

Stock Assessment of Belize Reef Fishes With Options for Its Management

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ABSTRACT

Management of finfish in Belize has been limited to the Fisheries Regulations of 1977. The laws making up these regulations never came about from any assessments done on the Belizean reef fishery, but rather from legislations passed down throughout the years and from recommendations made by the Fisheries Administrator. The Belizean Fishery is representative of a small-scale fishery. Sailboats are the predominant mode of transportation, although smaller and faster skiffs are becoming increasingly popular. Almost all vessels are motorized.

Most of the fishermen are members of a fishing cooperative, and they sell their products to that cooperative. Although they may also sell a portion at a local market and keep a portion for home use.

The paper describes a stock assessment project, with options for management of its reef fishes, that is currently being undertaken in Belize. Also, the results obtained from the first year of research are presented.

These results indicate that the handline is the most popular gear used to catch finfish, followed by divers, traps, and nets. Fishing occurs along the cays adjacent to the reef crest and atolls. 55% of the fishermen interviewed have observed a decrease in their catch in the last five years yet 55% did not observe a decrease in size for that time period. 97% claim that the species composition has remained the same. Most of the fishermen interviewed were in favor of a minimum mesh size and area closure as measures for management for the industry. However, they did not agree on such measures as season closures and a limit to the number of fishermen working in an area. When asked about their opinions on receiving less catches now to ensure good long-term catches, the fishermen seemed to be split in their answers (40%:yes: 39%:no).

INTRODUCTION

Some attempts have been made on stock assessment and management of coral reef fishes in Belize. Smith and Gathman (1947) were one of the first to study the coral reef fishery. Their aim was to provide suggestions for the management of the industry in Belize. The data source upon which they based their information, however, was mostly general information and no in-depth study was ever attempted. Alan Jackson (unpubl.) made a more valid attempt at stock assessment of reef fishes for the period 1972-1977. He estimated landings, effort, and catch per unit of effort (CPUE) from production logs taken from

three of the then five cooperatives operating in Belize. He warns, however, that his value for effort may be exaggerated as it may have included effort for fishing products other than finfish.

Presently, The Belize reef fishery is managed according to the Fisheries Regulations of 1977 which prohibits: 1) the use of fishing with scuba gear; 2) the use of a beach seine, trap, or stop net within a radius of two miles east of the Barrier reef or a half mile from any inhabited locality in Belize; 3) a mesh size of less than three inches except for cast/throw nets, special permission for exemption from the Fisheries Administrator, trawl or seine nets (which must have a mesh size regulation of no less than 1.5 inches), or any traps or other device that allow for the escapement or release of fish; 4) a large catch that allows for the "wanton" waste of fish; 5) the closing off of a waterway, either channel, entrance, or embayment, with any fishing device. The regulations are not based on any assessment done on the fishery but rather on legislations made by government officials which have been passed down throughout the years and on recommendations made by the Fisheries Administrator (Winston Miller per comms). The reef fisheries management project which is currently being undertaken will be the first bona fide attempt at stock assessment for use in management to be done on finfish stocks in Belize. The project is being sponsored by the International Center for Ocean Development (ICOD) in conjunction with the Jamaica Fisheries Division and the Belize Fisheries Department and it is being coordinated through the University of the West Indies. The project is being carried out separately, in Belize and Jamaica, and in parallel with each other. It aims to develop a management plan for the coral reef fish stocks in both countries. I am working on the Belizean part of the project. The management plan will be achieved through the collection and analysis of fishery statistics to be used in a multispecies surplus production model, a socioeconomic study to be done on the fishing community, and a habitat mapping of the reef fish habitat. The socioeconomic study will also be carried out separately, but in parallel with with the biological study. The purpose of this paper is to present the results obtained from the biological study after one year of research.

MATERIALS AND METHODS

The project consists of two parts. The first part is a fishing catch and effort survey; the second a mapping of the fish habitat.

