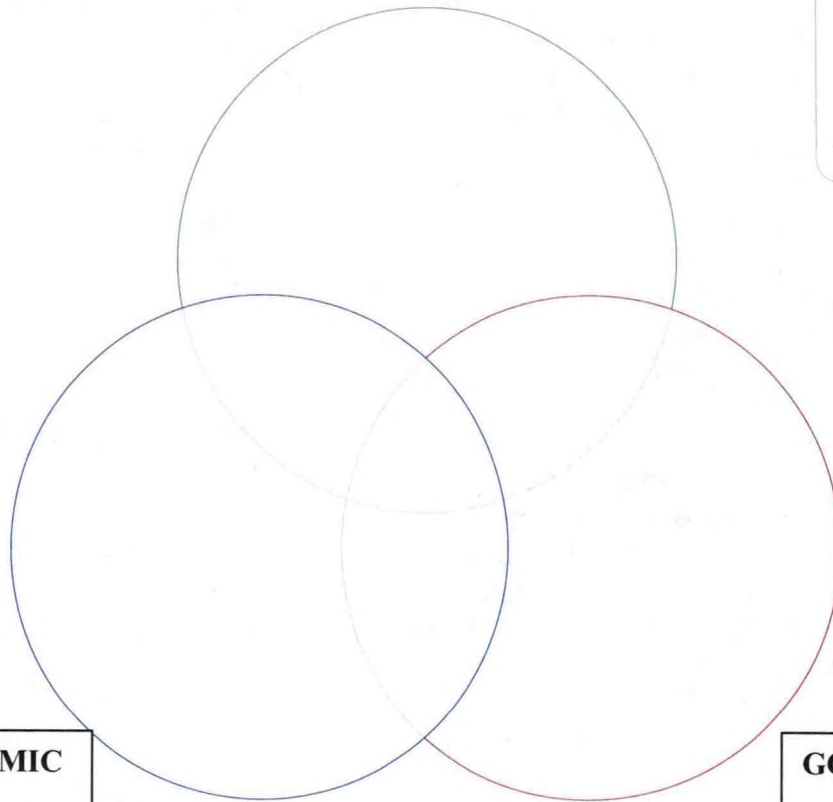
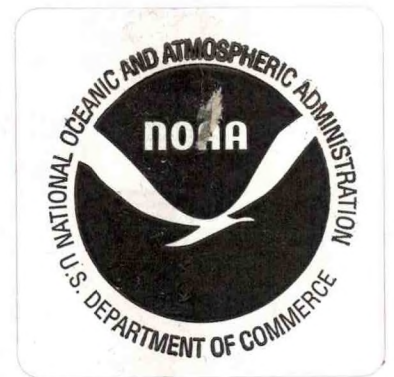


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2004**

Management Evaluation of the Hol Chan Marine Reserve

BIOPHYSICAL



SOCIOECONOMIC

GOVERNANCE

SPONSORED BY WWF and NOAA

INTRODUCTION

The Hol Chan Marine Reserve was declared in May 1987 and was the first managed marine protected area in Belize. It includes interdependent mangrove, seagrass and coral reef habitats (Figure 1) within its relatively small area (1545 ha). At the time of its designation time the community of San Pedro had active commercial fishermen, who had to be convinced about the benefits of marine reserves, particularly for the zones that would be completely closed to fishing. Many workshops and public forums were held before and after the reserve's declaration to clarify and educate the community about its goals and objectives. The community has now largely transformed into a tourism-based economy with few full-time fishers remaining. The reserve now has good community support. It is considered the community's major tourist attraction and is credited with contributing to the economic development of the island. In fact, Hol Chan has consistently been Belize's main marine tourism attraction. Its success has fueled the declaration of many more MPAs, with a total of eighteen now in Belize. The 1987 Management plan was revised and updated in 2000.

The first six years of management were funded by the World Wildlife Fund, followed by the Government of Belize. By 1995, the Government of Belize enacted legislation so that the admission fees (which had been collected and held in trust) could be used for the management of the reserve. However, the low fee (\$US1.50) and low-level budget left the reserve operating at minimal efficiency levels for many years. However, in 2001, the reserve management started to attract small but significant international funding to restart environmental education programs, carrying capacity studies and other monitoring programs. In addition, the annexation of Shark Ray Alley as Zone D of the reserve, and the restructuring of the admission fee (US\$5), the reserve has started to be financially sustainable since the beginning of 2003.

Hol Chan was included in a management effectiveness evaluation conducted by the Coastal Zone Management Authority and Institute in 2000, using the WWF/CATIE methodology. Reserve management was found to be moderately satisfactory and a number of management changes resulted from that initial evaluation. Attaining full management efficiency is still a challenge, as many issues and programs need to be addressed and redeveloped now that funding is more secure.

In October of 2002 the manager of the Hol Chan Marine reserve, met with the WWF project coordinator (Carlos Garcia), and other WWF, NOAA and IUCN collaborators in Hawaii to finalize the draft WCPA/IUCN methodology for evaluating management effectiveness. In this workshop the MPA managers selected the specific indicators to be measured, based on the objectives of their MPA, and drafted a work plan for their site. The indicators that were selected for the Hol Chan Marine Reserve, are listed in Table 1.

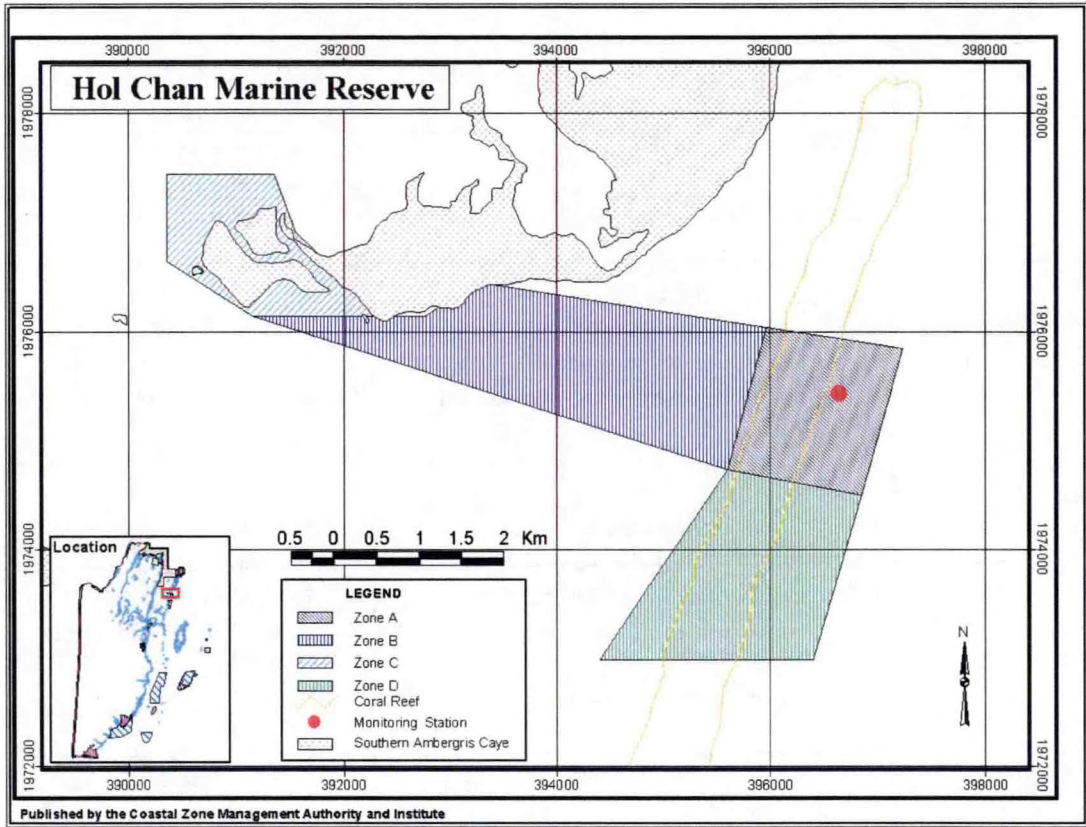
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Figure 1 Map of the Hol Chan Marine Reserve



RESULTS

Work began in early 2003 and terminated in September 2003. The results were recently presented at a workshop in Belize City, which was attended by approximately thirty stakeholders and other MPA managers. These participants are now eager to conduct such evaluations in their MPAs. About a dozen MPA staff members also were trained in how to select indicators for their MPAs. In addition, a MPA network evaluation concept was developed, and will be turned into a proposal which will incorporate the use of these guidelines among Belize's system of reserves.

The following sections summarize the results of the evaluation for each of the sub-components (Biophysical, Socioeconomic and Governance). Table 1 presents the full list of indicators selected for the evaluation during the workshop in Hawaii in October 2002.

Table 1. Indicators Selected for the Hol Chan Marine Reserve

Category	Indicator	Method
Biological	Focal Species Abundance	Data and Reports from past monitoring activities. Species Count.
	Focal Species population Structure	In situ surveys. Data and reports from past monitoring activities.
	Area under reduced human impact	Resource use analyses and threat identification.
	Type and Level of fishing effort	Interview resource users. Collect catch data.

Category	Indicator	Method
Socioeconomic	Household occupational structure	Survey interview form to a sample.
	Perception of non-market and non-use value of the MPA	Interview a sample of household.
	Local use patterns	Use pattern analysis and interview users.
	Local attitudes and beliefs	Survey a sample of households.
	Community knowledge of natural history	Focus groups interviews.
	Level of understanding of human impacts	Survey user groups.
	Distribution of scientific knowledge to the community	Survey households and interview key stakeholders.
	Income distribution by source by household	Survey households.

Category	Indicator	Method
Governance	Existence of management plan and adoption	Review management plan and level of adoption.
	Understanding MPA rule and regulation	Interview stakeholders.
	Existence and compatibility of legislation with needs of MPA MP	Legal diagnosis of rules and regulations.
	Level of satisfaction of stakeholders with participation	Survey stakeholders.
	The amount and quality of training for resource users to participate in management	Review number of training opportunities. Interview management and other organizations providing training. Analyze budget assigned to training.
	Available human resource and equipment for surveillance and monitoring	Review management plan and current monitoring and surveillance plan.
	Clearly defined enforcement procedures	Review management plan and current enforcement procedures.
	Number of patrols per time period	Review management plan patrol schedule.
	Effective education program on compliance for stakeholders	Record number of workshops and training programs to stakeholders. Interview stakeholders.
	Regular meetings of MPA staff with stakeholders	Review agendas and minutes of meetings. Interview stakeholders.

