-related goals, the SLA also now appears in coastal and marine analyses. However, in the Caribbean, few coastal interventions have adopted a livelihoods perspective in their design, implementation or impact analysis. The study reported on here was one component of a larger project aimed at developing and promoting institutional arrangements for the management of marine protected areas (MPAs) in the Caribbean. Pro-poor institutional arrangements may facilitate poverty alleviation by ensuring that benefits from MPAs impact the livelihoods of the poorest stakeholders. This socio-economic analysis assesses impacts on the livelihoods of the stakeholders of two MPAs: the Hol Chan and Glover's Reef Marine Reserves in Belize. Data on demographics, capital assets and individuals' perceptions of the MPAs were collected primarily through a formal questionnaire administered to the poorest stakeholder group, the fishers. Respondents at both study sites supported the need for MPAs, but they did not want more established close to their communities. Impacts on income and business expansion have been minimal for fishers, but amenities and social services improved concurrently. Reduction of user group conflict was said to be minimal. Respondents were dissatisfied with MPA management, particularly with information flow between park authorities and user groups. Overall, Hol Chan may be moderately successful in alleviating poverty in San Pedro, whilst Glover's Reef Marine Reserve offered limited opportunity for poverty alleviation in the adjacent communities.

KEY WORDS: Belize, livelihoods, marine protected areas, socio-economic

Un Análisis del Sustento de Dos Áreas Protegidas Marinas en Belice

El enfoque sostenible de sustentos (SLA) es una adición bastante reciente a los instrumentos para evaluar la administración y otras iniciativas. Utilizado

principalmente en desarrollo rural, a menudo en el contexto de actividades con metas de pobreza-relaciono, el SLA tambien ahora aparece en costero y marino analiza. Sin embargo, en el caribe, pocas en su diseno, el analisis de la implementacion o impacto. El estudio informo en aquí estaba un componente de un proyecto mas grande apunto a desarrollar y promoviendo los arreglos institucionales en pro de pobres pueden cafitar el alivio de la pobreza asegurando que beneficia de MPAs imprisiona los sustentos del tenedor de apuestas mas pobre. Este analisis socio-economica valora los dos MPAs: el Hol Chan y las Reservas de Marina de escollo de Guantero en Belice. Los datos en percepciones demograficas principales de ventajas e individuos del MPAs se reunieron principalmente por un cuestionario formal administrado al grupo mas pobre del tenedor de apuestas, los pescadores. Los demandados en ambos sitios del estudio sostuvieron la necesidad para MPAs pero para ellos no quisieron mas establecido cierra a sus comunidades. Los impactos en la expansion de ingresos y negocio han sido minimos para pescadores, pero los servicios y los servicios sociales mejoraron debido al MPAs. La reduccion del conflicto del grupo de usuario se dijo ser minimo. Los demandados no fueron satisfechos con la administracion de MPA, especialmente con flujo de informacion entre autoridades de parque y grupos de usuario. En terminos generales, Hol Chan puede ser moderadamente exitoso en aliviar la pobreza en San Pedro, mientras Escollo de Guantero la Reserva Marina ofreciera la oportunidad limitada para el alivio de la pobreza en las comunidades adyacentes.

PALABRAS CLAVES: Belice, los sustentos, el marina protegió áreas, socioeconómica

INTRODUCTION

The sustainable livelihoods approach (SLA) is a recent addition to the people-centred tools for policy, planning and management. Used primarily in rural development, often in the context of activities with poverty-related goals (Carney 1998), this approach is also now appearing in Caribbean coastal and marine studies (Pantin et al. 2004, Renard et al. 2000). However, few coastal interventions in the Caribbean have explicitly adopted a livelihoods perspective in their design, implementation or impact analysis.

Allison and Ellis (2001:379) define a livelihood as comprising:

“...the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household”.

A livelihood is sustainable if it adapts to remain viable under changing circumstances. The sustainable livelihoods approach, as used in policy and planning, recognises the seasonality, diversity, complexity, uncertainty and other features of livelihood strategies in project and programme interventions. The approach attempts to remove constraints and to create an enabling

environment for existing or potentially useful patterns of coping with chronic and acute livelihood problems to emerge. For example, poor people often have innovative solutions for dealing with their circumstances. Conventional interventions may unintentionally reduce their ability to cope.

