CRFM Secretariat

GLOVER'S REEF MARINE RESERVE FISHERIES BOAT CENSUS 2004 (PART 1)

Middle Caye, Glover's Reef

Sandra Grant
Consultant
June 2004

Funded by the Wildlife Conservation Society

CRFM Secretariat
Belize City, Belize
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Prepared for:

Wildlife Conservation Society
in collaboration with
Caribbean Regional Fisheries Mechanism Secretariat (CRFM)

Glover's Reef Marine Reserve
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1. Introduction

1.1 Glover's Reef

Glover's Reef Atoll (16^0 44'N, 87^0 48'W), 32 km long and 12 km wide, with an approximate area of 260 km^2, is the prototypic atoll of the Caribbean (Fig. 1). The atoll is located approximately 75 km southeast of Belize City, 45 km east of the mainland, and 25 km east of the barrier reef. According to Dahl et al. (1974), it is best developed biologically, but also possesses the greatest reef types of all the offshore reefs in Belize. The atoll has a deep lagoon with 850 patch reefs and pinnacles rising to the surface and six sand cayes on the southern edge of the reef crest. The peripheral reef is broken into three places by deep channels (at Southwest Caye, between Northeast Caye and Long Caye, and the Northern Lighthouse) allowing water flow between the lagoon and open water (Gibson, 2003; Fisheries Department, 2004). The channels also allow for the entry and exit of large boats. There are four major cayes within the area, Southwest II Caye, Southwest I Caye, Middle Caye, Long Caye, Long Caye North, and Northeast Caye (Fig. 1).

Glover's Reef Marine Reserve, the largest marine protected area in Belize, is managed by the Belize Fisheries Department. The reserve was established by the government to maintain the ecological processes, to preserve the genetic diversity, to maintain natural areas for education and research, to provide social and economic benefits through ecologically sensitive recreation and tourism, and to achieve sustainable use of its resources through wise management of the species and their habitats (Munnings et al., 2002). This area is divided into two main zones (Fig. 1):

- The Conservation Zone, approximately 70 km^2, encompasses all the cayes of the atoll. This area was set aside to protect a representative sample of the atoll's habitats, to provide an area for recreational activities, and provide a relatively undisturbed area for applied research. No extraction uses are allowed.

- The General Use Zone, approximately 261 km^2, is designated for commercial uses such as traditional and sustainable use, a study area for monitoring fish catch,

and to provide an area for water sports, e.g., diving, snorkelling, sailing, kayaking and sport fishing. Traditional fishing is allowed by special license owners; however, no traps, long line, or net fishing are allowed. Fishermen are expected to submit details of their catch data (Gibson, 2003).

Fishing and tourism are the main economic activities on the atoll. For fishermen, it is a traditional fishing area for lobster, conch, and finfish. About 8 to 20 boats (representing between 40 and 100 fishermen) visited the atoll during the grouper spawning season and the opening of the lobster and conch seasons. The number of fishers and boats varied from month to month. Fishermen who visited the atoll originated from several coastal communities on the mainland: Belize City, Dangriga, Hopkins, Sarteneja, and Placencia.

1.2 Objective of frame survey

The main goal of this frame survey was to enumerate all fishing boats or other fishing units, and gear by landing sites/fishing communities and fishery, on Glover's Reef Atoll; then to use the frame information to design a catch and effort data collection program, which proposes to demonstrate to fishermen the positive benefits of marine reserves on fish production (CRFM 2004).

The frame survey required conducting a boat inventory, mapping fishing areas, and gathering information on fishing grounds and activities. The information will be used to develop a sampling program which will allow fisheries managers (Fisheries Department and WCS) the opportunity to understand fishing trends in the General Use Zone. The frame was also used as an opportunity to determine fishermen's desire and ability to operate as data collectors in the sampling program.