Biophysical Indicators:

The four indicators selected were Focal Species Abundance, Focal Species Population Structure, Area under reduced human impact, and Type and Level of fishing effort. To measure these indicators data was collected on focal species inside and outside the marine reserve using standardized transect methodologies, including belt transects for fish and conch, and timed surveys for lobster. A recently completed study of visitor impacts in the reserve was used to evaluate the third indicator and the last indicator was not evaluated due to the difficulty of getting information on catch from the local fishermen.

Focal Species: Queen Conch (*Strombus gigas*)

Introduction:

Queen conch is Belize's second most valuable export fishery, and is under heavy fishing pressure. Populations are generally considered to be declining, with the only remaining healthy stocks being found in deep water inaccessible by skin divers and in the fully-protected zones of MPAs.

The Hol Chan Marine Reserve is known to have a relatively healthy queen conch population within its no-take zone (Zone A). This report presents finding from several years of monitoring the conch population in the Marine Reserve. We also selected a similar unprotected reference site (Mexico Rocks) and compared its queen conch population for the current year.

Methodology:

Within the no-take zone of the HCMR two areas were selected. These were the back reef and the seagrass meadows. Zone B where fishing is allowed was also surveyed. It is generally accepted that no-take zones provide a spill over effect to adjacent fished areas. Zone B is immediately west of Zone A and covers a large expanse of seagrass. Therefore this zone was surveyed in order to have an idea of the extent of the spill over effect.

In Mexico Rocks the back reef and the seagrass meadows were surveyed. These areas are currently under fishing pressure and have no protection apart from the national fisheries regulations.

A total of 10 transects were conducted at each habitat. A diver would lay a 30 meter line perpendicular to the barrier reef and count and measure all Queen conch found within one meter on either side of the transect line. After completion of a transect, the diver swims not less than 15 meters before laying the next transect. The diver swims in a north or south direction laying transects in succession of the other.

Results:

There are obvious differences between the conch populations in Hol Chan and the unprotected reference site, Mexico Rocks.

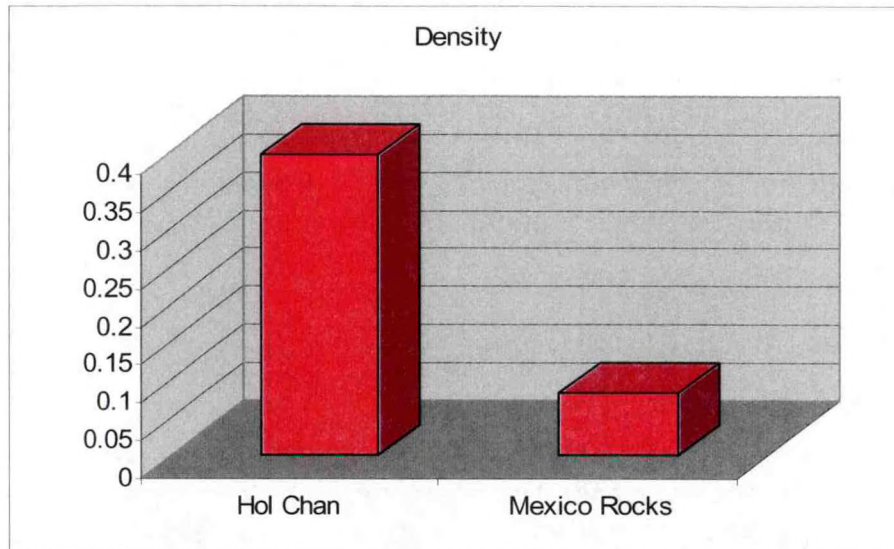


Fig 2: Comparison of Density (#/m²) Between Hol Chan and Mexico Rocks

The density of conch in Hol Chan is approximately five times higher than in Mexico rocks. (Fig 2)

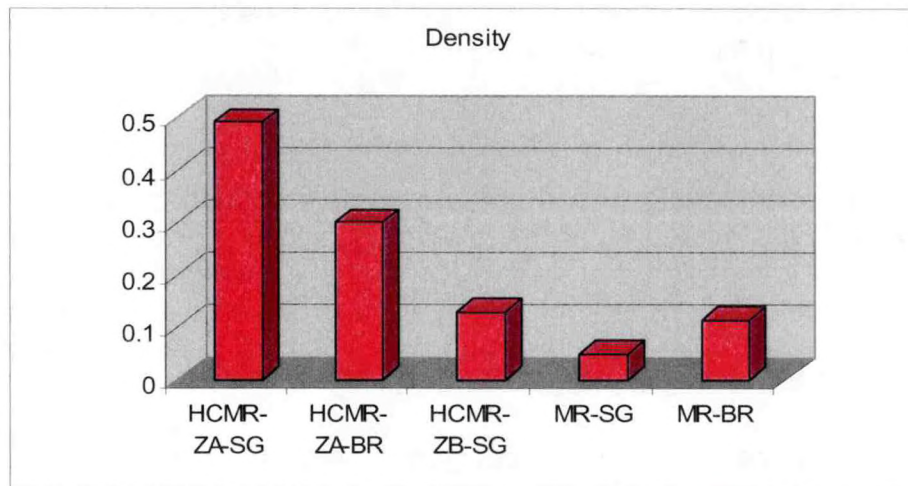


Fig 3: Density comparison between all sites surveyed (#/m²)

The graph on fig 3 illustrates queen conch density in all sites surveyed. The density on Back reef (BR) and seagrass (SG) in the no-take zone of HCMR are higher than in similar habitats in MR. It is also interesting to observe that the density on the sea grass bed of Zone B of the HCMR is higher than the similar habitat in Mexico Rocks, despite the fact that Zone B of Hol Chan is fished (with approximately the same fishing pressure). This may be the result of the 'spill over effect' from the adjacent no-take zone within the HCMR.

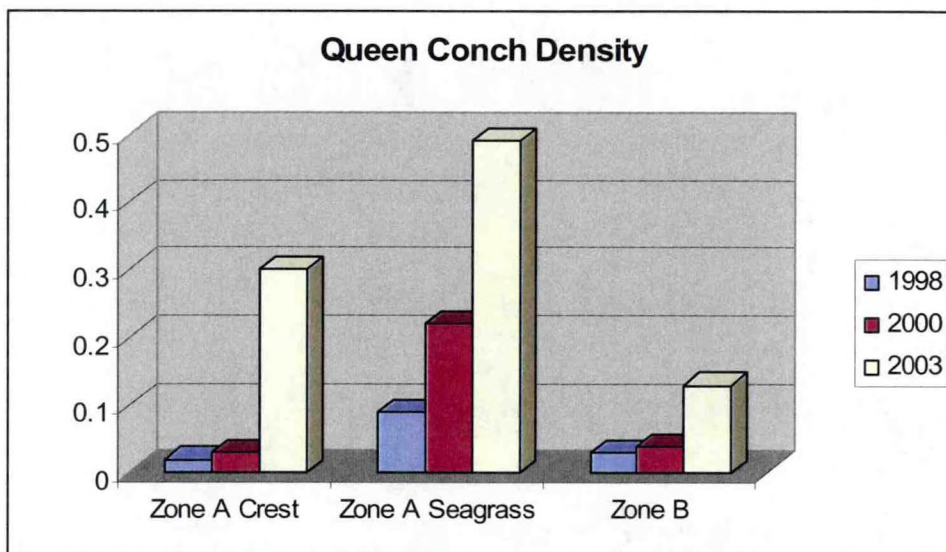


Fig 4: Queen Conch Density for 1998, 2000 & 2003

Fig. 4 shows that the number of queen conch per unit area appears to be increasing (over the last 5 years) within the Hol Chan Marine Reserve. There is no data on conch population at Mexico Rocks from corresponding years but it is known that this location has had no management even though it has been proposed as a MPA. Hol Chan on the other hand appears to have a healthy and increasing conch population.

Biophysical Indicator 1: Focal Species Abundance

From a scale of 1 to 5 we would rank the queen conch population in the HCMR a 4 because the data presented in this report suggests that the number of queen conch is steadily increasing. Also, the data suggests that the spill over effect is occurring to some degree. Additionally, the queen conch population in zone B appears to be increasing. Overall, the queen conch population in the HCMR is experiencing growth.

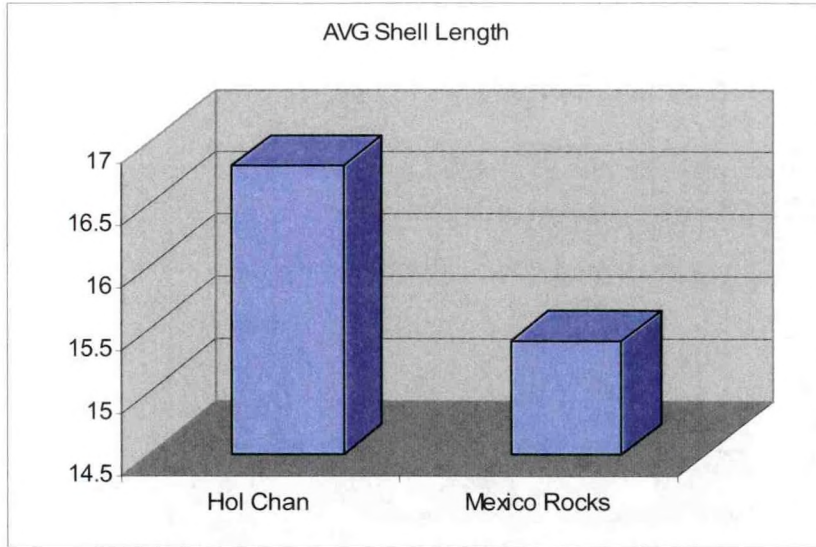


Fig 5: Comparison between average shell length (cm)

The data (Fig. 5) also show that the average shell length in Hol Chan is greater than in Mexico Rocks by over a centimeter.