Pro-poor institutional arrangements may facilitate poverty alleviation by ensuring that benefits from marine protected areas (MPAs) improve the livelihoods of the poorest stakeholders. The socio-economic analysis in this paper assesses impacts on the livelihoods of the poorest stakeholders of two MPAs: the Hol Chan and Glover's Reef Marine Reserves in Belize.

STUDY SITES

Two MPA sites in the Belize barrier reef complex, where active management had been in place for at least five years, were selected for study: Glover's Reef Marine Reserve (GRMR), the southernmost of three atolls located 25 km east of the barrier reef, and Hol Chan Marine Reserve (HCMR) to the north end of the barrier reef (Figure 1).

Glover's Reef Marine Reserve

GRMR, established in 1993, is the largest of Belize's MPAs (the atoll is 27 km from north to south, 10.8 km wide, encompassing an area of approximately 30,800 hectares) and was declared a World Heritage Site in 1996. It is relatively inaccessible, being 74 km southeast of Belize City and 45 km east of the mainland, where the adjacent communities of Dangriga, Hopkins and Placencia are located (Figure 1). The atoll comprises six small coral cayes, all of which are privately owned. Middle Caye is the site of the Glover's Reef Marine Research Station and visitor centre and serves as the monitoring headquarters for the Belize Fisheries Department. Three other cayes support small resorts.

The objectives of GRMR, as stated in the Glover's Reef Marine Reserve Order (Government of Belize 1993), are:

- i) To maintain ecological processes;
- ii) Preserve genetic diversity;
- iii) Achieve sustainable yields of its resources through wise management of species and their habitats;
- iv) Maintain natural areas for education and research; and
- v) Provide social and economic benefits through ecologically sensitive recreation and tourism (Gibson 1988a).

To achieve these multiple objectives a zoning system has been implemented. These zones comprise a very small Wilderness Zone where no extractive or recreational activities are allowed; a Conservation Zone where non-extractive recreational activities are allowed and subsistence fishing by residents of the cayes (e.g. resort owners) under special license; a small Seasonal Closure Area (currently under indefinite closure) protecting an important grouper spawning aggregation site; and two large (covering 70% of total reserve area) General Use Zones where fishing is permitted by special license issued to fishers using the site before its designation as a MPA.