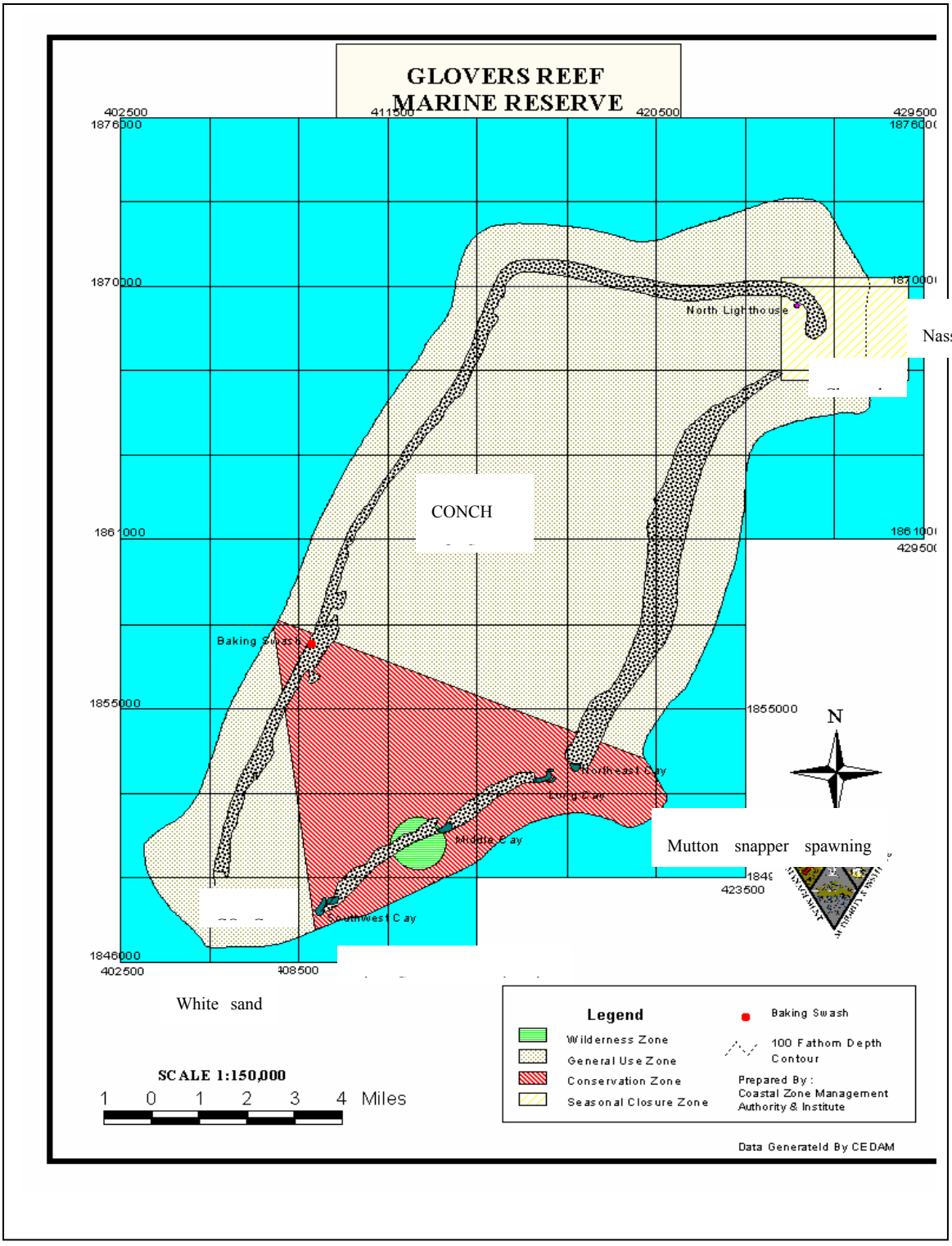

Fig. 1: Map of Glover's Reef Marine Reserve

1.3 Frame survey

Fish products caught on Glover's Reef are distributed to various fish landing sites in Belize. Compiling a census of fish landings and fishing effort from all possible sites was not feasible. Therefore, this project attempts to capture reliable estimates of landings and CPUE data through the use of a suitably designed sampling program. A sampling program design can only be completed if a frame of sampling units is available (Banerji, 1974); therefore, a census was conducted to make a systematic recording of all boats and gears from all landing sites (Stamatopoulos, 1995).

Frame surveys are used to provide a picture of the structure of the fishing industry and the basic information required for the design of CPUE and biological sampling program. For sampling programs, the most important output of the frame survey is the identification of all fishing vessels and fishers, their location, the gear used and the area fished. The frame survey can be used to verify licensing and registration information of the Fisheries Department, and, more importantly, the data generated will be used to design the sampling program and for generating raising factors. Information generated may also include paths of the catch covered by sampling at landing sites, information on economic impact of fish distribution, and maps of marketing pathways for fish products (Gray 1996).

2. METHODOLOGY

2.1 Overview

The frame survey was conducted in three phases:

- Phase 1: Gather baseline information

  The objective was to determine how many fishers and boats actively use the Glover's Reef area, the communities where fishers live, and when and where would be the best time to have meetings with fishers on the proposed data collection program in different communities. Information gathering included the following activities:

- Visits to the National Cooperative, the Northern Cooperative, the Dangriga fish market, Hopkins, and Glover's Reef to speak with fishermen.
- Meetings with staff of the Fisheries Department (the Chief Fisheries Officer, the Ecosystem Management Unit, the Reserve staff, the Capture Fisheries Unit staff).
- Meetings with staff at the Wildlife Conservation Society (Belize City and Glover's Reef).
- Meetings with staff at the Caribbean Regional Fisheries Mechanism Secretariat (CRFM) (Appendix A: Itinerary of field activities).

The following results were drawn from the discussions outlined above; fishermen who fish on Glover's Reef were from Sarteneja (main community), Hopkins (second largest community of fishermen), Dangriga, and Belize City; while boat owners were mainly from the first three communities. Community meetings were necessary in Sarteneja and Hopkins to inform fishers of frame survey activities.

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- Phase 2: Consult fishermen

The objective was to discuss with fishermen why a frame survey and data collection program was necessary, to describe the type of data to be collected and the project activities, and to solicit fishermen participation in the process. Fishers' meetings were held in Sarteneja and Hopkins. Luckily for the team (consultant and research assistant), the Belize Fishermen Cooperative Association Ltd. (BFCA) had planned a fishermen workshop in Sarteneja on sustainable fishing for the Belize fishing

industry. As part of the agenda, we made a presentation on the project to over 77 fishermen who were present. A second meeting was held in Hopkins, with over 20 fishermen (fishers and non-fishers of Glover's Reef). Both meetings went well; fishermen were receptive to the planned activities and promised to participate in the frame survey and upcoming data collection activities. Due to the small numbers of fishermen in Dangriga and Belize City, the data collection team relied on one-and-one discussion of the proposed program.

Fishermen meeting in Sarteneja

- Phase 3: Develop questionnaire(s)

Baseline activities and fishers meetings set the foundation for developing a questionnaire. Two survey instruments were developed:

(1) ***Listing record*** – developed to ensure that all boats were listed and counted if the data collector did not have a chance to complete survey questionnaire (Appendix B: Listing record). The listing record recorded all the boats operating from Glover's Reef. Once the vessels were listed, the main questionnaire was administered.

(2) ***Main questionnaire*** – developed based on the consultancy terms of reference and needs of the data collection program (Appendix C: Main survey). It has 10 sections:

- Section 1 – information on vessel owner (name, education, experience)
- Section 2 – information on vessel (name, size, type, power)
- Section 3 – information on crew (numbers, relationships)
- Section 4 – fishing area (fishing grounds)
- Section 5 – Fishing operations (fishing, storage, purpose)
- Section 6 - Gear specification (gear type and usage)

- Section 7 – Catch characteristics (catch seasonality)
- Section 8 – Marketing arrangements (catch distribution)
- Section 9 – Economics (initial investment, variable cost, maintenance cost)
- Section 10 – Comments (general comments on Glover's Reef reserve)

2.2 Data collection process

During preliminary consultations, fishermen estimated that the number of vessels operating on the atoll was 15. With such a small sample size and the limited time frame to complete this activity, the main questionnaire was pre-tested only once. Based on the interviews and review by Ms. Marin, the final questionnaire was drafted and administered.

The initial plans were to conduct meetings with fishermen, in order to generate a list of all boats operating in the area. After the formal meeting, boat owners were asked to remain behind so that the main survey could be conducted. In the case of Hopkins, this worked very well, as most fishers were in the community and attended the meeting. In the case of Sarteneja, only 50% of the fishermen were in the community; the others were at sea. Thus, we had to change our strategy to gather information on other fishers. We used telephone interviews and waited for fishers at the Cooperatives when they returned from sea.

The listing and main questionnaires were completed by the research assistant, Ms. Marin, and checked by the consultant, Sandra Grant. Where necessary, call-backs were done. The data was further verified by the Fisheries Department licensing and registration fishers and vessel application forms, Marine Reserve Rangers' enforcement log sheets, and the annual and quarterly reports by the Fisheries Department.

The data was entered and analysed in the Statistical Package for the Social Sciences (SPSS), using mainly frequency tables and cross-tabulations. Tables of findings are presented below.

3. RESULTS

3.1 Overview of the census data

The purpose of the listing record was to compile a list of all boats fishing on Glover's Reef, then to follow-up with a census interview. The listing recorded 26 vessels operating from three fishing communities (Appendix D: Listing results); Dangriga (11.5%), Hopkins (50%), and Sarteneja (38.5%). Of the 26 vessels, 73% regularly or occasionally fish the atoll. Other vessels had been sold (4%), destroyed (4%), moved to other areas (8%) because of increased enforcement or low fish catch, or only visited the area at the beginning of the lobster and conch seasons (12%) when catch rate is at its highest (Table 1). We were unable to gather full census information on some of the sailboats, so we had to rely on informant information.