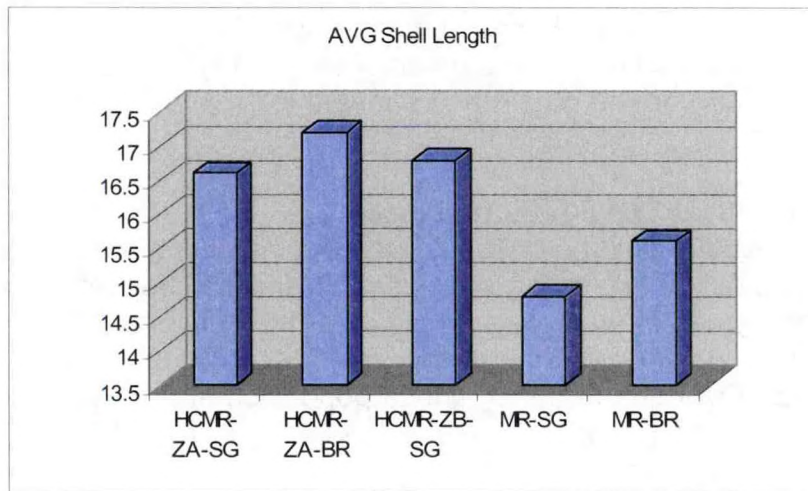


Fig 6: Average shell length comparison in all sites surveyed

The difference in average shell length between a protected area and one with no protection is also evident in figures 4 and 5. Even Zone B where fishing is allowed has a larger average shell length than at MR. Large conchs for the no-take zone may be spilling over to Zone B (seagrass)

Biophysical Indicator 2: Focal Species Population Structure

All sites surveyed in the HCMR have larger individuals than MR protection status. From a scale of 1 to 5 we would classify it as a three. There is not enough data to suggest that the average size is increasing over time. Therefore, we can not yet classify the population structure of the queen conch population in the HCMR.

However, it is important to note the additional sizes attained will have additional reproductive output as compared to smaller conch outside the reserve

Focal Species: Fish

Introduction:

There are several fish species that have a high commercial value for such as snappers and groupers. These species have been found to be larger and more abundant in MPAs due to the protection they receive from fishing. The Hol Chan Marine Reserve has been known to have a very high density of fish which serves as a major attraction for visitors. For the purpose of this project we used the AGRRA fish census methodology which looks at selected indicator species.

Methodology:

The AGRRA methodology for fish census uses a 30 meter belt transects. The transects were laid perpendicular to the reef crest and selected indicator species found within a 2 meters cube are counted as the surveyor swims along the transect. A T-bar was use to assist in estimating the width of the transect and size of fish. A total of 10 transects were conducted on the back reef of each location.

Results:

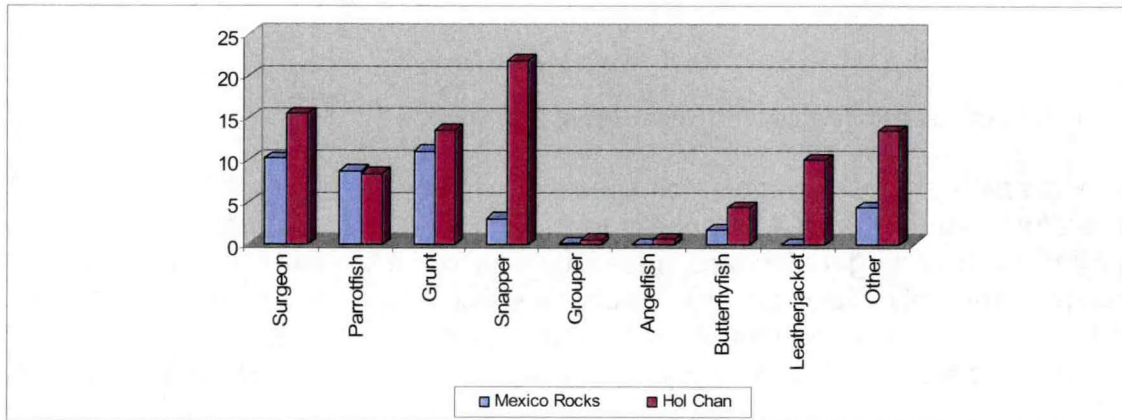


Fig 7: Density of selected indicator species

From the data obtained we can observe that on all selected fish group the density is higher in HCMR than in MR. The only exception are the parrotfish which show a slightly higher density in MR.

The most obvious difference in density can be seen on the snappers. In HCMR there are 21.83 snappers per every 100 m² compared to 3 snappers per every 100 m² at Mexico Rocks. Snappers are targeted by commercial fishermen and populations have declined in areas outside of MPAs.

Biophysical Indicator 1: Focal Species Abundance

The data suggests that the population density of selected indicator species in the HCMR is greater than in MR. This indicates that the fish population within the HCMR is healthy and experiencing growth. Therefore, we classify it as a category four. However, it is important to compile information of population growth over time in order to reinforce this category level. Earlier studies of fish populations also found Hol Chan to have higher abundance and sizes of most species, although methods employed were not directly comparable in terms of quantitative numbers per square meter.

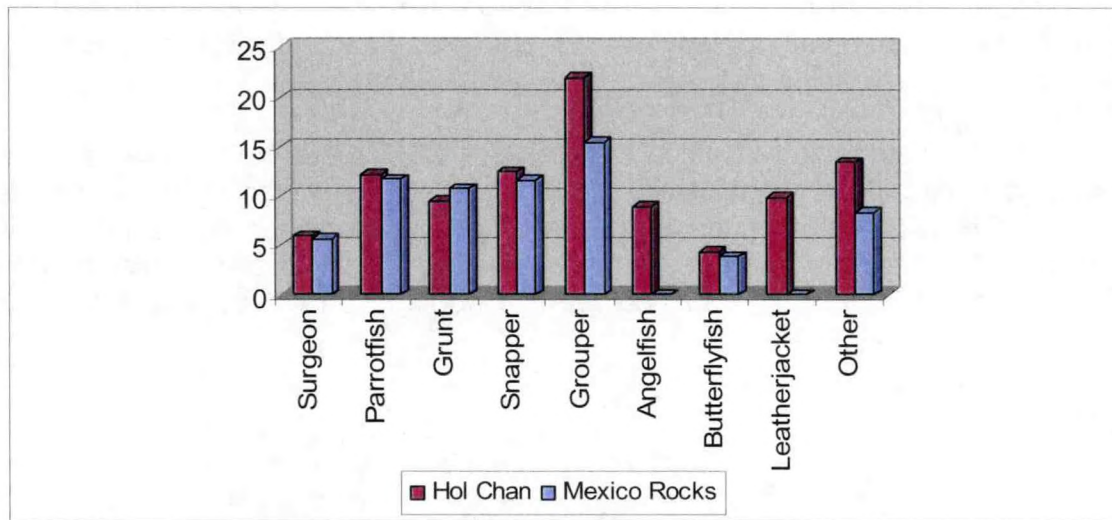


Fig 8: Average Size of Selected Indicator Species

The average size of all indicator species is higher in the HCMR than in MR. Therefore, fish in the HCMR appear to live longer and grow larger. Outside the marine reserve larger fish are prized by fishermen and are the first that are caught. The only exception are the grunts which appear to be larger in MR than in HCMR, which may be explained by added predation on this group in Hol Chan by the more abundant carnivores. This group not targeted by fishermen in Belize.

Biophysical Indicator 2: Focal Species Population Structure

We ranked the HCMR this indicator for average size of indicator fish species as a 3. The average size of fish in the HCMR is greater than in MR, however the differences are less prominent than those for abundance. As in the previous indicators, more information is required to determine the level of growth of the average size of indicator fish species. Also, it is important to note that higher abundances and sizes of fish are found in the Hol Chan cut (versus backreef areas), than in the back reef area sampled in this study. The cut was not sampled in this study due to the difficulty in finding a similar cut to serve as an adequate control site.

Focal Species: Lobster (*Panulirus argus*)

Introduction:

Lobsters have a high commercial value in the region and represent the most important component of the Belize fishing industry. The Belize government has employed various management tools in order to achieve sustainable management of the lobster fishing industry. Nevertheless, it appears that lobster populations are decreasing and conversely the catch is also decreasing. In this study we compared the lobster population in Hol Chan (no-take) and Mexico Rocks (Fished area) so we could have a picture of the difference of a fished versus no-fished area.

Methodology:

Two divers swim parallel to the reef crest for approximately 800 meters. This is a timed transect and in which lobsters observed. At the end they record the time taken to complete the transect.

Results:

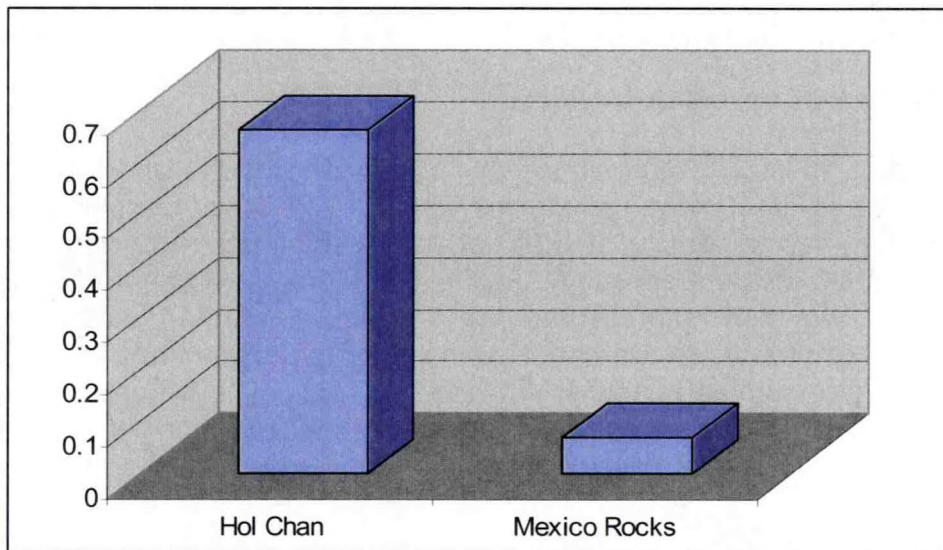


Fig 9: Density (Lobs/min) of lobster

The graph in figure 9 illustrates the density of lobsters in Hol Chan and Mexico Rocks for June 2003. The number of lobsters found in the protected Hol Chan back reef area is about 600% greater than the number found in the fished Mexico Rocks area. The timing of the survey corresponded to the end of the closed season, which should have the highest populations in the fished areas. However, there are reports of fishing throughout the close season and there is little surveillance in the area (which may have been fished in anticipation of the opening of the season shortly after our surveys). Hol Chan has patrols all year so illegal fishing within the reserve is maintained to a minimum.