Fishery Catch and Effort Survey

A complete enumeration was made of all registered fishermen for 1989. The information obtained included the fishermen's addresses, birth dates, license numbers, and fees. Similarly an enumeration was done on all registered fishing boats for that period including boat owners/captains, mode of

locomotion, cooperative affiliation, license number, and boat name. A stratified random sample was then taken to obtain 200 fishing boats. This sample was stratified according to cooperative affiliation (whether the person is a fishing cooperative member or an independent fisherman). The fishermen chosen were then interviewed to obtain a "broad-scale" survey of the industry. This particular group of fishermen was chosen based on the assumption that fishing boat owners/captains are likely to be full-time fishermen. The questions chosen for the broad-scale survey covered characteristics of the fishing boat and captains, fishing activity, landings, effort, location, depths, the fishermen's observation on changes in the fishery and their views on management strategies for the demersal and pelagic stock. Upon completion of the broad-scale survey, a year of more direct and detailed information on the annual cycle of the fishery will follow.

Habitat Mapping

The project also calls for the mapping of the fish habitat. The mapping, however, will be in terms of proportion live coral/sand/silt or mud/turtle grass. The categories should be broad (eg., 10-25%, 26-50%, 51-75%, >75%). The mapping can be determined using hydrographic survey charts, aerial, acoustic or underwater photographs, or whatever is available. Ground truthing will be used to supplement and verify any information gotten.

RESULTS

The broad-scale survey is now complete. From this survey, some initial interferences can be made from the data. 64.9% of all fishing boat owners/captains are members of cooperatives. Consequently, a portion of their landings are sold to a fishing cooperative. The rest would be taken home or sold privately. Figure 1 shows a thematic map that indicates the location of fishing cooperatives in Belize, the reef crest and atolls, and the fishing grounds in Belize, as determined from the fishermen surveyed. The fishing areas are shown quantitatively, each block representing a unit of five to illustrate how many times an area was cited by a fisherman. Figure 2 shows a pie chart, of gear types (for finfish only), by percentage. The results show that for the Belizean fishery the most popular fishing gear appears to be the handline used by 43.3% of the surveyed fishermen, 26.1% were divers, using either a Hawaiian sling or spear gun, traps were used by 17.1% of the fishermen, and nets, seine or gill, were used by 14.4%. A point to note here is that the traps used in Belize are not modelled after the "Jamaican" Z-shaped traps or the "Cuban" S-shaped traps (Munro, 1983). The traps used in Belize are rectangular wooden-framed boxes of varying dimensions of approximately 4'x3'x2.5' with chicken wire covering of different mesh sizes and a single entrance (Figure 3).

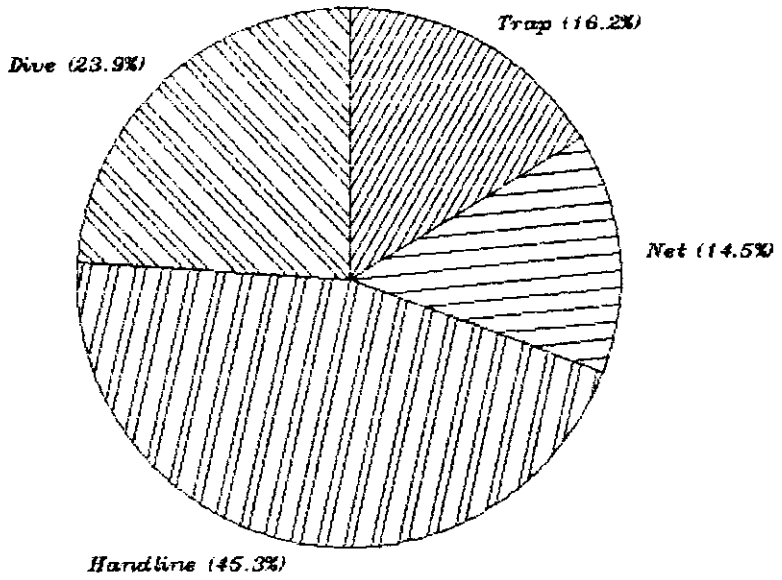


Figure 2. Geartype used in Belize (finfish only).