Table 1: Fishing activity level of vessels fishing on the atoll, by fishing community

Fishing Activity	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
Boat sold			1	**1**	**4**
Destroyed, to be replaced		1		**1**	**4**
Moved to other area	1		1	**2**	**8**
Opening of season		3		**3**	**12**
Regular fishermen	2	9	6	**17**	**65**
Occasional fishermen			2	**2**	**8**
Total	**3**	**13**	**10**	**26**	**100**

3.2 Characteristics of vessel owners, owner/captains and crew

Only boat owners (4%) and owner captains (96%) were interviewed. For fishermen

presently fishing the atoll, 62% of boat owners were between the ages 20-39. Hopkins and Dangriga had younger fishermen (between the ages 20-39) than Sarteneja (30 to 49 years) [Table 2]. The last school attended by 88% of fishers was primary (Table 3). Hopkins fishermen were younger, with less fishing experience (5 – 14 years) on Glover's Reef, than Sarteneja fishermen, who were older with more experience (15 – 24 years) [Table 4].

3.3 Characteristics of the fleet

There were three boat types on the atoll: skiff, dory, and sailboat (Fig. 2). Of the 26 vessels listed, only 22 were active (regular, occasionally, and open season fishers). The rest of the analysis focused on the 22 active boats. The census studied 8 sailboats from Sarteneja, and 14 skiffs from Dangriga and Hopkins (Table 5). Many of these vessels carried dories from which divers paddle to different patches on the reef to harvest lobster and conch. Sailboats carried 7-14 dories, while skiff carried a maximum of 2 dories; however, 40% of vessels do not operate with dories (Table 6). Sailboats were powered by sail and outboard/inboard engines, while skiffs were powered by outboard engines (Table 7). Sailboats ranged from 21-38 ft, while skiffs ranged in size from 20-26 ft. (Table 8).

Fig. 2: Photos of vessel types (skiff, dory and sailboats)

Sailboats had a crew sizes ranging from 7 to12 members, with a total active fishing fleet of 8, and with an estimated 73 fishermen (Table 9). Crews were mainly composed of mixes of family and friends. Crew members were from different communities; mainly Sarteneja, but others were from Belize City, Orange Walk, Benque Viejo, Cayo, Copper Bank, Chunox, and Corozal. Skiffs had crew size ranging from 2 to 4 members, with a total active fleet fishing on the atoll of 14 (Dangriga 2, and Hopkins 12), and with a final estimate of 35 fishermen (Table 9). Hopkins' crew were mainly family members from Hopkins, while Dangriga crew were mainly friends from the area.

3.4 Fishing gears, operations, and practices

3.4.1 Gears

The main gear types used by sailboats were free dive using hook stick for lobster (referred to in this document as dive/stick) and hand for conch (referred to as dive/hand), while skiffs used mainly handline (Table 10). Tables 11 and 12 provide a description of line and dive gears by fishing community. Sailboats main operations were diving for lobster and conch (diving 7-15 hrs per day). At night, some fishermen used handline to catch finfish (1-3 hrs). Hopkins' and Dangriga's main fishing operation was handline (fishing 7-15 hrs per day). If, within one hour of fishing handline the catch was 'bad', fishermen tried spearfishing, and if that was bad, they dived for lobster/conch depending on the season. Boats usually set four handlines in the water, a drop/deep line at the bow, middle and stern of the boat, and a set line (shallow water) also at the stern (Table 11).

3.4.2 Operations and practices of fishing vessels

The following lists outline fishing operations and practices of main boat and fishery types.

Sailboat/dive practices:

- Sailboats returned to Sarteneja for major repairs (i.e., painting, replacing worn lumber, changing ice-box, etc.). This was usually done twice per year; once just before the opening of the lobster season and when fishing was slow or low.

- At the opening of the lobster season, fishermen returned to Belize City with boats and crew. Boats were stationed in Belize City by Swing Bridge, and fishers returned from sea and commuted by bus to Sarteneja.
- At the beginning of a trip, the captain purchased groceries; he either brought them from home or got them on credit through the Cooperatives. He obtained gas and ice from the Cooperative (sometimes on credit). Some captains hired water taxis or used a dory to journey up and down the river.
- Fishers usually left Belize City by 7:30 AM and traveled 7-8 hours mainly by sail, to the atoll. At the atoll, fishermen left their sailboat and each traveled by dory to different locations to dive for conch/lobster. During fishermen's lunch period, they broke the conch out of the shell or tail lobsters. The product was marked, bagged, and placed in the ice-box. This process was repeated many times during the day for as long as the trip lasts (about 8 days).
- Boats usually fish for eight days (this was the time specified by the Cooperative as the best time to return to ensure good products).
- At the end of the trip, the captain usually left the atoll at night in order to arrive at the cooperatives early the next morning.
- Once they returned to Belize City, each fisherman was responsible for his own catch. He would take his product to the Cooperative of which he was a member, sell his product and receive first payment. From his income, he gave the captain his boat share. Second payment was made at the end of the season.
- Captains left boats in the river near the Swing Bridge, while fishermen took buses to their homes in the Corozal District. After 4-5 days rest, they returned to Belize City and resumed fishing.

Skiff/Handline/Dive practices:

- At the beginning of a trip, the boat owner/captain purchased gas from Sittee River Marina, or from Oliver in Hopkins, or in Dangriga town. He bought shilling ice from community members or from a merchant in the community who had an ice machine; then purchased groceries for the trip. The total cost was about $40.
- Captain and crew usually left Hopkins at 7 AM and traveled 30 miles to Glover's Reef. Estimated travel time was about two hours.
- The first stop was South Water Caye, where they caught sprat for bait, using caste net. They needed approximately 15 lbs or a half bucket of bait for one day of fishing. Some fishermen purchased shrimp from vendors in Hopkins to use as bait.
- On the first day, they fished for about five hours using handline for finfish, usually yellowtail snapper and deepwater snapper. During the conch and/or lobster season they dive freelung using hook stick for lobster, and hand for conch. Some fishermen traveled with dories to Glover's Reef and, like Sarteneja fishermen, dive conch and lobster from these vessels.
- At the end of the day, fishers slept on the boat, on one of the cayes, Long Caye or Middle Caye if allowed, or at

camps. Camps were individually owned and did not belong to the collective/ group of fishermen.

- At 4 AM, fishermen checked the tide because there is a greater possibility of catching fish during low tide.
- They remained 2-3 nights at sea, fishing all day and storing fish in ice-boxes.
- On their return back to Hopkins, they sold fish from the boat side in the village, to restaurants, or they sold fish throughout the village from a vehicle. For lobster and conch, fishermen hired a vehicle or used their own vehicle, and traveled by road to Mango Creek to sell products to Mango Creek (Northern) Fisherman's Cooperative receiving station.

3.4.3 Fishing areas

The main fishing areas for Hopkins and Dangriga fishermen were areas A, B, and C (Fig. 3a). Area A was the main fishing area for handline fishing. If the catch was low in this area, fishers moved to area B. During lobster and conch season, fishers fished in area C. Groupers are no longer fished in the seasonal closure zone. Sailboats with dories mainly dive for lobster in areas D and E, and conch in area F (Fig. 3b). Although fishermen have specific fishing areas, when these areas are not productive they fished all around the atoll, except the conservation zone. The shaded areas labelled A – F, indicate skiff boats and sailboats fishing in separate areas, with the exception of area E, where there were overlaps (Fig. 3a and 3b).