Biophysical Indicator 1: Focal Species Abundance

It is clearly obvious that the density of lobster in the HCMR is far greater than at MR. This suggests that the population is relatively healthy and the reserve is meeting its goal of increasing important commercial species populations. Therefore, we rank this indicator as 4 where growth in the population is being experienced.

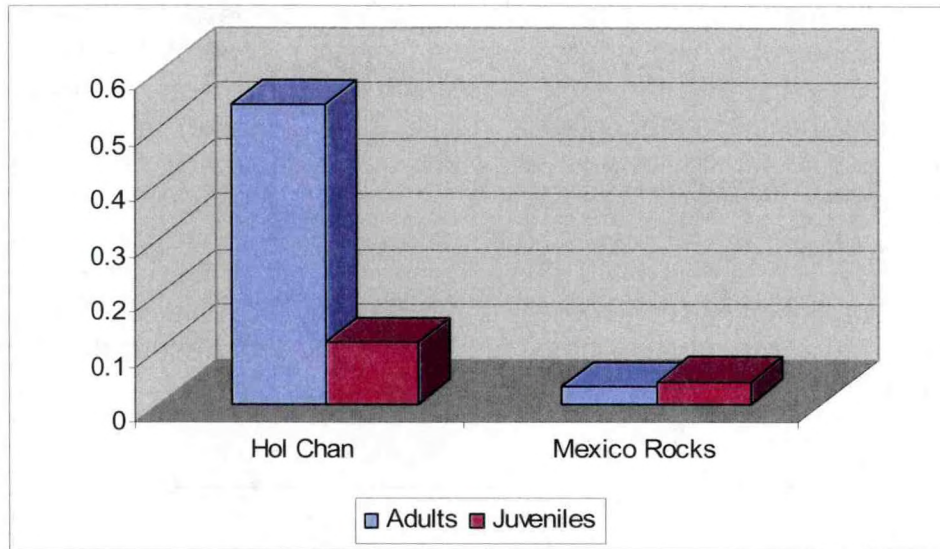


Fig 10: Size densities in Hol Chan and Mexico Rocks

The graph in figure 10 clearly illustrates that the density of adult and juvenile lobster in Hol Chan is greater than in Mexico Rocks. This is more obvious in adult where HCMR has a density of 0.54 lobsters per minute surveyed and Mexico Rock has 0.03 lobsters per minute surveyed/ A greater number of adult lobsters is a sign that fishing pressures are minimal. A greater number of juveniles may suggest that there are better chances for recruitment in a no-take zone and thus a higher number of adults. While the method employed and cryptic habitat of this species did not allow for a precise size measurement or even a good estimate, the basic juvenile (give approximate size you used for each class)

Biophysical Indicator 2: Focal Species Population Structure

The number of both adults and juveniles is greater in Hol Chan than in Mexico Rocks. Therefore we rank it as a 4 because the population appears to be healthy and the status of no-take appear to be have an effect on the growth of the population, particularly on the adult lobsters, which contribute reproductive output to the wider lobster populations outside of the reserve, replenishing depleted populations elsewhere. The reserve contains intact mangrove and seagrass ecosystems that may be serving as nursery areas for juvenile lobster.

Conclusion: Indicators B1 and B2

The results of this study suggest that all of the focal species selected appear to be more abundant and have a higher proportion of large / adult individuals than do the control unprotected study sites. The no-take zone (Zone A) appears to be effective in maintaining population growth for commercially valuable species such as the queen conch, the spiny lobster, and targeted commercial fish species that are vital for the fishing industry in the country. In Zone B traditional fishing practices are allowed for a limited number of fishers. In the future the reserve needs to measure the amount of harvesting occurring in the reserve and in comparable control sites.

Overall we would rank HCMR as a 3.5 to 4 for biophysical indicators 1 and 2. The population growth and high average size of focal species indicate that the HCMR is fulfilling to some degree this stated management objective (maybe cite this objective as stated in your management plan). Also, with additional effort the reserve can continue and expand on efforts to evaluate the status of the reef in the reserve relative to similar control sites outside the reserve.

SOCIO-ECONOMIC INDICATORS (ALSO SEE APPENDIX 2)

Socioeconomic 3: Material style of life of household.

Data collected for this indicator shows the socioeconomic status of the community with reference to their homes. Seventy six percent of those interviewed lived in houses with zinc roofing, 12 % of concrete and 6 % under tiled roofing. Sixty five percent of those houses were constructed out of wood while 35 % out of cement. Fifty nine percent had wooden windows, 35 % glass windows and 6 % metal windows. Fifty three percent had wooden floors, 29 % cemented and 18% had the floor tiled. Eighty eight percent of the households had flush toilet while only 12 % had outdoor toilets. Eighty eight percent had inside tap water supply (18% provided by pump) while 12 % had outside tap water source. A hundred percent of the households had electricity. Eighty two percent of those interviewed owned the households while 18 % rented. (Appendix 2 b). In general this reflects the relatively developed and high socioeconomic status of the community, relative to others in Belize. The condition has improved over time, although similar baseline data is not available. The reserve contributes to the tourism value of the area, which has fueled these economic improvements.

Socioeconomic 5: Household occupational structure.

The average age of those interviewed was 26 years old from a range of 1 to 65 years. Fifty five percent were male and 45 % females. Of the workforce, 6 % had diving as their primary source of income, 6 % from their own businesses, 6 % from farming (selling of products produced by family members inland), 12 % from rental businesses, 12 % from business management, 12 % from office work, 23 % from teaching and 23 % did not answer. When asked about any secondary

sources of income, 12% did not have one, and another 6 % were involved in common labor, 6 % in cooking, 6 % had a shop business, 6 % did private tutoring, 6 % additional catering and 52 % did not answer. When asked why they had a secondary source of income 62% said it was because their primary income source was inadequate, while 13% said that they liked to work and 25 % did not answer (Appendix 2 b). Overall, a variety of types of employment were noted, although their link to tourism and the reserve were not entirely clear. Most of the support businesses in the community are tied to tourism, although this was not clear from the specific questions given. More direct questions regarding the importance of tourism might be helpful in future questionnaires.

Socioeconomic 8 & 9: Perceptions of non-market and non-use value of the Hol Chan Marine Reserve.

The questionnaire in appendix 2 A had the following statements, which respondents were asked to rank according to the following scale: (V-very, S-strongly, D-disagree, A-agree, N-neutral, NR-no response)

1. The reefs are important for protecting land from storm waves and erosion.
2. In the long-run fishing would be better if we cleared the corals.
3. Unless mangroves are protected we will not have any fish to catch because they act as nursery areas.
4. Coral reefs are only important if you fish or dive.
5. I want future generations to enjoy the mangroves and coral reefs.
6. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow.
7. We should restrict development in some coastal areas so that future generations will be able to have natural environments.
8. Seagrass beds have no value to people.
9. The Hol Chan marine Reserve is important to the fishing and tourism industry because it encompasses three interrelated habitats (mangroves, seagrass beds & corals).

Statement	VSD	SD	D	N	A	SA	VSA	NR
1	6 %	0 %	0 %	0 %	0 %	0 %	82 %	12 %
2	52 %	6 %	12 %	6 %	0 %	0 %	6 %	18 %
3	18 %	6%	0 %	6 %	0 %	18 %	40 %	12 %
4	40 %	24 %	6 %	6 %	0 %	6 %	18 %	12 %
5	0 %	6 %	0 %	6 %	6 %	6 %	64 %	12 %
6	0 %	6 %	0 %	6 %	18 %	18 %	46 %	6 %
7	6 %	0 %	0 %	12 %	18 %	12 %	40 %	12 %
8	40 %	12 %	18 %	6 %	6 %	0 %	6 %	12 %
9	0 %	6 %	0 %	0 %	18 %	6 %	59 %	12 %

Overall respondents had strong opinions which supported conservation views, as every majority response either strongly agreed with a conservation statement or strongly disagreed with an anti-conservation statement. This suggests the reserve has been very successful with its education and outreach efforts to promote the value of reefs and associated habitats and the benefits of the reserve (see Appendix 2 b)

Socioeconomic 11: Local Use Patterns

When asked about the type of activities taking place at the HCMR, 64% mentioned snorkeling and diving, 6 % said protection of the natural resources, 6 % said research and 24 % did not answer. Twenty nine percent mentioned that development activities were taking place near the reserve, 18 % said that buoy replacements were being conducted, 6 % noticed patrols, 6 % noticed dredging activities, 12 % did not understand the question and 29 % did not answer.

Twenty nine percent felt that the abovementioned activities were not impacting the marine resources, 6 % said there was environmental protection, 6 % said there were negative impacts, 6 % did not understand the question and 53 % did not answer. Thirty five percent said that the HCMR staff were conducting some activities, 6 % said some private investors and 53 % did not answer. Eighteen percent said that they did not know what type of equipment was being used to conduct some of the above-mentioned activities, 12 % said boats, 6 % said a dredge and 64 % did not answer. Seventy percent mentioned that the people conducting the different activities were organized to use the marine resources, 18 % said no and 12 % did not answer. Fifty nine percent did not know in which zones or areas the different marine related activities were taking place, 12 % said yes and 29 % did not answer (Appendix 2 b).

Overall, there was some confusion regarding this set of questions and also more lacking knowledge about what type of activities were occurring in the reserve, although most knew about the main tourist-related activities.

Socioeconomic 12: Local values and beliefs regarding the Hol Chan Marine Reserve.

Seventy percent of the stakeholders believe that the seagrass/mangroves/coral reefs are important because they protect the coastline from erosion especially during storms, 6 % said that these resources attract tourist which is a source of income, 6 % said the resources provide habitats for various species and 12 % did not answer. Forty one percent said that fishing, diving and other activities were important to them because they depended on them, 35 % said the importance was for recreation, 6 % said development and 18 % did not answer.

Eighty two percent said that illegal fishing/dredging/mangrove clearance had negative impacts on the resources, 6 % said there were no impacts if the activities were controlled while 12 % did not answer. Thirty four percent said that people conducted these activities for survival, 24 % said out of greed, 6 % for development, 6 % did not witness any illegal activities, 6 % did not understand the question and 24 % did not answer.