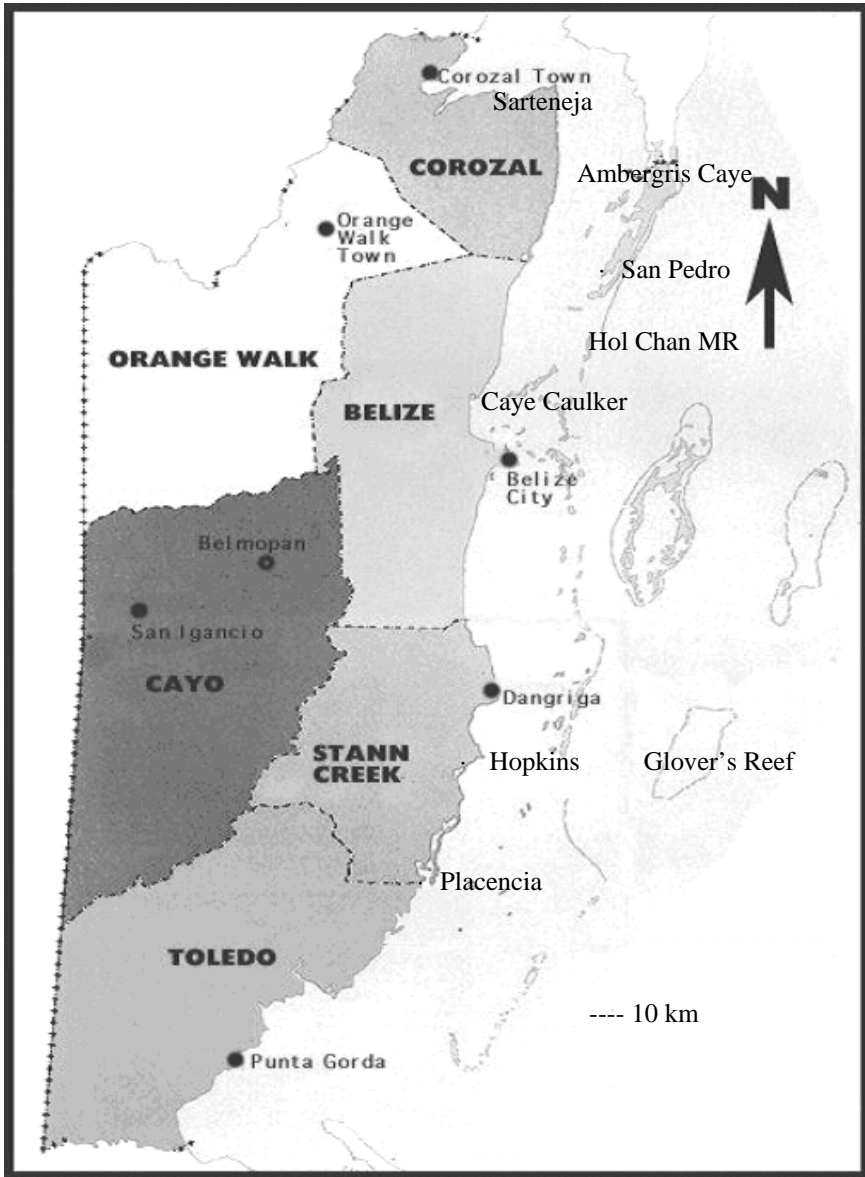


Figure 1. Map of Belize showing the administrative districts, the MPA study sites (Glover's Reef Marine Reserve, Hol Chan Marine Reserve) and adjacent communities (GRMR: Dangriga, Hopkins and Placencia; HCMR: San Pedro). Adapted from: <http://www.belize.net/html/maps/shtml>

Glover's Reef has been the traditional fishing ground and source of livelihood for the Garifuna communities of Dangriga, Hopkins and Placencia. Particularly important was the spawning aggregation site for groupers before

its dramatic decline (Sala et al. 2001). An estimated 81 boats currently fish in GRMR: 24 from adjacent communities (16 from Hopkins, 8 from Dangriga, 8 from Placencia), 19 from other distant areas of Belize, and as many as 30 illegal Honduran boats.

Hol Chan Marine Reserve

HCMR is Belize's oldest marine reserve (established in 1987), is located off the southern tip of Ambergris Caye (Figure 1) and encompasses an area of approximately 1,116 hectares, including a section of the barrier reef, seagrass beds and coastal mangrove forest (Gibson 1988b).

There is a reserve office and visitor centre in San Pedro, Ambergris Caye managed by the Fisheries Department. The objectives of HCMR, as stated in the 2000 Hol Chan Management Plan (Young and Bilgre 2000), are to:

- i) Maintain a sample coral reef in its natural state;
- ii) Provide recreation and tourism services;
- iii) Preserve the area for fisheries;
- iv) Provide an area for education and research; and
- v) Conserve genetic resources.

To achieve these multiple objectives a zoning system has been implemented. These zones comprise: a Conservation Zone (A) located over the barrier reef and well known Hol Chan Cut primarily for recreational use and conservation (no extraction of resources is allowed); a General Use Zone (B) incorporating seagrass beds where sport fishing and artisanal fishing is allowed; an Exclusive Recreational Zone (C) incorporating mangrove habitat where cutting of mangroves and disturbance of wildlife is prohibited, but sport fishing is allowed; and a Zone D incorporating Shark Ray Alley, a popular dive site, and used for catch and release sport fishing. HCMR is easily accessed by boat from Ambergris Caye (6.4 km from San Pedro) and Caye Caulker and has a very high visitor rate (over 42,000 visitors per year; BTB 2000).

The HCMR was a traditional fishing area for the community of San Pedro on Ambergris Caye, particularly for export species (conch, lobster) as well as for snapper and groupers and shallow reef fish (Carter et al. 1994). It is currently fished by an estimated 17 boats from San Pedro and has become the centre of Belize's marine-based tourism (e.g. Bonilla et al. 2000).