Other fishing areas where Hopkins and Dangriga fishermen fished were South Water Caye, Twin Caye, and 'Cockin'. Sarteneja fishermen fished on Halfmoon Caye, Alligator Caye, South, Turneff, and Long Caye.

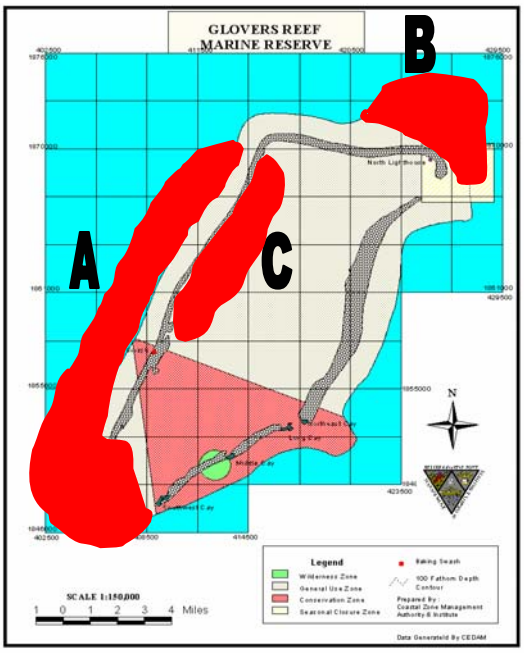


Fig. 3a:

Fishing Area – Hopkins and Dangriga fishermen

A – handline, finfish, main area; B – handline, finfish,

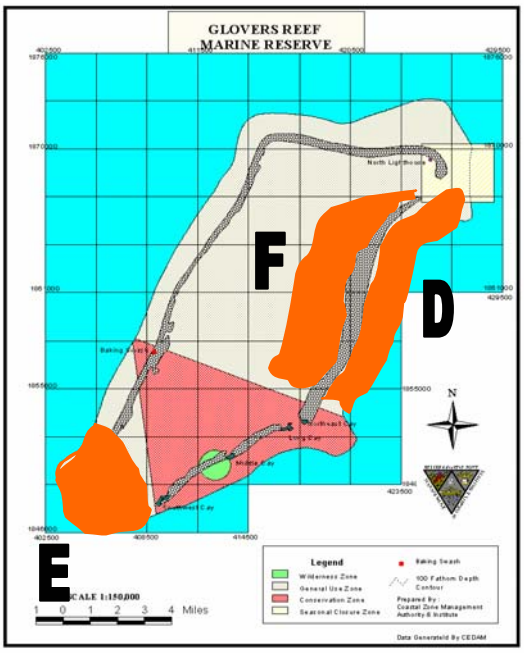


Fig. 3b:

Fishing Area – Sarteneja fishermen

D – dive, conch and lobster, main area; E – dive,

3.5 The catch: estimates of landings, and seasonality

3.5.1 Estimates of landings

The average catch/trip for lobster and conch varied according to time of season. Average lobster catch at the beginning of the season for sailboats was 700 lbs per diver; for skiff it was 200 lbs per boat. By the end of the season, average catches reduced to 100 lbs for sailboats and 30 lbs for skiff. Average conch catch at the beginning of the season was 200 lbs per diver for sailboats and 800 lbs per skiff boat; at the end of the season 50 lbs per diver for sailboats and 15 lbs per skiff boat. The average catch/trip for finfish skiff boats ranged from 500 lbs during peak harvesting season (good fishing) and 150 lbs during off-season (bad fishing) [Table 13].

3.5.2 Seasonality

The closed season for lobster is February 15th to June 14th and for conch it is July 1st to September 30th. Vessels (skiff and sail) were active mainly from June to December, at the beginning of the lobster season. By October to November, most of the lobsters were harvested. During this period (starting October) conch season opened, and harvesting switched from lobster to conch or fishers would harvest both. Finfish was harvested year-round; December to February fishermen switched to spawning aggregation areas (Fig. 1) for Nassau Groupers, and between April and June there was a spawning aggregation for mutton snapper (Fig. 4). Fishermen from three communities exploited lobster, conch, and finfish resources (Table 14).

Fishery Type	J	F	M	A	M	J	J	A	S	O	N	D
Lobster												
Conch												
Finfish												

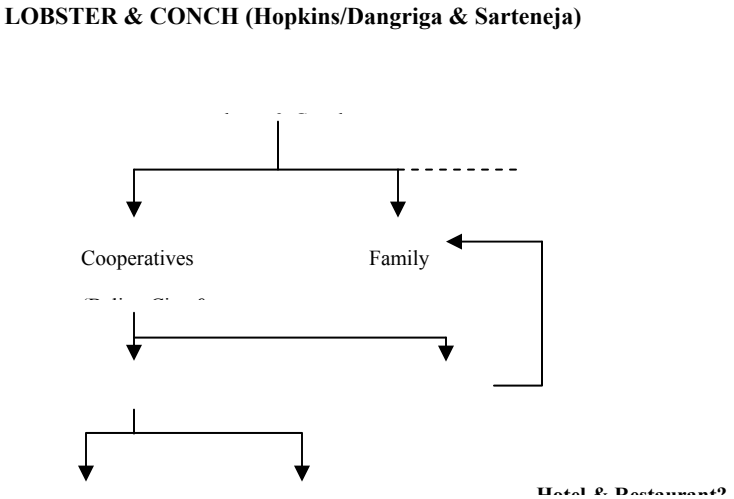
Fig. 4: Seasonality of fishery type by both vessel types
(Lighter colours indicates reduced fishing intensity)

3.6 Fish marketing

Lobster and conch were sold mainly to the National Fishermen Cooperative in Belize City and the Northern Fishermen Cooperative in Belize City and Mango Creek (receiving station). Although some fishermen mentioned that lobster and conch were sometimes sold to hotels and restaurants, we were unable to verify this information. Crew on sailboats worked independently of the mother vessel. Since this survey targeted mainly sailboats, we were not able to determine how much of the product went to hotels and restaurants. The fishers we spoke to indicated only the rejects from the Cooperatives (which in many cases was very little) were sold to hotels and restaurants (Fig. 5).

Finfish landed in Hopkins were sold directly to consumers at the side of boats on return from fishing (38%), hotels in Hopkins (21%), restaurants (35%), or given to family and friends (6%). At times, fish fillets were sold to cooperatives if they were accepting fillets

(Fig. 6). Finfish from sailboats were usually eaten on the boat or taken home for family and friends.