Six percent said that the reserve management strategies were working, 11 % said that the staff can do better, 6 % said that the reserve staff need more visibility, 12 % were not acquainted with the strategies, 6 % said the strategies were doing average, 12 % good, 6 % fairly good, 12 % very good and 23 % did not answer. Thirty four percent said that the current reserve management strategies complimented local cultural beliefs and traditions, 18 % said no, 23 % did not know and 24 % did not answer.

The following statements were presented for responses (similar to previous response labels):

1. We have to take care of the land and the sea or they will not provide for us in the future.
2. We do not have to worry about the sea and the fish; God will take care of it for us.
3. We should manage the sea to ensure that there are fish for our children and their children.

The following were the responses: (Also see appendix 2)

Statement	VS A	SA	A	N	D	SD	VSD	No answer
1	58 %	0 %	12 %	6 %	0 %	0 %	12 %	12 %
2	12%	0 %	0 %	12%	12 %	6 %	46 %	12 %
3	46%	6 %	18 %	0 %	0 %	0 %	12 %	18 %

Overall, the community is supportive of the reserve and general conservation measures. They are informed about the potential negative impacts associated with development and support conservation management. Their perceptions about the reserve management are mixed and moderately positive/supportive.

Socioeconomic 14: Stakeholders knowledge of natural history.

When asked to give the 'local names' of numerous species (general 'common english names were given, 65% did not answer, while 35 % said they did not know any of the common names for the list of local fish mentioned in the questionnaire (appendix 2 b). This question seems not to be a good measure of local knowledge and another question should be developed for this indicator. However, given the demographics and employment profiles of the respondents, traditional knowledge of marine resources is also likely lacking in this group, possibly even more so than in the general community (a potential sampling bias).

Socioeconomic 15: Level of understanding of human impacts on the Hol Chan Marine Reserve.

Twenty nine percent felt that no events, activities or changes have affected or are affecting the natural environment in or around the reserve, while 12 % cited nearby dredging activities, 18 % coastal construction, 6 % illegal fishing, 6 % overcrowding and 29 % did not answer. Six percent said that there

were no changes to the natural environment which could be attributed to these activities, 12 % there was loss of habitats, 12 % said the resources were being depleted and 70 % did not answer. Twenty nine percent said the impact level was heavy, 18 % medium, 24 % minimal and 29 % did not answer. Six percent voiced that more HCMR staff monitoring is needed to alleviate impacts on the reserve, 6 % said more patrols, 12 % better planning by developers, 6 % said environmental offenders should be punished, 6 % said more public education about the activities are needed, 6 % said locals should avoid foreign influences in order to minimize impacts, 6 % said the activities need more monitoring and 52 % did not answer (appendix 2). Overall ideas about human impacts in the reserve were about evenly split among respondents, with slightly more recognizing impacts and habitat loss than not.

Socioeconomic 16: Distribution of scientific knowledge to the San Pedro Community.

Twenty nine percent of respondents were aware of research being conducted at the Hol Chan Marine Reserve, 53 % were not aware and 18% did not answer. Eighty two percent have not seen or heard any of the reports on the coral health, fish, conch and lobster population studies and 18 % did not answer. Seventy one percent said that they had not seen or heard the results of the carrying capacity study that was recently conducted and 29 % did not answer. Seventy six percent mentioned that they did not attend any of the three public forums held to inform about the carrying capacity study and 24 % did not answer. Twenty four percent said they did not attend the public forums because they were not invited, 18 % were not aware of the events, 12 % did not attend because they were not guides, 6 % said they did not have time and 40 % did not answer.

Twenty four percent said that they had confidence in the data being generated by the reserve staff, 35 % had no confidence and 41 % did not answer. When asked the reserve staff could improve on the information service, the results were as follows:

Comment	Percentage
More community involvement is needed	40 %
More school workshops are needed	6 %
More stakeholders meetings are needed	6 %
Country wide public forums are necessary	6 %
There should be more advertisement on research results	6 %
No comments	6 %
No answer	24 %

Overall, the community is not well informed about the reserve's studies, with 82% not aware of regular monitoring results. They expressed a desire to have more involvement with the reserve, which should be addressed by management.

Socioeconomic 17: Income distribution by source by household.

When asked about household income, only 53% responded (likely due to fears about governmental taxation). The percentage of importance is as follows:

Percentage of income	Percentage of importance
5 %	13 %
50 %	13 %
60 %	13 %
80 %	37 %
87 %	12 %
100 %	12 %

A hundred percent did not answer what were the different types of livelihood of the households. Twenty nine percent gave an answer on what was the relative importance of each livelihood activity to the overall household income and 71 % did not answer. The results are as follows:

Percentage of overall household income	Percentage of importance
50 %	80 %
75 %	20 %

This set of questions was inadequate as a measure of household income, because respondents did not fully understand the questions. The questions were too open-ended and should have listed example categories of the main livelihoods, etc. Also, it is recognized that people are generally fearful about discussing income due to perceived potential taxation issues. (see Appendix 2)

GOVERNANCE INDICATORS (ALSO SEE APPENDIX 3)

Governance 1: Existence of a management plan and adoption of plan.

The present Hol Chan Marine Reserve Management Plan is a revision of the original draft management plan produced in 1987 by Mrs. Janet Gibson, Wildlife Conservation Society (previously called New York Zoological Society) Officer. The draft management plan was never published or formally adopted. However, copies were made available during the consultative process through public forums and at various public places such as the local town board office and post office in San Pedro Town, Ambergris Caye, Belize. The document served as a guiding tool for the establishment of various programs undertaken by management of the reserve at various stages throughout the years.

The present management plan was produced by Earl Young and Barbara Bilgre in 2000, revised by James Azueta, Miguel Alamilla and Rocio Cordoba and edited by Francisco Pizarro. Young and Bilgre updated the document by conducting literature reviews and conducting questionnaires to the Hol Chan staff as well as stakeholders. The endeavor was made possible through a grant from IUCN Regional Office for Mesoamerica. Under this grant the Hol Chan Marine

Reserve was chosen as a pilot project site to identify socio-economic indicators and provided assistance with environmental education programs. The document "Hol Chan Marine Reserve Management Plan" was published in 2002 by Doble Giro S.A., Costa Rica, for the Fisheries Department, Government of Belize and it was formally adopted at the time of printing.

Governance 2: Understanding of MPA rules and regulations by the community.

When stakeholders fully understand the rules and regulations of a protected area, the chance of success is greater. Thus, a questionnaire was conducted on the major stakeholders using the HCMR. (Appendix 3) Of those polled, 24% were tour guides, 18% were fishermen and 58% were classified as others (hoteliers, shop keepers, dive shop operators and tour operators, etc). Of the fishermen interviewed 83% were independent and 17% were affiliated to the Caribena Fishermen Cooperative Society Limited. This reflects the claim by various locals that the cooperative membership has been diminishing from the record high of 280 in 1977 to around 32 in 2002 (G. Kumul personal communication). Sixty two percent of the tour guides were catering to sports fishing while 38% were catering to SCUBA diving and snorkeling. This is not reflective of the composition of the San Pedro Tour Guide Association which has 220 members and about 75 % cater exclusively to SCUBA/snorkel guiding (B. Leslie personal communication).

Stakeholders Interviewed Composition	
Fishermen	18 %
Tour Guides	24 %
Tourists	0 %
Others (tour operators, hoteliers etc.)	58 %
Total	100 %
Fishermen Composition	
Independent	83 %
Cooperative Member	17 %
Tour Guide Composition	
SCUBA/snorkel	38 %
Sports Fishing	62 %

Those interviewed ranged from 1 to 25 years experience in their professions. Thirty percent were in the age range of 15 to 25 years, 40 % in 26 to 35, 9 % in 36 to 45, 6 % in 56 to 65 and 15 % did not answer. Eighty five percent were born in Belize, 3 % in Guatemala, 3 % in Canada and 9 % gave no answer. Of those born in Belize 18 % were born in San Pedro Town, 25 % in San Ignacio Town, 28 % in Belize City, 7 % in Orange Walk, 18 % in Punta Gorda Town and 4 % from Corozal Town. Thus only a small percent were born in San Pedro Town, the home of the Hol Chan Marine Reserve.

A high percentage of those interviewed (78%) were aware about the Hol Chan regulations, but with 18 % being unaware. Fifty eight percent got their

information from brochures, 3 % from the Hol Chan Website, 24 % from the tour guides, 9 % from workshops offered by the reserve staff and 6 % gave no answer.

The following were the answers by those interviewed about the reserve regulations:

1. No diving without proper equipment
2. No touching of corals
3. Do not remove flora or fauna
4. Do not feed fish
5. Always have a buddy when diving
6. Guides must explain regulations
7. No fishing
8. No SCUBA diving in Zone D
9. Need entrance ticket
10. No anchoring outside the reef
11. No littering

Thirty four percent said that the Fisheries Department declares the reserve's regulations while 30 % gave no answer, 12 % said Hol Chan, 6 % BTB, 3 % BTIA and 3 % said the community in general. Seventy two percent said that the rules and regulations are simple and easy to understand while 12 % said that they were difficult to understand:

a) Rules and regulations are very complex and difficult to understand.	3 %
b) Rules and regulations are complex and difficult to understand.	0 %
c) Rules and regulations are of average complexity.	9 %
d) Rules and regulations are simple and easy to understand.	53 %
e) Rules and regulations are very simple and easy to understand.	19 %
f) No answer.	16 %

Sixty five percent said they felt that the rules and regulations design process was participatory while 19 % said no and 16 % did not answer. Fifty five percent said that they felt "ownership" of the reserve rules and regulations while 33 % said no and 12 % did not answer. Seventy six percent felt that the rules and regulations are credible and appropriate while 12 % felt that they were not and 12 % did not answer. Eighty five percent felt that the rules and regulations are socially acceptable while 3 % said no and 12 % did not answer. Sixty three percent did not answer which rules and regulations were acceptable. However, 27 % said that all the regulations (below) were acceptable.

- No fishing in the area
- No standing on corals
- No removing of flora and fauna
- All regulations are acceptable

Again, 63 % did not answer when asked why they felt the rules and regulations were acceptable or unacceptable.