METHODS

Identification of Poorest Stakeholder Group

The poorest stakeholder group at each MPA was identified through local key informants, using a set of pre-established livelihood/wealth indicators (i.e. food and health, capital assets, income, employment and education, together with any local indicators of wealth considered important by key informants) to judge the relative wealth of all MPA stakeholders. Using these criteria, fishers were identified as being the poorest stakeholder group at both HCMR and GRMR.

Data Collection

Fieldwork was conducted from 19 September to 1 November, 2001. The principal means of data collection was a formal interview survey of fishers using a questionnaire. Informal interviews and observation complemented the formal interview approach. The questionnaire was pre-tested on a small sub-sample and modified to increase local relevance before being used on the full sample of fishers. Questions were structured to obtain information on status before and after implementation of the MPA. All interviews were conducted in person and generally lasted about thirty minutes per fisher. Interviews took place at fish landing sites, and the Caribeña Fishermen's Cooperative in San Pedro for HCMR and at mooring sites and fishers' homes in Hopkins and Dangriga for GRMR fishers (Figure 1).

Since the total number of fishers in these communities was small (San Pedro: 30 fishers; Hopkins: 53 fishers; Dangriga: 19 fishers), all of the fishers who owned a boat (fisher/captain/boat owner) and who fished in the MPAs (41 fishers) were interviewed (Table 1). A further 34 informal interviews took place with persons closely associated with fishers in these communities (Table 1) and were useful for verifying data obtained from formal interviews. No questionnaires were administered to the few fishers from Placencia, or the more distant community of Sarteneja who also fish at GRMR, as a result of Hurricane Iris and impending tropical storm Michelle during the field study period. However, eight informal interviews provided supporting information

Table 1. Number of formal and informal interviews held with MPA fishers (boatowner/captains) and other stakeholders of the Glover's Reef and Hol Chan marine reserves

MPA	Community	Formal interviewees	Informal interviewees
Hol Chan Marine Reserve (HCMR)	San Pedro	17 fishers	5 tour guides (former fishers) 2 retired fishers 3 members of Town Council. 1 Manager HCMR 1 Secretary, Caribeña Co-operative
Glover's Reef Marine Reserve (GRMR)	Adjacent Communities		
	Dangriga	8 fishers	5 Fishers (crew members) 3 Tour guides (x-fishers of GRMR) 2 Retired fishers 1 Manager of GR Marine Research Station 1 Ranger GRMR
	Hopkins	16 fishers	8 Fishers (crew members) 2 Members of Village Council
	Distant Communities		
	Sarteneja	0	2 Fishers (crew members) 2 Retired fisher
	Placencia	0	2 Fishers (crew members) 2 Tour guides

RESULTS AND DISCUSSION

General Biographic Data

Most fisher (owner/captain) respondents are 25 - 35 years old, have families of 4 - 6 dependents, and own their own fishing business, house, land and other assets. Around one-half (GRMR: 50%, HCMR: 54.8%) have a full primary education or higher. Over one-half the fishers (GRMR: 62.5%, HCMR: 64.7%) currently have no other sources of income other than that derived from their activities (fishing and non-fishing) in the MPAs. As such, they are highly vulnerable to changes at the MPA.

Economic Benefits

A summary of responses to selected questions on livelihoods, economic status and changes is given in Table 1. When asked directly, the majority of fisher respondents from communities adjacent to the GRMR and HCMR did not attribute any positive economic gain to the implementation of the MPAs. Most fishers reported a decrease in income (GRMR: 83.4%, HCMR: 58.8%) following the establishment of the MPA and blamed this on the MPA, although a few did report an increase (GRMR: 16.7%; HCMR: 23.5%) which they attributed to the MPAs. The Hopkins community, in particular, appears to have suffered as a result of the seasonal closure of the grouper spawning aggregation site at the GRMR that previously provided a major part of their annual income.