Fisherman delivering conch

Fig. 5: Flow chart of lobster and conch to various purchasers

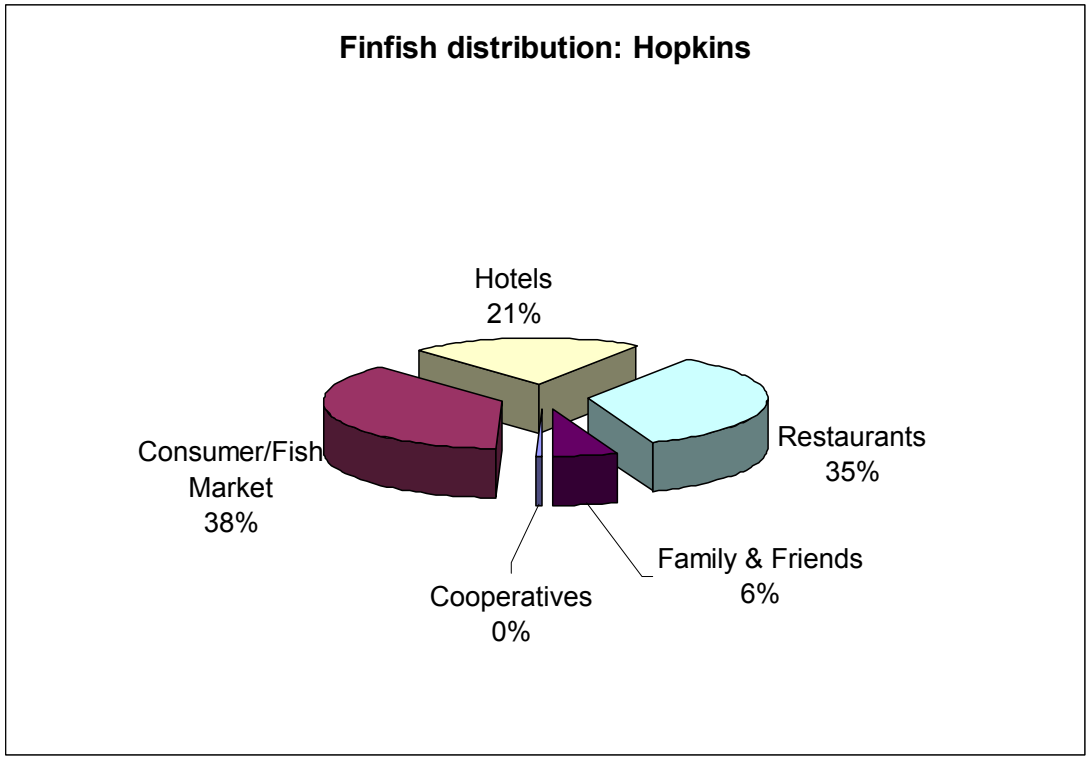


Fig. 6: Hopkins fishermen distribution of finfish to various purchasers in the village

3.7 Economics

3.7.1 Share system

Share system varied with fishing communities and boat types:

1. Hopkins/Dangriga (skiff) – the first priority was to clear expenses, then dividing the remaining income equally among the crew. Second payment for lobster and conch, from the Cooperatives, was claimed by the boat owner/captain.
2. Sarteneja (sail) – each diver on the boat worked independently and paid the captain. The sailboat was not used for fishing; it was a transport boat or mother vessel. There were two share system methods:
   - (1) if a fishing trip was nine days, a fisherman would fish for himself eight days and fish for the captain/boat owner on the ninth day. Or,
   - (2) each fisherman paid a fee of $125 - $150, and the equivalent in cash of 1 lb lobster and 4 lbs conch per fishing day per trip. Fishermen paid the boat captain after their products were delivered to their respective Cooperative.

3.7.2 Capital and operational expenses

Capital expenses (boat, engine, and equipment) for sailboats were higher than skiffs, BZE $31,690 and $15,375 respectively. Operational costs for sailboats were also higher than skiffs, BZE $305 and $1,153 respectively (Table 15).

3.7.3 Fish prices (/lbs)

- Lobster: first payment $14/$18.00; second payment $7.00
- Conch: first payment $5/$6.50; second payment 0.25/ 0.50 cents
- Finfish: $2.50/lb (whole); $5.00/lb (fillet)

3.8 Livelihood Options

- *Hopkins/Dangriga*: Usually a spouse/partner did not work outside the home, but fishermen were involved in alternative income activities such as farming, hunting,

working of citrus boats, and tourism (tour guide). In times of financial crisis fishermen depended on the community or their savings for support.

- *Sarteneja*: Spouses do not work outside the home. Fishermen had no alternative employment opportunities, so the entire family depended on fishing. In times of financial crisis, fishermen depended heavily on loans from the cooperatives and savings from lobster and conch second payment.

3. 9 Fishermen's Comments

The following comments were made by fishermen when asked to express their problems and concerns regarding Glover's Reef Marine Reserve:

1. Fishermen would like the government to reopen snapper and grouper spawning aggregation sites.
2. Sharks moved from the Glover's Reef area as a result of tagging activities by scientists.
3. Catch rate on Glover's Reef had declined over the years.
4. In the past, fishermen used to sleep on Middle Caye and other islands, and they would like to return to that practice.
5. The authorities do not respond to complaints or concerns of the fishers, and meetings at Radisson, Belize City produced no results.
6. Fishermen say they were not against conservation, i.e., they were not against closing areas to make reserves, but Government should re-open some areas after 5 years or so.
7. Fishermen were concerned with illegal fishing; they felt that the government needed to increase surveillance at nights and on weekends.
8. Presently, lobster and conch production on Glover's Reef is low, and in many cases fishermen were unable to support their families as in the past.

4. SURVEY LIMITATIONS

1. Not able to observe fishing at sea.
2. Upon further and more detailed analysis, the survey should have included dory operators, as each operated independently. In this study we were unable to fully assess the flow of lobster and conch products. For any future studies, boat effort should be assessed as dory, not sailboats.
3. We were unable to obtain detailed information on all sailboats, because many were at sea fishing lobster. Thus, we had to rely on informant's information.
4. The survey was conducted during the closed season, when many boats were not active. Thus, it was difficult to determine who was actually fishing.
5. During some interviews, we were told that some boats would not return after the opening of the 2004 season, because many fishers decided to move to other areas because of low catches and increased surveillance and enforcement by the Fisheries Department. However, it was difficult to determine if this was true.

5. CONCLUSION

The goal of this frame survey report was to document the number of boats, fishermen, gear, fishing and landing patterns, and gear use, operating on the Glover's Reef Atoll (Part 1), and to use the information to develop a sampling program (Part 2). Fishermen from Sarteneja using sailboats and those from Dangriga and Hopkins using skiffs operated from the atoll. The number of boats fishing on the atoll fluctuated depending on lobster or conch season, on whether it was the beginning or end of the seasons, on the past years' catch rates, on the performance of other fishing grounds, and on enforcement by the Fisheries Department. It is for this reason that this census should be updated (a quick count of boats, not a full census) at the beginning of the lobster and conch season, which will be important for the data collection sampling program. A full census should be done every three years, depending on significant changes in the fishery.