Because the regulations protect the fish stocks
Because the regulations protect the reserve in general
Marine life protection is a priority
There is a need for continuous protection

Fifteen percent felt that the rules and regulations did not need improvement while only 6 % said they were fine. Below are the areas that need improvement:

- Enforcement of diving with proper equipment
- Enforcement of no fishing in area
- Increase fines for illegal fishing
- Enforce no touching of animals
- All regulations are fine
- No need for improvement at the this time (appendix 3)

While most stakeholders know and agree with the basic rules and regulations, there is an urgent need for the reserve staff to embark on an information campaign, due to the high turnover of stakeholders and the increase numbers of tour guides.

Governance Indicator 4: Existence and adequacy of legislation to enable the reserve to accomplish its goals and objectives.

The regulations governing the Hol Chan Marine Reserve are declared under Fisheries Act, Chapter 210, Revised Edition 2000. In July 1987, the Hol Chan Marine Reserve was granted reserve status under section 7 of the Fisheries (Amendment Act) of 1983. Section 9A-(1) of this Act states that "the Minister may, where he considers that the extraordinary measures are necessary, by order Published in the Gazette, declare any area within the fishing limits of Belize and as appropriate any adjacent surrounding land, to be a marine reserve". Subsection 9A-1(a) provides for special protection to the aquatic flora and fauna and to protect and preserve the natural breeding grounds and habitats of aquatic life. Subsection 9A-3(a) further states that "no person shall, in a marine reserve, engage in fishing without a license issued by the Fisheries Administrator.

In December 1988, the Hol Chan Marine Reserve Regulations was gazetted into law creating three zones and the rules and regulations governing each zone. They are Zone A, Zone B and Zone C. Recreational (non-extractive) activities such as diving and snorkeling can be carried out within Zone A. However, no person shall engage in fishing or remove or disturb any species of flora or fauna including rocks, dead coral shells, or sand within this zone. Sports and commercial fishing can be done within zone B and C under a special license from the Fisheries Administrator.

In September 1999, the HCMR regulations were amended to include another section of reef adjoining Zone A. It now features four zones and several sub-zones for special uses. Section 8A of the Hol Chan Marine Reserve (Amendment) Regulations of 1999 was used to designate Zone D as a multi-

purpose use zone consisting of a General Use Area and two Exclusive Recreation Areas. Within the General Use Area commercial fishing is allowed in all of Zone D except for the exclusive recreational areas of "Shark Ray Alley" and "Amigos del Mar Dive Wreck". Scuba diving and feeding of fish by tourists is prohibited at Shark Ray Alley. Hol Chan Marine Reserve (Amendment) Regulations of 1999 has replaced the former as the principal regulations. The Hol Chan Marine Reserve (Amendment) Regulations of 1994 also provides for the management of the HCMR through the establishment of a Board of Trustees. Section 13(1) states that "there is hereby established: a Board of Trustees for the purpose of directing and managing the affairs of the reserve. Section 14(1) (e) further states that "the function of the Board shall be to: manage the affairs of the reserve and disburse moneys from the same for the purpose of maintaining the integrity of the ecosystems within the reserve. The Board comprises 10 members from the private and public sectors and meets at least once every quarter for the transactions of business. The Fisheries Regulations of 1977 also apply within Hol Chan. Section 8(2) of the Fisheries (Amendment) Regulations of 1982 states that "no person shall with intent to take fish, use any trap or other device constructed of net or wire in any area within a distance of one hundred yards of the Barrier Reef. Section 26 of this regulation also prohibits anyone from setting nets across channels to restrict the free passage of boats or to wholly prevent the passage of fish.

The Wildlife Protection Act (WPA) of 1981 and the National Parks System Act (NPSA) of 1981 also provide for the governance of coastal and marine resources. The WPA states that "no person shall hunt, kill, or take any species of whale, any species of dolphin, manatee, Caribbean monk seal, salt-water crocodile and Morelet's crocodile. Under the NPSA, the minister can declare crown lands, including submerged lands and associated waters a national park, nature reserve, wildlife sanctuary or natural monument, though this act does not apply to the Hol Chan Marine Reserve (HCMR Management Plan 2002).

Governance Indicator 6: Level of satisfaction of stakeholders with participation.

In order to measure the level of satisfaction of stakeholders their level of participation in the management of the reserve was measured through a questionnaire (Appendix 4). Seventeen percent of those interviewed were fishermen. Of those fishermen, 100 % were independent fishermen. Thirty one percent said they were tour guides. Of the tour guides, 82 % catered to SCUBA diving/snorkeling and 18 % to sports fishing. Fifty two percent were registered as others.

Forty three percent ranged between 1 to 5 years in their occupation, 28 % between 6 to 10 years and 6 % between 16 to 20 years. The average years in the same occupation was 7.6. Thirty four percent were in the 20 to 30 year bracket, 33 % in the 31 to 40 years and 19 % in the 41 to 50 years. The average age of those interviewed was 37.5 years.

Seventy seven percent of those interviewed were Belizeans, 5 % Guatemalans, 3 % Hondurans, 6 % USA nationals, 3 % Canadians and 6 %

gave no answer. Of those that were Belizeans, 40 % were from the Belize District, 4 % from Orange Walk District, 26 % from the Cayo District, 4 % from the Corozal District, 15 % from the Stann Creek District and 11 % from the Toledo District.

Below are the results for the planning and management participation respectively:

Planning Participation	
Total Dissatisfaction	0 %
Some Dissatisfaction	3 %
Neutral	33 %
Some Satisfaction	28 %
Total Satisfaction	36 %

Management Participation	
Total Dissatisfaction	0 %
Some Dissatisfaction	6 %
Neutral	38 %
Some Satisfaction	31 %
Total Satisfaction	25 %

Twenty one percent of those interviewed said that they had representation in the Hol Chan Trust Fund Board of Directors through their fishing cooperative representative, 24 % said through their tour guide association and 55 % did not answer. Twenty two percent said they needed better representation, 70% said they did not need better representation while 8 % did not answer. Of those that said they needed better representation, 6 % said their tour guide association needed to do a better job, 3 % said they would look at another conservation organization, 3 % said they would seek their Belize Tourism Industry Association local branch and 88 % did not answer who they would identify for better representation (appendix 4).

Governance Indicator 7: The amount and quality of training provided to resource users to participate in the reserve management.

A capacity building program does not exist for the Hol Chan Marine Reserve. However, due to the expanding mandate of the reserve and the increase in expectation by the San Pedro Community, one is presently being developed. Capacity building for management of the reserve has been concentrated on staff training in various disciplines. Staff members have been trained in monitoring and research, protected areas management, environmental education, public relations and equipment maintenance skills. Eighty five percent of the capacity building training has been acquired through international training provided through organizations such as WWF, MesoAmerican Barrier Reef System Project, ICRAN, UNEP and IUCN.

About two to three major workshops are held annually by the reserve staff to meet with the major stakeholders such as the fishermen and tour guides. These workshops serve to introduce new rules and to get feedback. The reserve

staff has started to hold workshops to provide information on findings from the various ongoing projects. Overall, the level of stakeholders' participation in these meetings has been poor. This is not surprising as participation in the whole of Belize has always been poor on conservation issues. With the creation of the capacity building program, new innovations will have to be designed in order to attract the stakeholders to participate in the management process.

Governance Indicator 10: Available human resources and equipment for surveillance and monitoring.

With limited financial resources, the availability of human resources and equipment for surveillance and monitoring will always be imperfect. However, the reserve works with the resources available and is considered one of the best (or the best) enforced MPAs in Belize. This is assisted by the relatively small size of the reserve, its easy accessibility and its proximity to a supportive community. The HCMR presently has nine staff members: one manager, one administrative assistant, one marine biologist, one technician, three rangers, one environmental education officer and one Peace Corps volunteer. This is more staff than most other MPAs, most of which are larger and less accessible. The rangers deal with enforcement issues full time. The manager, biologist, technician and Peace Corps volunteer deal with the monitoring programs. There are times when the manager and technician have to assist the rangers in enforcement.

The reserve staff has two patrol vessels, one research vessel and various communication, SCUBA diving and monitoring equipment to do the surveillance and monitoring. About 19 % of the total reserve budget is allocated to fuel and lubricants in order to maximize surveillance and monitoring. Overall, there are sufficient staff and equipment for adequate surveillance of the reserve.

Governance Indicator 11: Clearly defined enforcement procedures.

The HCMR has clearly defined enforcement procedures. Patrols are planned and scheduled. The rangers are assigned to patrol shifts. The rangers each have their terms of reference, which outlines their duties. In the event of any violations, there are standard operations protocols that are followed. Violators are approached, and depending on the severity of the violation, they are either warned as a first offense or arrested. Those arrested are summoned to court or arrested and escorted to court along with any evidence. The court cases are handled by the Fisheries Inspector who is the Fisheries Department's prosecutor. The arresting rangers or reserve officers serve as witnesses for the cases.

Throughout the years of the HCMR management existence, only about six illegal fishing infractions have been detected. Three were successfully prosecuted and one is still pending (M. Alamilla personal communication).

Governance Indicator 12: Effective information dissemination to enhance and support compliance of stakeholders. (General)

Seventy five percent of those interviewed were tour guides, 19 % gave no answer and 6 % were both fishermen and tour guides (Appendix 5). Those who

were four guides said that 31 % catered to SCUBA/snorkeling, 8 % to sports fishing, 8 % to both Scuba/snorkeling and sports fishing and 53 did not answer.

Years in occupation and age composition

Years in Occupation		Age Group	
1 to 5	6 %	26 to 30	37 %
6 to 10	6 %	31 to 35	6 %
11 to 15	25 %	36 to 40	13 5
16 to 20	19 %	41 to 45	25 %
21 to 25	6 %	16 to 50	0 5
No Answer	13 %	51 to 55	13 %
		No Answer	6 %

Seventy five percent said that they were born in Belize, 13 % in the USA, 6 % in Curacao and 6 % in Guatemala. Seventy five percent said that public forums and workshops were provided during the planning of the HCMR, 19 % said no and 6 % did not answer. The number of forums and workshops attended are:

None	6 %
1 to 5	51 %
6 – 10	6 %
Some	6 %
Not sure	6 %
All	6 %
No Answer	19 %

Seventy five percent said that public forums and workshops were provided during the implementation phase of the HCMR, 6 % no and 19 % did not answer. Eighty one percent said that they were satisfied with the public forums and workshops, 6 % said no and 13 % did not answer. The following were the information provided at those forums and workshops:

- Printed materials
- Briefings
- Positive outlook
- First Aid Training
- Advertisements
- Workshop materials
- Basic information
- Protection information
- Reef & fish information

Eighty one percent did not answer why information was most effective. Those that answered said the following:

- Guide responsibility section
- Revenue generation
- Advertisements
- All were effective

Seventy five percent did not answer why certain information were more effective. Those that answered described the forums as: Helping understand about the reserve, being full of information and/or providing understandable information.