However, responses to other questions illustrate that the MPAs do seem to have provided some economic benefit to the fishers. For example, most fishers also agreed that the income derived from the MPA helped them to put their children through school (GRMR 66.7%; HCMR: 76.5%). Importantly, the MPAs have enabled adaptive livelihood strategies. In particular, the MPAs have provided alternative, non-extractive employment opportunities such as tour guiding and water taxi operation for some fishers at GRMR (20.8%) and for more than half of the fishers at HCMR (60.7%), increasing resilience to fluctuations in fish availability. Fishers cite insufficient income from fishing and better prospects associated with tourism as the reasons for altering their economic activities. Opportunity to benefit through increases in capital assets have been relatively small, since many respondents at both MPAs (particularly those from San Pedro) already owned their fishing business, house, land, household appliances and transportation before the MPAs were established. Interestingly, half or more of the fishers (GRMR: 50%, HCMR: 58.8%) said that they currently have no need for additional sources of income. The fact that most reported decreased earnings as a result of MPA implementation was probably because respondents were referring only to their income from fishing. This is supported by the fact that most fishers who have taken up additional activities have seen an increase in earnings (GRMR 9 of 11 respondents; HCMR 7 of 12 respondents). Another consideration is that fishers do not generally perceive substantial economic benefits from the MPAs, partly because natural disasters (e.g. hurricanes) are reported as the primary threat to their livelihoods, and MPAs do not protect them from these impacts.

Social Benefits

A summary of responses to selected questions on livelihoods, social status and changes is given in Tables 2 and 3. The changes appear to have been very similar at both MPA sites, and most are attributed by fishers to the development of tourism in general, rather than directly a result of the MPAs.

Fishers were virtually unanimous in listing many public service amenity improvements (e.g. drinking water, garbage collection, sewage disposal, medical facilities, electricity, telephone communications and schools) since the establishment of the MPAs, but few saw these relating directly to the MPAs. Fishers are divided however on the issue of health benefits associated with the MPA. At GRMR, those from Dangriga saw none or were unsure, whilst 25% from Hopkins cited better recreational opportunities, greater peace and happiness, and reduced conflict. The majority from HCMR (64.7%) saw health benefits, citing a cleaner environment and better amenities. Few fishers from either MPA saw negative health impacts, although for some, increased conflict and less peace were issues.

The majority of fishers (GRMR: 66.7%, HCMR: 88.2%) recognised that the MPAs did generally benefit their communities, although this was less clear for the Hopkins community (7 of 16 did not see any benefits). However, although the vast majority of fishers were generally happy working in the MPAs (GRMR: 75%, HCMR 94.1%) and satisfied with their current quality-of-life (GRMR: 75%, HCMR: 64.7%), they were dissatisfied with the unequal distribution of benefits. At both MPA sites there was a strong perception that most of the benefits accrued to the tourism sector (particularly to tour guides in GRMR and dive operators in HCMR) with least benefits for fishers. This has resulted in fishers feeling alienated both socially and economically from other stakeholders.

Management Issues

A summary of management issues aired by fisher respondents is given in Table 4. Despite few benefits to themselves being attributed directly to the MPAs, most fishers (GRMR: 87.5%, HCMR: 76.5%) considered that their MPA was successful. Interestingly, the key criterion by which fishers judged the success of their MPA was conservation. This would suggest that they have seen improvements to resources within the MPAs. They were, however, almost unanimous in their desire to see improved management. Greater community participation in decision making, better enforcement of regulations, improved dissemination of information, and clearer demarcation of boundaries were the key issues for both sites. Fishers, particularly those from Hopkins and HCMR, also expressed concern over the levels of conflict in the MPAs, with management being the key source for the former and zoning for the latter. The majority of fishers from both MPAs agreed that the MPAs have had little success in decreasing conflict levels.