6. TABLES

Table 2: Age group distribution of boat owner/captain by fishing community

Age	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
20 – 29	3	4	1	**8**	**33**
30 – 39		5	2	**7**	**29**
40 – 49		1	4	**5**	**21**
50 – 59		1	1	**2**	**8**
> 60		1	1	**2**	**8**
Total	3	12	9	**24**	**100**

Table 3: Educational level of boat owners by fishing community

Education	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
Unknown		1		**1**	**4**
Primary	3	11	9	**23**	**88**
Secondary		1	1	**2**	**8**
Total	3	13	10	**26**	**100**

Table 4: Boat owner's fishing experience on Glover's Reef by fishing community

Experience (years)	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
< 4	1			**1**	**5**
5 – 9		7		**7**	**37**
10 – 14	1	1		**2**	**11**
15 – 19			2	**2**	**11**
20 – 24		2	2	**4**	**21**
> 25		1	2	**3**	**16**
Total	2	11	6	**19**	**100**

Table 5: Boat types by fishing community

Boat Type	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
Sail			8	8	**36**
Skiff	2	12		14	**64**
Total	2	12	8	22	**100**

Table 6: Number of dories used in fishing operation by fishing community

# of Dory	Fishing Community			Total
	Dangriga	Hopkins	Sarteneja	
Sail				
7			1	**7**
8			2	**16**
9			3	**27**
11			1	**11**
14			1	**14**
Total			8	**75**
Skiff				
0	2	6		**8**
1		4		**4**
2		2		**4**
Total	2	12		**16**

Table 7: Method of propulsion by fishing community

Powered	Fishing Community			Total
	Dangriga	Hopkins	Sarteneja	
Outboard	2	12		**14**
Sail & outboard			7	**7**
Sail & inboard			1	**1**
Total	2	12	8	**22**

Table 8: Length frequency of vessels by type by fishing community

Boat Size ft.	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
Sail					
21			2	2	**29**
22			3	3	**43**
28			1	1	**14**
38			1	1	**14**
Total sail			7	7	
Skiff					
20		1		1	**7**
23	2	8		10	**71**
26		3		3	**21**
Total skiff	2	12		14	

Table 9: Boat type by crew by fishing community

Crew Size	Fishing Community				Estimated total fishermen
	Dangriga	Hopkins	Sarteneja	Total boats	
Sail					
7			1	1	**7**
8			2	2	**16**
9			3	3	**27**
11			1	1	**11**
12			1	1	**12**
Total sailboat fishermen					**73**
Skiff					
2	1	7		8	**16**
3	1	4		5	**15**
4		1		1	**4**
Total skiff fishermen					**35**

Table 10: Gear type by vessel type by fishing community

Gear Type	Fishing Community			Total
	Dangriga	Hopkins	Sarteneja	
Sail (N=8)				
Handline			4	**4**
Speargun			4	**4**
Hook stick			8	**8**
Sling			1	**1**
Skiff (N=14)				
Handline	2	12		**12**
Speargun		2		**2**
Hook stick	2	11		**13**
Rod and Reel		2		**2**

Table 11: Description of line gear used by fishing community

Gear: LINE	Community	Bait	Fish Type	Hooks	Depth (fath.)	Strain (lbs)	# Lines/boat	Hrs fish
HANDLINE drop/deep line	Hopkins Dangriga	dead sprat shrimp	Deepwater snapper	2	120-250	100-120	3 (bow, middle, stern)	7-15
HANDLINE set line	Hopkins Dangriga	whole live yellowtail snapper	Barracuda Kingfish Rockfish	1	50-150	200	1 (stern)	7-15
HANDLINE	Sarteneja		Red Snapper	1	30 ft	30-80	2	1-3
TROLLING	Hopkins	Sprat	Barracuda	1		140	2	4-7

Note: Handline drop/deep and set lines were fished together.

Table 12: Description of diving methods by fishing community

Gear: DIVE (include mask & fin)	Community	# Gear	Hrs fishing
Hook stick Lobster	Hopkins Dangriga	1 per fisherman crew 2-4	4-8
	Sarteneja	1 per fisherman crew 7-12	7-12
Hand Conch	Hopkins Dangriga	crew	4-8
	Sarteneja	crew	7-12
Speargun Finfish*	Hopkins Dangriga	1 per fisherman	7
	Sarteneja	1 per fisherman	7

*Finfish – Hogfish, snapper, grouper, barracuda

Table 13: Average catch/trip by gear and fishery type by fishing community

Gear/Fishery Type	Community	Average Catch/trip
HANDLINE: Finfish	Hopkins/Dangriga	Good: 200-500 lbs/boat Bad: 30 – 150 lbs/boat
	Sarteneja	20 – 50 lbs/fisher
TROLLING: Finfish	Hopkins	100 lbs/boat
DIVE/HOOK STICK: Lobster	Hopkins/Dangriga	Open: 200 lbs/boat Close: 15 – 30 lbs/boat
	Sarteneja	Open: 700 lbs/diver Close: 50 – 100 lbs/diver
DIVE/HAND: Conch	Hopkins/Dangriga	Open: 800 lbs/boat Close: 15 lbs/boat
	Sarteneja	Open: 150 – 200 lbs/diver Close: 15 - 50 lbs/diver
DIVE/SPEARGUN: Finfish	Hopkins	Good: 100 lbs/boat Bad: 60-80 lbs/boat

Code: Good – good fishing; Bad – bad fishing; Open – beginning of the season; Close – end of the season

Table 14: Boat type by fishery type by fishing community

Boat type/ Fishery type	Fishing Community			Total	%
	Dangriga	Hopkins	Sarteneja		
Sail					
Lobster, Conch, Finfish			8	8	**100**
Skiff					
Conch, Lobster		1		1	**7**
Finfish	1	1		2	**14**
Lobster, Conch, Finfish	1	10		11	**79**
Total	2	12		14	**100**

Table 15: Capital and operational expenses by boat type

Capital Expenses (BZE$)		
	Skiff	**Sail**
Boat	8000	23000
Engine	5700	6500
Sail & Jib		600
Line	45	20
Caste net	60	
Dive equip.	260	260
Speargun	400	400
Hook stick	10	10
Dory	900	900
TOTAL	**15375**	**31690**

Operational Costs (BZE$)/trip		
	Skiff	**Sail**
Fuel	144	600
Lube	11	
Ice	15	110
Food	40	400
Transportation	75	20
Repairs	20	33
TOTAL	**305**	**1153**

7. REFERENCES

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APPENDIX A: ITINERY OF FIELD ACTIVITIES

Date	Comments
5-13/4/2004	Document review – Fisheries Division, CRFM, Cooperatives
13/4/2004	Janet Gibson, Wildlife Conservation Society
15/4/2004	Fishermen consultation & data collection - Sarteneja
16-17/4/2004	Scoping – Dangriga and Hopkins
20/4/2004	Develop frame questionnaire
23-25/4/2004	Trip to Glover's Reef
27/4/2004	Develop frame questionnaire
28/4/2004	FD – review licensing and registration data
29/4/2004	Discuss project with Beverly Wade, Chief Fisheries Officer
2/5/2004	Fishermen consultation & data collection - Hopkins
3/5/2004	FD – I. Majil (Protected Area Management)
20/5/2004	Frame survey presentation