Sixty three percent said that the public forums and workshops affected their compliance behavior, 31 % said not and 6 % did not answer. The following were the answer to why the change in behavior:

- Made a better guide +
- Better information +
- Important for tour guides +
- Awareness +
- Never got workshops -
- Coral conservation policy +
- There is the need to protect the turtles +
- + positive comment - negative comment

Ninety four percent said that they had a better understanding of the rules, regulations and enforcement arrangements as a result of those events and 6 % said no. Eighty eight percent had a better understanding of the purpose of the HCMR as a result of those forums and workshops, 6 % said no and 6 % did not answer. Eighty eight percent had a better understanding of the conservation efforts geared towards sustainable use of our natural resources, 6 % said no and 6 % did not answer (appendix 5). Overall, the stakeholders have a clear understanding of the reserve purpose and have involvement in the management efforts of the reserve.

Governance Indicator 13: Effective information dissemination to enhance and support compliance of stakeholders. (Tourists)(Appendix 6)

The profession for the tourists interviewed are as follows: doctor (1), nurse (1) physician (1), priest (3), secretary (1), journalist (1), banker (3), tour guide (1), accountant (3), engineer (2), realtor (3), sales representative (6), house wife (2), lawyer (3), manager (3), financier (1), public relations officer (2), veterinarian (1), teacher (1), teacher (1), student (4), builder (1), therapist (1), film director (1), business consultant (1), advertiser (1), planner (1), driver (1), retired (1) and 15 gave no answer (Appendix 6).

The average age of those interviewed was 37.1 years. The age range composition is as follows:

15 to 25	4.5 %
26 to 35	52.2 %
36 to 45	25.4 %
46 to 55	2.98 %
56 to 65	9 %
66 to 75	6 %

Seventy five percent of the visitors were from the USA, 7.5 % from Canada, 3 % from France, 4.5 % from Great Britain, 1.5 % from Belize, 1.5 % from Australia, 1.5 % from Mexico, 3 % from Spain and 3 % from Italy.

Seventy three percent said that they had received information prior to visiting the HCMR, 25 % said no and 2 % did not answer. The information received was as follows:

Information Type	Percentage
Leaflets	5.97 %
Brochures	17.9 %
Verbal briefing by dive shop	28.35 %
Verbal briefing by tour guide	44.77 %
Verbal briefing by ranger	2.98 %
No answer	19.4 %

Seventy six percent were satisfied with the information received, 10.44 % were not and 13.43 % did not answer. The following are the most effective information received:

Reserve destination information	2.98 %
Tour guide briefing	40.3 %
Brochures	
All information provided	7.46 %
Internet information	
Book about Belize information	
Hotel information	2.98 %
No Answer	38.8 %

The following were the answers to why the information above-mentioned were most effective:

The area was more appreciated	1.49 %
The information gave directions	1.49 %
The information was detailed	31.34 %
Brochures were very informative	2.98 %
During briefing it could be interactive	1.49 %
Information calmed fears	2.98 %
Book information was detailed	1.49 %
Witnessed descriptive information	1.49 %
Did not answer	55.22 %

Eighty nine percent said that they understood the rules and regulations as provided, 5.97 % said no and 4.47 % did not answer. Eighty two percent said that they had a better understanding of the purpose of the reserve, 13.43 % said no and 4.47 % did not answer. Ninety one percent of the visitors said that they would recommend visiting the reserve to a friend, 1.49 % said no and 7.46 % did not answer. The following were suggestions made to improve dissemination of information about the reserve:

There is the need for more leaflets with information.
There is a need to improve the website.
Management should demand the separation of skilled divers and snorkelers from the beginners.
Management should cut down the number of visitors from the cruise ships.
Dive masters should always supervise divers and snorkelers.
Management should make the information through advertisements.
More brochures are needed at the hotels.
There is the need for a coral and fish guide.
The rangers need to interact more with the visitors.
More information is needed on neighboring Caye Caulker (appendix 6).

Governance Indicator 14: Regular meetings of reserve staff with stakeholders.

Seventeen percent of those interviewed were fishermen. Of those fishermen, 100 % were independent fishermen (Appendix 7). Thirty one percent said they were tour guides. Of the tour guides, 82 % catered to SCUBA diving/snorkeling and 18 % to sports fishing. Fifty two percent were registered as others.

Forty three percent ranged between 1 to 5 years in their occupation, 28 % between 6 to 10 years and 6 % between 16 to 20 years. The average years in the same occupation was 7.6. Thirty four percent were in the 20 to 30 year bracket, 33 % in the 31 to 40 years and 19 % in the 41 to 50 years. The average age of those interviewed was 37.5 years.

Seventy seven percent of those interviewed were Belizeans, 5 % Guatemalans, 3 % Hondurans, 6 % USA nationals, 3 % Canadians and 6 % gave no answer. Of those that were Belizeans, 40 % were from the Belize District, 4 % from Orange Walk District, 26 % from the Cayo District, 4 % from the Corozal District, 15 % from the Stann Creek District and 11 % from the Toledo District.

Thirty three percent said that they had participated in meetings with the Hol Chan staff, 63.9 % said no and 2.8% did not answer. Thirty three percent did know that they had representation through their organizations at those meetings, 63.9 % said no and 2.8 % did not answer. Thirty percent said that they felt that their representatives were being taken seriously, 55.5 % said no and 13.8 % did not answer. Thirty percent felt that the meetings were open and transparent to the stakeholders, 63.9 % said no and 5.5 % did not answer. Thirty three percent said that they or their representatives were allowed to participate in making rules and regulations while 47.22 % said no and 19.44 % did not answer (appendix 7).

Summary of Governance Indicators:

Governance 1: There is a management plan that has recently been revised and adopted. Rating: highly satisfactory

Governance 2: There is a high awareness of rules and regulations by stakeholders. However, a very low percentage actually knows who declared the regulations. The reserve staff needs to address the issue of stakeholders'

representation at the Board of Trustees. Obviously, there is a communication gap between the representatives and their respective organizations. The rules and regulations were clear, credible and acceptable. Rating: Highly satisfactory

Governance 4: There is the existence of adequate legislation for the reserve to achieve its goals and objectives. Rating: Extremely satisfactory

Governance 6: There is satisfaction in the planning and management processes for the reserve. A high percentage said they did not need better representation. Rating: moderately satisfactory

Governance 7: The staff capacity building process was very high for the reserve staff but low for the stakeholders. This has been a problem due to the stakeholders' low participation. The reserve staff has to design new ways on how to attract stakeholders to participate in the capacity building process.

Rating: satisfactory

Governance 10: Available human resources and equipment for surveillance and monitoring is improving. Rating: moderately satisfactory

Governance 11: There are clearly defined enforcement procedures in place.

Rating: Highly satisfactory

Governance 13 (General): Information dissemination is high and satisfactory. Because of the information provided, stakeholders have a better understanding of the reserve and conservation efforts in general. Rating: Highly satisfactory

(Tourist) Tourists are receiving information that is very clear to understand.

However, the information dissemination process can be improved. Rating: moderately satisfactory

Governance 14: Meetings between the reserve staff and stakeholders have been low. The reserve staff has to provide more meetings and try to attract more stakeholders' participation, which has been one of the main reasons for fewer meetings. Rating: moderately satisfactory

Final Notes on Methodology: The evaluation methodology used is very flexible but concise. Of the various indicators that can be applied, the most applicable to the reserve were used. The rating system does not necessarily establish a management failure but rather points to strong areas and weakness in the management regime of a protected area. Better results can be obtained when the interviewer reads the questions and clarifies any doubt about a question to the person being interviewed. In this evaluation process, the interviewers handed over the questionnaires to the targeted stakeholders and collected them later for processing. Peer review of the questionnaires is also necessary to ensure clear formatting and fluency in the questions chronological order. When the overall ratings for the different components are tabulated, the Hol Chan Marine Reserve management is highly satisfactory, although there is still room for improvement in the areas identified.

STAKEHOLDER QUESTIONNAIRE

The Hol Chan Marine Reserve was declared a protected area on May 1987 by the Minister of Agriculture and Fisheries. The reserve was declared as a fisheries management tool, an area for controlled recreation, research and education. Being the first marine reserve in Belize, basic rules and guidelines were implemented to address human impacts in the late 1980s. However, due to development and usage pressures the reserve staff is constantly conducting surveys to receive feedback on how to better manage the area. This questionnaire is an attempt to collect socio-economic data to better serve the stakeholders using the Hol Chan Marine Reserve.

Material Style of Life of Households

1. Type of roof: tile ___ concrete ___ zinc ___ wood shingles ___ thatch ___
2. Type of outside structural walls: brick/concrete ___ wood ___
3. Windows: glass ___ wooden ___ metal ___ screen ___ open ___
4. Floors: tile ___ wooden ___ cement ___ none ___
5. Toilet: flush ___ pail flush ___ outdoor ___
6. Water: inside tap ___ pump ___ outside tap ___
7. Electricity: yes ___ no ___
8. Household furnishings: a/c ___ fan ___ refrigerator ___ radio ___ tv ___
computer ___ phone ___
9. Do you own ___ or rent ___?

Control # 3

Household Occupational Structure

Household member	Age	Gender	Education	Primary Occupation	Secondary Occupation	Tertiary Occupation
1						
2						
3						
4						

1. What is the primary source of income?
2. What is the secondary source of income?
3. Why do you have a secondary source of income? _____

Control # 5

Perceptions of Non-Market and Non-Use Value of the MPA

1. The reefs are important for protecting land from storm waves and erosion.
2. In the long-run fishing would be better if we cleared the coral.

Very Strongly Disagree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Very Strongly Agree

3. Unless mangroves are protected we will not have any fish to catch because the act as nursery areas.
4. Coral reefs are only important if you fish or dive.
5. I want future generations to enjoy the mangroves and coral reefs.
6. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow.
7. We should restrict development in some coastal areas so that future generations will be able to have natural environments.
8. Seagrass beds have no value to people.
9. The Hol Chan Marine Reserve is important to the fishing and tourism industry because it encompasses three interrelated habitats (mangroves, seagrass beds & corals).