Table 2. Summary of responses to selected questions on livelihood /economic status and changes for fishers (boat owner/captains) from Glover's Reef Marine Reserve and Hol Chan Marine Reserve

Question	Response	No. responses (% responses)			
		Glover's Reef			Hol Chan n = 17
		Dangriga n = 8	Hopkins n = 16	Total n = 24	
Did income from MPA help put your children through school ?	Yes	5	11	16 (66.7)	13 (76.5)
	No	2	3	5 (20.8)	4 (23.5)
	Not sure	1	2	3 (12.5)	0
What new skills were acquired as a result of MPA?	Tour guiding	2	2	4 (16.6)	11 (64.7)
	Water taxi	1	0	1 (4.2)	0
	None	5	14	19 (79.2)	6 (35.3)
Do you own a business?	Yes	8	15	23 (95.8)	17 (100)
	No	0	1	1 (4.2)	0
Did you own a business before MPA?	Yes	7	15	22 (91.7)	15 (88.2)
	No	1	1	2 (8.3)	2 (11.8)
Did MPA help to acquire business?	Yes	1	1	2 (8.3)	3 (17.7)
	Not applicable	7	15	22 (91.7)	14 (82.3)
What capital assets did you have before MPA?	House	5	15	20 (83.3)	16 (94.1)
	Land	6	16	22 (91.7)	16 (94.1)
	Household items	7	15	22 (91.7)	16 (94.1)
	Motor vehicle/golf cart	5	4	9 (37.5)	6 (35.3)
	Bicycle	2	11	13 (45.8)	5 (29.4)
What capital assets do you have now?	House	5	15	20 (83.3)	16 (94.1)
	Land	6	16	22 (91.7)	17 (100)
	Household items	7	15	22 (91.7)	16 (94.1)
	Motor vehicle/golf cart	5	5	10 (41.7)	5 (29.4)
	Bicycle	2	12	14 (58.3)	5 (29.4)
Did MPA help you to acquire these?	Yes	4	3	7 (29.2)	1 (5.9)
	No	4	13	17 (70.8)	16 (94.1)
How much of your income is derived from MPA?	Small Part	1	5	6 (25.0)	7 (41.2)
	Large Part	1	1	2 (8.3)	4 (23.5)
	Very Large Part	6	9	15 (62.5)	6 (35.3)
	Not sure	0	1	1 (4.2)	0
Other sources of income?	Yes	3	6	9 (37.5)	6 (35.3)
	No	5	10	15 (62.5)	11 (64.7)
Do you need other sources of income?	Yes	3	9	12 (50.0)	7 (41.2)
	No	5	7	12 (50.0)	10 (58.8)
What was the change in your income after MPA?	Substantial increase	0	0	0	1 (5.9)
	Increase	2	2	4 (16.7)	4 (23.5)
	Substantial decrease	4	6	10 (41.7)	1 (5.9)
	Decrease	2	8	10 (41.7)	9 (52.9)
	No change	0	0	0	2 (11.8)
	Not sure	0	0	0	0
Was MPA responsible for change in income?	Yes	6	16	22 (91.7)	14 (82.3)
	No	2	0	2 (8.3)	0
	Not sure	0	0	0	1 (5.9)
	Not applicable	0	0	0	2 (11.8)
Has your economic activity changed since MPA?	Yes	4	7	11 (45.8)	12 (70.6)
	No	4	9	13 (54.2)	5 (29.4)
Why did you change economic activity?	Scarcity of fish	0	0	0	2 (11.8)
	Insufficient income	1	4	5 (20.8)	7 (41.2)
	Tourism more income	3	3	6 (25.0)	3 (17.6)
	Not applicable	4	9	13 (54.2)	5 (29.4)
What was the change in your income from new activity?	Substantial increase	0	2	2 (8.3)	2 (11.8)
	Increase	3	4	7 (29.2)	5 (29.4)
	Substantial decrease	0	0	0	1 (5.9)
	Decrease	0	0	0	1 (5.9)
	Not sure	1	0	1 (4.2)	3 (17.6)

Table 3. Summary of responses to selected questions on status and changes in quality-of-life for fishers (boat owner/captains) from Glover's Reef Marine Reserve and Hol Chan Marine Reserve