APPENDIX B: LISTING RECORD

GLOVER'S REEF FISHERMEN --- LISTING RECORD

FISHING COMMUNITY	DATA COLLECTOR	DATE	COMMENTS

BOAT NAME	OWNER NAME	NICKNAME	TEL.	COOP	# BOATS OWNED	BOAT SIZE	BOAT TYPE	CREW	FISHERY TYPE	GEAR TYPE

APPENDIX C: MAIN SURVEY

CENSUS OF BOATS IN THE

GLOVERS REEF MARINE RESERVE

Interviewer: _____ Date: ____/____/____ Landing Site: _____

NOTE: IF BOAT OWNER HAS MORE THAN ONE VESSEL, COMPLETE MULTIPLE FORMS

SECTION 1: INFORMATION ON VESSEL OWNER

1.1 Name of Vessel Owner: _____

1.2 Nickname of Vessel Owner: _____

1.3 Sex: [1] Male [2] Female 2.4 Date of Birth: _____

1.5 Home Address: _____

1.6 Home Telephone: _____

1.7 Are you a registered fisher? [1] Yes [2] No Fishers License Number: _____

1.8 How long have you been fishing (overall)? _____ 1.9 What grade did you leave school_____

1.10 Which Cooperative are you a member? [1] None [2] National [3] Northern [4] Other _____

1.11 How many vessels do you own? [ ]] 1.12 How many vessels operate from Glovers Reef

1.13 Do you also captain your vessel? [1] Yes [2] No

SECTION 2: INFORMATION ON VESSEL

2.1 Name of Vessel: _____

2.2 Is this vessel registered? [1] Yes [2] No Vessel Registration Number: _____

2.3 Which community/town is this boat registered? _____ [ ]]

2.4 What is the size of this boat: Length: [ ]] feet Width: [ ]] feet Depth: [ ]] feet

2.5 Type of vessel? [1] Wooden Canoes [2] Skiff [3] Sailboat [4] [Other] (specify)_____

2.6 Number of dingy the boat operates? _____ 2.7 What is the age of this boat? _____

2.8 Which colour(s) is this boat painted? outside_____ inside_____ deck_____

2.7 How is your boat powered?

[1] Oars [2] Sails [3] Outboard [4] Sail and outboard [5] Inboard [6] Other

2.8 Please list the brand and horsepower of the engines used on this boat:

Engine	Brand Name	Horsepower
1		
2		

SECTION 3: INFORMATION ON CREW

3.1 What is the regular size of your crew? [ ]]

3.2 How many additional workers do you have on the vessel? [ ]]

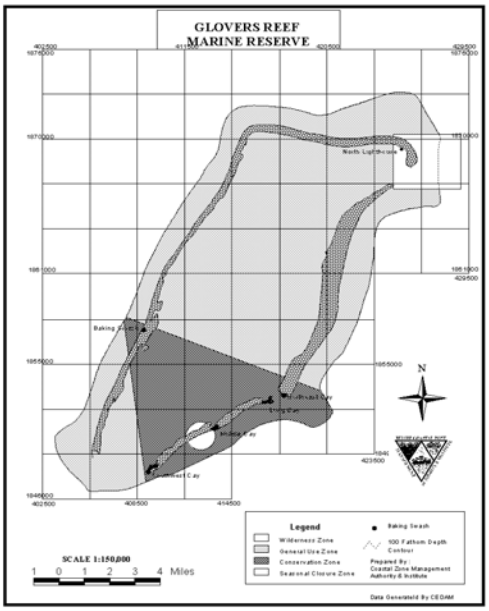
3.3 How often do you change crew? _____

3.4 To the best of your ability, please give information on crew members:

Name	Nickname	Role	Age	Education	Relation to crew

SECTION 4: FISHING AREAS

5.5 To the best of your knowledge, please point area on map where different products are taken:



SECTION 5: FISHING OPERATIONS

5.1 Do you normally fish on weekends? [1] Yes [2] No On holidays? [1] Yes [2] No

5.2 What time of day do you usually bring catch to cooperative? _____ [ ]]]]

Why? _____

5.3 How far is your main fishing area from your community/town? _____

5.6 How long have you been fishing on Glovers Reef? _____

5.7 If you are no longer fishing in the area, why? _____

5.8 How do you store your fish products at sea? _____ size capacity____

5.9 Describe your fishing operations (include leaving community; obtaining fuel, ice, etc; fishing on GR, returning to the cooperatives, selling products): _____

_____

_____

_____

_____

SECTION 6: GEAR SPECIFICATION

6.1 What are the main fish products this vessel targets? _____

6.2 What are the main gear types this vessel use? _____

6.3 Could you give me an idea of all the gear used on this vessel and how it is used.

LINES

Type	**# lines used per trip**	**# of hooks per line**	**Line test**	**Hours spent fishing per trip**	**Average catch per trip in past 12 months**	**Main fishing ground**
Hand Line						

DIVING: Free Lung

TYPE	LOBSTER	CONCH	FINFISH
No. Spear Gun			
Hand, Grab			
No. Slings			
No. Sticks			
No. of Dives per trip			
No of Divers per trip			
Time under water per trip			
Average catch per trip in past 12 months			
Main fishing ground			
Price			

If you use any other gear, please give description?

SECTION 7: CATCH CHARACTERISTICS

7.1 Which months of the year do you fish, by fishing area?

Type of fish		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Lobster	Glovers Reef												
Conch	Glovers Reef												
Finfish	Glovers Reef												

SECTION 8: MARKETING ARRANGEMENTS

8.1 What percentage of your catch is:

(Note: Catch must add up to 100%)	Lobster	Conch	Finfish	
Retained by Fisher				
Given to Family and Friends				
Sold to Hotels & Restaurants Where?				
Sold to Cooperative				
Sold to Consumer				

SECTION 9: ECONOMICS

9.1 On an average, how many fishing trips, to Glovers Reef, does the boat takes per month? _____

9.2 What is your average variable cost per trip?

	Amount	Cost
Fuel/trip		
Oil/trip		
Ice/trip		
Bait/trip		
Food/trip		
Other		

9.3 Please explain the share system (or payment system) on your boat? _____

_____

_____

_____

_____

_____

9.4 Apart from your crew who else do you have to pay for services provided to your operations? _____

MAINTENANCE/REPAIR COSTS

9.5 What are your average fixed costs?

	Cost
Replace sails	
Replace lines a. Lines b. Hooks	
Replace diving equipment a. Dive mask b. Speargun	
Boat maintenance a. Paint b. Lumber/fibreglass	
Engine maintenance	
Other	

How often do you replace gear?