Control # 8 & 9

Local Use Patterns

1. What marine related activities are taking place at the Hol Chan Marine Reserve?

2. What development activities are taking place near the reserve?

3. What impacts are these activities having on the marine resources?

4. Who is conducting these activities?

5. What equipment is used to conduct these activities?

6. Are people organized to use the marine resources? Yes ___ No ___
7. Do you know in which zones these different marine related activities take place?
Yes ___ No ___

Control # 11

Local Values and Beliefs Regarding Marine Reserves

1. Why is/are the seagrass/mangroves/coral reefs important to you?
2. Why is/are fishing/diving/other activities important to you?
3. Does illegal fishing/dredging/mangrove clearing hurt the resource?
4. Why do people conduct these activities?
5. What do you think of current reserve management strategies?
6. Do the current reserve management strategies compliment local cultural beliefs and traditions?

Stories/anecdotes-

- We have to take care of the land and the sea or they will not provide for us in the future.
- We do not have to worry about the sea and the fish; God will take care of it for us.
- We should manage the sea to ensure that there are fish for our children and their children.

Very Strongly Agree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Very Strongly Disagree

Control # 12

Stakeholder Knowledge of Natural History

What are local names of lobster, conch, Nassau Grouper, Black Grouper, Dog Snapper, Cubera Snapper, Mutton Snapper, Yellowtail Snapper, Gray Snapper, Mahogany Snapper, Lane Snapper, Blackfin Snapper, Schoolmaster, Blue-striped Grunt, Hogfish, Barracuda, Horse-Eye Jack, and Bar Jack?

Control # 14

Level of Understanding of Human Impacts (Including Population) on Marine Reserves

1. What events, activities, or changes do you feel have affected or are affecting the natural environment?

2. What changes in the natural environment do you attribute to these threats?

3. How do you compare the threats in terms of levels of impact?
a) Heavy b) medium or c) minimum

4. What would you suggest to alleviate impacts? _____

Control # 15

Distribution of scientific knowledge to the community

1. Are you aware of any research being conducted at the Hol Chan Marine Reserve?
Yes ___ No ___
2. Information is being collected on coral health, fish, conch and lobster populations.
Have you seen any report? Yes ___ No ___
3. A carrying capacity study was recently conducted. Did you see the results? Yes ___ No ___
4. All tour guides were invited to three public forums to inform of the above-mentioned study and receive feedback. Did you attend? Yes ___ No ___
5. Why?

6. Do you have confidence in the scientific data collected? Yes ___ No ___
7. How can the reserve staff improve the information provided to you?

Control # 16

Income Distribution by Source by Household

1. What is the relative importance of each source of household income in the community?
Provide percentage.

2. What are the different types of livelihood of the household? List all.

3. What is the relative importance of each livelihood activity to overall household income? Provide percentage. _____

Control # 17

Thank you for taking the time from your busy schedule to address this questionnaire. The information collected will be used to better the management of the Hol Chan Marine Reserve in order to address the needs of the stakeholders.

STAKEHOLDERS' QUESTIONNAIRE

The Hol Chan Marine Reserve was declared a marine protected area in May 1987 by the Minister of Agriculture and Fisheries in exercise of the powers conferred upon him by section 13 of the Fisheries Act, Chapter 210 of the Laws of Belize, Revised Edition 2000. The reserve was established as a fisheries management tool, for the conservation of biodiversity, and as an area for recreation and research. In order to achieve its goals and objectives, a set of regulations were enacted. This questionnaire attempts to measure the awareness and understanding of those regulations.

Occupation: (a) Fisherman 1. Cooperative member 2. Independent
(b) Tour guide 1. SCUBA/snorkel 2. Sports fishing
© Tourist

Years in this occupation: _____ No applicable to tourists

Age: _____ Place of Birth: _____

1. Are you aware of the existence of any rules and regulations for the management of the Hol Chan Marine Reserve? Yes ____ No ____
2. If you are aware, how did you become aware?
 - a) Leaflets, brochures, newsletter
 - b) Reserve website
 - c) Tour operator or tour guide briefing
 - d) Workshop (not applicable to tourists)
3. What are these rules and regulations? Please list as many as you know:
 - a)
 - b)
 - c)
 - d)
 - e)
 - f)
4. Which institution declared the rules and regulations? _____
5. How clear are the rules and regulations?
 - a) = rules and regulations are very complex and difficult to understand
 - b) = rules are complex and difficult to understand
 - c) = rules are of average complexity
 - d) = rules are simple and easy to understand
 - e) = rules are very simple and easy to understand

6. Do you feel that the rules and regulations design process was participatory? Yes _____ No _____ (Not applicable to tourists)
7. Do you feel “ownership” of the rules and regulations? Yes _____ No _____ (Not applicable to tourists)
8. Do you feel that the rules and regulations are credible and appropriate? Yes _____ No _____
9. Do you feel that the rules and regulations are socially acceptable to you the stakeholder? Yes _____ No _____
10. Which rules and regulations do you feel are acceptable or unacceptable?
- a)
 - b)
 - c)
 - d)
 - e)
11. Why?
- a)
 - b)
 - c)
 - d)
 - e)
12. Which rules and regulations need improvement?
- a)
 - b)
 - c)
 - d)
 - e)

Thank you for addressing this questionnaire. The results will be used to improve the management of the Hol Chan Marine Reserve.

STAKEHOLDERS' QUESTIONNAIRE

The Hol Chan Marine Reserve was declared a marine protected area in May 1987 by the Minister of Agriculture and Fisheries in exercise of the powers conferred upon him by section 13 of the Fisheries Act, Chapter 210 of the Laws of Belize, Revised Edition 2000. The reserve was established as a fisheries management tool, for the conservation of biodiversity, and as an area for recreation and research. In order to achieve its goals and objectives, stakeholders' participation in management of the reserve is very important. This questionnaire attempts to measure the level of satisfaction of you the stakeholder in the participation of management of the reserve.

Occupation: (a) Fisherman 1. Cooperative member 2. Independent
 (b) Tour guide 1. SCUBA/snorkel 2. Sports fishing

Years in this occupation: _____ Age: _____

Place of Birth: _____

Planning Participation		Management Participation	
Total Dissatisfaction		Total Dissatisfaction	
Some Dissatisfaction		Some Dissatisfaction	
Neutral		Neutral	
Some Satisfaction		Some Satisfaction	
Total Satisfaction		Total Satisfaction	

Please tick one statement from each column.

1. Are you aware that you have representation on the Hol Chan Trust Fund as follows:

- a) Fishermen = Caribena Fishermen Cooperative Society Ltd.
- b) Tour guide = Belize Tourism Industry Association

2. Do you feel that you need better representation? Yes ___ No ___

3. If yes, by what organization? _____

Thank you for addressing this questionnaire. The results will be used to improve your participation satisfaction in management of the Hol Chan Marine Reserve.

STAKEHOLDERS' QUESTIONNAIRE

The Hol Chan Marine Reserve was declared a marine protected area in May 1987 by the Minister of Agriculture and Fisheries in exercise of the powers conferred upon him by section 13 of the Fisheries Act, Chapter 210 of the Laws of Belize, Revised Edition 2000. The reserve was established as a fisheries management tool, for the conservation of biodiversity, and as an area for recreation and research. In order to meet its goals and objectives, effective information dissemination is important to enhance and sport compliance by stakeholders. This questionnaire is aimed at measuring the level of information granted to the stakeholders.

Occupation: (a) Fisherman 1. Cooperative member 2. Independent
(b) Tour guide 1. SCUBA/snorkel 2. Sports fishing

Years in this occupation: _____ Age: _____

Place of Birth: _____

1. Were public forums and workshops provided to you during the planning of the Hol Chan Marine Reserve? Yes ___ No ___

2. How many public forums and workshops did you attend?

3. Were public forums and workshops provided during the implementation phase of the Hol Chan Marine Reserve? Yes ___ No ___

4. Were you satisfied with the public forums and workshops? Yes ___ No ___

5. Why?

6. What types of information dissemination were provided?

7. Which were more effective?

8. Why?

9. Have the public forums and workshops affected your compliance behavior? Yes ___ No ___

10. Why?

11. Do you have a better understanding of the rules, regulations and enforcement arrangements as a result of these vents? Yes ___ No ___

12. Do you have a better understanding of the purpose of the Hol Chan Marine Reserve as a result of these forums and workshops? Yes ___ No ___

13. Do you have a better understanding of the conservation efforts geared towards sustainable use of our natural resources? Yes ___ No ___

Thank you for addressing this questionnaire. The results will be used to improve the capacity building effort for the stakeholders for better compliance of the reserve's rules and regulations.

STAKEHOLDERS' QUESTIONNAIRE

The Hol Chan Marine Reserve was declared a marine protected area in May 1987 by the Minister of Agriculture and Fisheries in exercise of the powers conferred upon him by section 13 of the Fisheries Act, Chapter 210 of the Laws of Belize, Revised Edition 2000. The reserve was established as a fisheries management tool, for the conservation of biodiversity, and as an area for recreation and research. In order to meet its goals and objectives, regular scheduled meetings between the reserve staff and the stakeholders is important to enhance and sport compliance. This questionnaire is aimed at measuring the level of meetings held between the reserve staff and stakeholders to discuss conflicts and seek solutions.

Occupation: (a) Fisherman 1. Cooperative member 2. Independent
(b) Tour guide 1. SCUBA/snorkel 2. Sports fishing

Years in this occupation: _____ Age: _____

Place of Birth: _____

14. Have you participated in regular scheduled meetings with the Hol Chan staff to discuss issues of compliance? Yes ___ No ___

15. Do you know if your representative has participated in regular scheduled meetings with the Hol Chan staff to discuss issues of compliance? Yes ___ No ___

16. Do you feel that your view or those of your representative are listened to and acted upon by the Hol Chan staff? Yes ___ No ___

17. Are these meetings open and transparent to all stakeholders? Yes ___ No ___

18. Are you or your representative allowed to participate in the making of rules and regulations? Yes ___ No ___

19. What suggestions would you recommend to improve dialogue between the reserve staff and the stake holders?

Thank you for addressing this questionnaire. The results will be used to better the stakeholders' compliance at the Hol Chan Marine Reserve.