Question	Response	No. responses (% responses)			
		Glover's Reef			Hol Chan n = 17
		Dangriga n = 8	Hopkins n = 16	Total n = 24	
What is your priority in life?	Food security	0	1	1 (4.2)	0
	Housing security	0	1	1 (4.2)	0
	Personal health	3	6	9 (37.5)	2 (11.8)
	Family well being	5	6	11	4 (23.5)
	Job security	0	1	(45.8)	11
	Other	0	1	1 (4.2)	(64.7)
Are you satisfied with your quality of life?	Yes	6	12	18	11
	No	2	4	(75.0)	(64.7)
What are the main threats to your livelihood in the MPA?	Natural disasters	6	5	11	14
	Increased conflict	0	0	(45.8)	(43.8)
	Management collapse	1	1	0	3 (9.4)
	Overexploitation	0	1	2 (8.3)	0
	Reduction in visitors	6	5	1 (4.2)	5 (15.6)
	Others	0	1	11	7 (21.9)
	Unsure	1	1	(45.8)	3 (9.3)
				1 (4.2)	0
How do you cope with livelihood threat?		0	1	1 (4.2)	
	Social services	3	2		
	Savings	5	9	5 (20.8)	2 (11.8)
	Loan	0	4	14	6 (35.3)
	Not sure			(58.3)	9 (52.9)
			4 (16.7)	0	
What improvements have there been in amenities/social services since MPA?		8	16	24 (100)	
	Potable water	7	15	22	
	Garbage collection	8	16	(91.7)	17 (100)
	Homes for the elderly	4	3	24 (100)	17 (100)
	Polyclinics	8	15	22	0
	Hospitals	8	16	(91.7)	17 (100)
	Telephone	6	14	7 (29.2)	17 (100)
	Electricity	4	2	23	17 (100)
	Sewage	8	15	(95.8)	17 (100)
	Drainage			24 (100)	17 (100)
	Schools			20	17 (100)
				(83.3)	
				6 (25.0)	17 (100)
				23	
			(95.8)		
Was improvement due to MPA?	Yes	2	0	2 (8.3)	1 (5.9)
	No	6	16	22(91.7)	16
				(94.1)	
Are there health benefits from the MPA?	Yes	0	6	6 (25.0)	11
	No	3	9	12	(64.7)
	Not sure	5	1	(50.0)	6 (35.3)
			6 (25.0)	0	
What are the positive health benefits associated with the MPA?	Better recreation	0	1	1 (4.2)	0
	More happiness/peace	0	3	3 (12.5)	0
	Reduced conflict	0	2	2 (8.3)	0
	Cleaner environment	0	0	0	4(23.5)
	Better amenities	0	0	0	7 (41.2)
	None	3	9	12	6 (35.3)
	Not sure	5	1	(50.0)	0
				6 (25.0)	
What are the negative health impacts of the MPA?	Loss of recreation	0	1	1 (4.2)	0
	Increased conflict	1	1	2 (8.4)	2(11.8)
	Dirtier environment	0	0	0	2(11.8)
	Less happiness/peace	1	2	3(12.5)	5 (29.4)
		6	11	17	8 (47.0)

Does MPA benefit community?	Yes	7	9	16	15
	No	1	7	(66.7)	(88.2)
				8 (33.3)	2 (11.8)
Are the benefits distributed equally?	Yes	4	9	13	4 (23.5)
	No	4	7	(54.1)	13
				11	(76.5)
				(45.9)	
Which sector benefits the most?	Fishers	1	0	1 (4.2)	0
	Dive operators	0	0	0	9 (52.9)
	Tour guides	3	7	10	4 (23.6)
	None	4	9	(41.6)	4 (23.5)
				13	
				(54.2)	
Which sector benefits the least?	Fishers	3	7	10	13
	Tour guides	1	0	(41.6)	(76.5)
	None	4	9	1(4.2)	0
				13(54.2)	4 (23.5)
Are you happy working in the MPA?	Yes	8	10	18(75.0)	16(94.1)
	No	0	4	4(16.7)	1 (5.9)
	Not sure	0	2	2(8.3)	0

CONCLUSIONS

The HCMR has apparently achieved some success in poverty alleviation in the adjacent community. The park has resulted in more job opportunities and stable incomes for the local community following its establishment. It has been used as a model for the establishment of other MPAs in Belize. Tourism has become the main income earning activity in San Pedro, and this has changed the social and economic structure of the community. Some of the revenue generated by the tourism industry is retained by the local community in employment, and through the purchase of local goods and services. This has improved the standard of living. Although this suggests that the park has close ties with the community and has had a positive impact, there have also been some negative impacts. The incomes of some fishers have suffered. There are also the potentially serious environmental impacts caused by coastal development and over-exploitation of resources, along with degradation due to the increased number of visitors to the MPA. It is often difficult to separate tourism development in general from MPA-specific interventions, and to say how much tourism relies on the MPA versus other elements of the tourism package.