_____

INITIAL INVESTMENT

9.6 What are your long-term costs?

	Cost	Life Expectancy
Insurance		
Original boat cost		
Engine		
Lines		
Sails		
Lobster traps		
Other		

9.7 Do you have a loan? If so, what is the loan for? And how much?

Name of organization(s): _____

Total loan: _____

Monthly repayment: _____

Years to repay loan: _____

9.8 Are your equipment insured? If so,

Name of the Insurance Company: _____

Total insurance: _____

Monthly repayment: _____

9.9 When do you get paid for your fish? _____

9.10 When do you pay your crew? _____

LIVELIHOODS

9.13 What are the present income earning activities of your household?

_____

_____

_____

_____

9.11 In times of crisis, how are you able to get back on your feet?

_____

SECTION 10: COMMENTS

10.1 What are some of the problems or concerns you have regarding the Glovers reef marine reserve?

_____

_____

_____

APPENDIX D: GLOVER'S REEF FISHERS -- 1

	Boat Owner							
BoatName	**LastName**	**FirstName**	**Age**	**FishCommunity**	**Cooperative**	**Role**	**Education**	**YrsGlover**
Mialie	Andrews	Solomon	26	Dangriga	Northern	BO/Captain	Primary	14
Baby G	Coleman	Wilfred	23	Dangriga	None	BO/Captain	Primary	.
	Duran	Clifford	27	Dangriga	None	BO/Captain	Primary	2
Queen Ann	Castillo	Conception	73	Hopkins	Northern	BO/Captain	Primary	25
Waves	Castillo	Darell	39	Hopkins	Northern	BO/Captain	Primary	.
Sea Gull	Castillo	Rodney	54	Hopkins	None	BO/Captain	Primary	20
Joline	Castillo	Tyson	35	Hopkins	Northern	BO/Captain	Primary	8
Ellen	Lewis	Aaron	36	Hopkins	National	BO/Captain	Primary	9
Lennox	Maximo	Lennox	26	Hopkins	Northern	BO/Captain	Secondary	6
Trudy	Miranda	Ashbert	23	Hopkins	Northern	BO/Captain	Primary	9
Chico	Nunez	Luke	34	Hopkins	Northern	BO/Captain	Primary	21
Alice	Nunez	Noawell	42	Hopkins	Northern	BO/Captain	Primary	7
Claricia	Nunez	Robert	.	Hopkins		BO/Captain		.
Jessie	Nunez	Robert	36	Hopkins	Northern	BO/Captain	Primary	14
Vivian	Ventura	Denmark	22	Hopkins	Northern	BO/Captain	Primary	9
Elta	Ventura	Enoch	26	Hopkins	None	BO/Captain	Primary	6
Viva	Enriques	Alamina	73	Sarteneja	Northern	BO	Primary	15
Suzeni	Flores	Rubycell	43	Sarteneja	National	BO/Captain	Primary	.
Tormento	Lopez	Francisco	52	Sarteneja	Northern	BO/Captain	Secondary	15

Ubafu	Munoz	Juan	35	Sarteneja	National	BO/Captain	Primary		20
Sandy Neo	Palmero	Albert	.	Sarteneja	National	BO/Captain	Primary	.	
Julia	Palmero	Yortelino	27	Sarteneja	National	BO/Captain	Primary	.	
Manta	Rivero	Hermando	41	Sarteneja	Northern	BO/Captain	Primary		30
Maurita	Rivero	Mateo	41	Sarteneja	Northern	BO/Captain	Primary		29
La Bonita	Rivero	Taulfo	46	Sarteneja	National	BO/Captain	Primary		23
Princess	Tamai	Lesbihildo	33	Sarteneja	Northern	BO/Captain	Primary	.	

APPENDIX D: GLOVER'S REEF FISHERS -- 2

BoatName	Boat Information									
	Boat Size	# Dory	Boat Type	Boat Age	Power	# Engine	Crew	FishTypes	GearTypes	ActivityLevel
Mialie	23	0	Skiff	.	outboard	1	2	Finfish	Handline	Regular
Baby G	23	.	Skiff	.	outboard	1	.			Moved to other area
	23	0	Skiff	.	outboard	1	3	Lobster, Conch, Finfish	Stick, Handline	Regular
Queen Ann	26	1	Skiff	8	outboard	1	2	Lobster, Conch, Finfish	Stick, Handline	Regular
Waves	23	0	Skiff	1	outboard	1	2	Lobster, Conch, Finfish	Stick, Handline	Regular
Sea Gull	20	0	Skiff	4	outboard	1	2	Finfish	Handline	Regular
Joline	23	1	Skiff	7	outboard	2	3	Conch, Lobster	Stick	Opening of season only
Ellen	23	1	Skiff	4	outboard	1	2	Lobster, Conch, Finfish	Speargun, Stick	Regular
Lennox	26	2	Skiff	8	outboard	1	3	Lobster, Conch, Finfish	Stick, Handline	Regular
Trudy	25	0	Skiff	4	outboard	1	2	Lobster, Conch, Finfish	Speargun, Stick, Handline	Destroyed, to be replaced
Chico	6	2	Skiff	6	outboard	1	4	Lobster, Conch, Finfish	Speargun, Sticks, Handline	Regular
Alice	23	0	Skiff	3	outboard	1	3	Lobster, Conch, Finfish	Stick, Handline	Regular
Claricia	23	0	Skiff	0.25	outboard	1	3	Lobster, Conch, Finfish	Rod & Reel, Stick	Opening of season only
Jessie	23	0	Skiff	12	outboard	1	2	Lobster, Conch, Finfish	Rod and Reel, Stick	Opening of season only
Vivian	23	0	Skiff	5	outboard	1	2	Lobster, Conch, Finfish	Caste net, Handline, Stick	Regular
Elta	23	1	Skiff	6	outboard	1	2	Lobster, Conch, Finfish	Stick, Handline	Regular
Viva	28	5	Sail	22	sail & outboard	1	4	Lobster, Conch, Finfish	Stick	Moved to other area
Suzeni	22	9	Sail	12	sail & outboard	1	9	Lobster, Conch, Finfish	Speargun, Stick, Handline	Sometimes

Tormento	38	7	Sail	20	sail & inboard	1	7	Lobster, Conch, Finfish	Stick	Regular
Ubafu	.	9	Sail	.	sail & outboard	1	9	Lobster, Conch, Finfish	Stick, Handline	Regular
Sandy Neo	21	8	Sail	.	sail & outboard	1	8	Lobster, Conch, Finfish	Speargun, Stick	Sometimes
Julia	22	14	Sail	.	sail & outboard	1	12	Lobster, Conch, Finfish	Speargun, Stick	Regular
Manta	29	10	Sail	4	sail & outboard	1	9	Lobster, Conch, Finfish	Speargun, Stick, Handline	Boat sold
Maurita	22	11	Sail	22	sail & outboard	1	11	Lobster, Conch, Finfish	Sling, line, net	Regular
La Bonita	21	9	Sail	18	sail & outboard	1	9	Lobster, Conch, Finfish	Speargun, Stick	Regular
Princess	28	.	Sail	4	sail & outboard	1	8	Lobster, Conch, Finfish	Stick, Handline	Regular