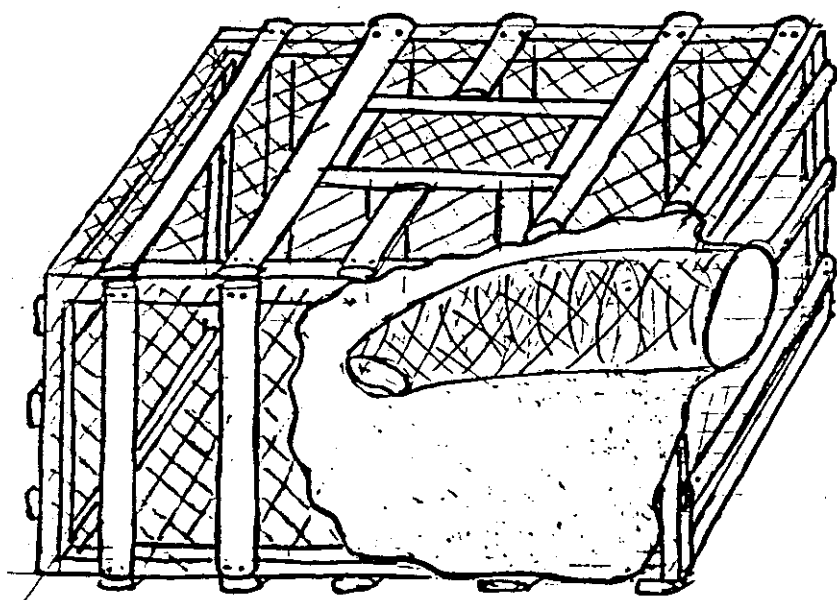


Figure 3. Belizean fish trap.

The broad-scale survey also addressed the fishermen's views on changes on: a) fish catch, b) size of fish, c) type of fish, as observed in the last five years. Table 1 shows their response.

DISCUSSION

The Belizean reef fishery is characteristic of a small scale artisanal fishery. The fishermen use either sailboats or skiffs. Most vessels, however, are motorized. The gear used is typical to gear used in the Caribbean. The handline is the most popular gear followed by divers, traps, and then nets.

The broad-scale survey addressed the fishermen's observation on changes in the fishery within the last five years. Although 55% of them did observe a decrease in catch rates in that time period, 55% of them did not observe any changes in fish size and 97% didn't observe any changes in fish composition. Most fishermen realize the need for management of the industry. 73% agreed with having a minimum mesh size on nets and 63% agreed with area closures. 59%, however, did not agree with a limit to the number of fishermen fishing in an area, and 56% disagreed with the idea of having a seasonal closure for reef fishes. Also, there was an equal split among those interviewed on whether they were willing to sacrifice a year or two of fishing in order to receive good long term catches. From Figure 1 we can see that fishing areas in Belize occur along the cays adjacent to the reef crest and the three atolls. The most heavily exploited areas, however, are found near the big fishing communities such as San Pedro and Cay Caulker in the north, Belize City in the north central part of Belize, and Dandriga and Placencia in the south. It is interesting to note that a fishing cooperative is resident in all the major fishing communities in Belize. These cooperatives operate as a landing site for fishing boats. They function to buy, process, and market the products.

My research attempts to develop a management plan for coral reef fish stocks in Belize. The information discussed here is the result of this project after a year of research. This first year of research consisted mainly of obtaining information about the fishing vessels, fishermen, types and levels of fishing activity, the fishing areas and the fishermen's views on changes in the fishery and their reactions to any management schemes. The second and final year will include a more intensive study of 6 fishing areas, each area representing a different level of exploitation. Information on catch and effort will be calculated from landings brought in from these areas which will be fitted into a multispecies surplus production model along with the results from a socioeconomic study to be done on the fishing industry will be used to develop a management plan for the Belizean fishery.

Table 1. Changes in fish catch, size, and type.

	CHANGES IN: CATCH	SIZE	TYPE
DECREASE	55%	36%	-
INCREASE	4%	3%	-
SAME	23%	55%	97%
SEASONAL DECREASE¹	11%	6%	-
N / A	7%	-	2%
DIFFERENT	-	-	1%

¹Seasonal decrease refers not to a systematic decrease in fish catches for the last five years, but to catches that may decrease one season and increase the next.

The fishermen were also questioned about their opinions on various management strategies for the coral reef fish stocks. Table 2 shows the results.

Table 2. Fishermen's opinions on various management schemes.

	NO	YES	N / A
POOR CATCHES NOW FOR GOOD LONG-TERM CATCHES	40%	39%	21%
MIN. MESH SIZE	19%	73%	8%
LIMIT TO FISHERMEN IN AN AREA	59%	37%	4%
AREA CLOSURE	31%	64%	5%
SEASON CLOSURE	56%	42%	2%

LITERATURE CITED

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