Regarding the GRMR, the observed economic and social impacts of the MPA suggest that additional measures will need to be taken if the MPA is to contribute to poverty alleviation in adjacent communities. Urgent attention should be given to training fishers to take advantage of alternative or additional income generating opportunities in tourism (such as recreational fishing).

In concluding, it must be noted that if the GRMR and HCMR are to be used as means to derive benefits for assisting poverty alleviation there must be effective management with all stakeholders assuming responsibly for the resources and their shared uses. Only then can the economic situations,

livelihoods and the quality of life of the adjacent communities be improved on a sustainable basis while the marine resources are developed rationally. If the sustainable livelihoods approach is employed as a process tool in policy, planning and management it is more likely that community-level benefits can be derived from MPAs. However, these cases demonstrate that, even if pro-poor and sustainable livelihoods approaches are not used, it is possible for some benefits to accrue.

Table 4. Summary of fisher (boat owner/captain) responses to selected questions on management of the Glover's Reef Marine Reserve and Hol Chan Marine Reserve

Question	Response	No. responses (% responses)			
		Glover's Reef			Hol Chan n = 17
		Dangriga n = 8	Hopkins n = 16	Total n = 24	
What do you consider to be indicators of MPA success?	Conservation	6	14	20(57.1)	9 (25.0)
	More benefits to stakeholders	1	2	3(8.6)	13
	Economic benefits to MPA	2	1	3(8.6)	(36.1)
	Enforcement of regulations	2	0	2(5.7)	4 (11.1)
	Community participation	4	0	4(11.4)	1 (2.8)
	Research	0	3	3(8.6)	3 (8.3)
	Other	0	0	0	5 (13.9)
Is the MPA successful?	Yes	8	13	21(87.5)	13
	No	0	3	3(12.5)	(76.5)
How do you receive information about the MPA?	Associations	2	1	3(12.5)	8 (47.1)
	Grape vine	0	5	5(20.8)	2 (11.8)
	MPA management	5	4	9(37.5)	1 (5.9)
	No Information	1	2	3(12.5)	3 (17.6)
	Other	0	4	4(16.7)	3 (17.6)
Your level of knowledge about the MPA	High	0	2	2 (8.4)	2 (11.8)
	Medium	4	7	11(45.9)	10
	Low	4	7	11(45.9)	(58.8)
Do you receive adequate information?	Yes	1	5	6(25.0)	6 (35.3)
	No	7	11	18(75.0)	11
What is level of stakeholder participation in MPA management?	High	2	3	5(20.8)	3 (17.6)
	Medium	4	8	12(50.0)	7 (41.2)
	Low	2	5	7(29.2)	6 (35.3)
	None	0	0	0	1 (5.9)
Is there conflict in the MPA?	Yes	3	11	14(58.3)	12
	No	5	5	10(41.7)	(70.6)
What is the conflict issue?	Zoning	0	1	1(4.2)	7 (41.2)
	Resource use	2	1	3(12.5)	5 (29.4)
	Management	1	9	10(41.7)	0
	Not applicable	5	5	10(41.7)	5 (29.4)
What effect has MPA had on conflict?	Reduced	1	7	8(33.3)	0
	Increased	0	0	0	5 (29.4)
	No difference	7	7	14(58.3)	11
	Not sure	0	2	2(8.4)	(64.8)
Would you like to see improvement to management?	Yes	7	16	23(95.9)	17(100)
	No	1	0	1(4.2)	0
What improvements would you like to see in management?	Community participation	6	7	13(15.3)	9
	Regulations/enforcement	7	8	15(17.6)	(20.1)
	More benefits to stakeholders	2	7	7(8.2)	10
	More information	4	17	21(24.7)	(22.1)
	Better demarcation of zones	4	17	21(24.7)	1 (2.2)
	Other	2	8	8(9.4)	8 (17.8)
					13
				(28.9)	

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