

- GUNTER, G.
1956. Principles of shrimp fishery management. Proc. Gulf Carib. Fish. Inst. 8: 99-106 (1955).
- IDYLL, C. P., AND W. SAENZ
1957. Preliminary report on the marine fisheries of Honduras, U. of Miami. 18 p. (mimeo.).
- INGLE, R. M.
1960. Synoptic rationale of existing Florida shrimp regulations. Address at Ninth Annual Meeting of Shrimp Association of Americas. Mexico City, June, 1960. 8 p.
- QUIROGA, R. D.
1959. Estado actual y lineas de posible desarrollo de la Industria Pesquera en Centroamerica, mimeographed FAO, CAIS, May, 1959. 113 p.
- SHAEFFER, M. B.
1959. Biological and economic aspects of the management of commercial marine fishes. Trans. Amer. Fish. Soc. 88: 100-104.
- U. S. FISH AND WILDLIFE SERVICE. Gulf Coast shrimp catch by area and depth, 1959-1960.

Marine Sport and Commercial Fishery Potentials of British Honduras¹

C. P. IDYLL

*Institute of Marine Science, University of Miami
Miami, Florida*

Abstract

A short survey of the British Honduras fisheries was made during February, 1961, to determine if lobster regulations were adequate, if the scale fish industry could be expanded and protected, and if some means could be found to encourage and protect marine sport fishing. Visits were made to inland and coastal areas where fishermen, fish dealers, and government officials were interviewed. Until proper statistics can be obtained a limitation on exports of 800,000 pounds of whole lobsters was recommended. Although the domestic consumption of scale fish can not be expected to expand, the export markets should be considerably enlarged with Government encouragement and control. There appears to be underexploitation of this resource. Sportfishing should be encouraged, perhaps with protection of some species. A small, permanent management program for both the sport and commercial fisheries is recommended. Fishermen and fish dealers should be licensed and statistics on landing should be collected.

IT IS BELIEVED that there is an excellent opportunity to expand the use of fish for food and for sport in British Honduras. The country has a large area of shallow water off its coast, a relatively small population, and men with a tradition of seamanship and experience in building and handling small boats, all factors which would be necessary in expanding the commercial fisheries. Sport fishes of several popular kinds are abundant in these waters too, and this activity might easily prove even more valuable than commercial fishing.

British Honduras, a colony of Great Britain, is located between the Mexican

¹Contribution 352 from The Marine Laboratory, University of Miami.

Territory of Quintana Roo and the Republic of Guatemala, on the Caribbean coast of Central America. It is about 170 miles long and 70 miles wide, with an area of about 8,500 square miles, approximately half the area of Jamaica. In this area live about 100,000 people, or about 85 per square mile. The capital is Belize, where about one-third of the population resides (Figure 1).

There is a shallow continental shelf area of about 15 to 25 miles width, beyond which the water is 300 to 600 fathoms deep, the slope being very steep. The bottom on the shelf area is mostly sand and mud, and the water is only a few fathoms deep. Inshore are extensive areas of mangrove swamps, with brackish and freshwater lagoons. Numerous islands are scattered over the shallows, while outside the barrier reef are several large reef areas, including Turneffe, Glover's and Lighthouse reef.

Principal Species:

The principal commercial species exploited in British Honduras is the spiny lobster, *Panulirus argus*. Of the fishes the black grouper, *Epinephelus striatus* (called the Nassau grouper in Florida), is the most important species caught. Considerable quantities are salted. Other commercial fishes include several other species of groupers, snappers, rockfish, mullet, jacks, snook, Spanish mackerel, king mackerel, barracuda, dolphin, and tarpon.

Some of the fishes listed above are also caught for sport, including the Spanish mackerel and king mackerel, rock fish, and dolphin. Tarpon is a species not included among commercial fishes in most areas, but small quantities of tarpon are sold in the market in British Honduras. It is popular as a sport fish, and this is likewise the case with the bonefish; these species comprise the two most important sport fishes of the Colony. There are also sailfish and marlin in the deep waters outside the reef.

Fishing Methods:

Crawfish are caught mostly by slat traps similar to those used in Florida (Smith, 1959). In recent years crawfish have been captured by divers using a spear, and this method seems to be increasing in popularity.

Groupers, snappers, rock fish, and other species are caught by handline, which is the principal type of gear for fin fish. Beach seines are used for snook and bonefish and for a number of other species. A few gillnets and fish pots are employed.

Published Information:

In 1942 the fisheries of nearly the whole Caribbean area were surveyed to evaluate food resources, especially in relation to wartime shortages (Fiedler, Lobell and Lucas, 1947). The survey included a brief visit to British Honduras. In 1955 the information was brought up to date during a visit by J. Adger Smyth (1957). Among his conclusions he stated, "Little needs to be done to improve either catching or marketing. Prices are very low, and fish are abundant."

In the summer of 1944 Dr. Ernest Thompson spent a month in British Honduras and made recommendations for the development of the fishing industry.

Thompson judged that the fish resources of British Honduras were "very far from complete exploitation." He thought brackish-water fish culture, oyster culture, and pearl oyster culture were possible. He thought that no great expansion of the fisheries was possible without development of foreign markets,

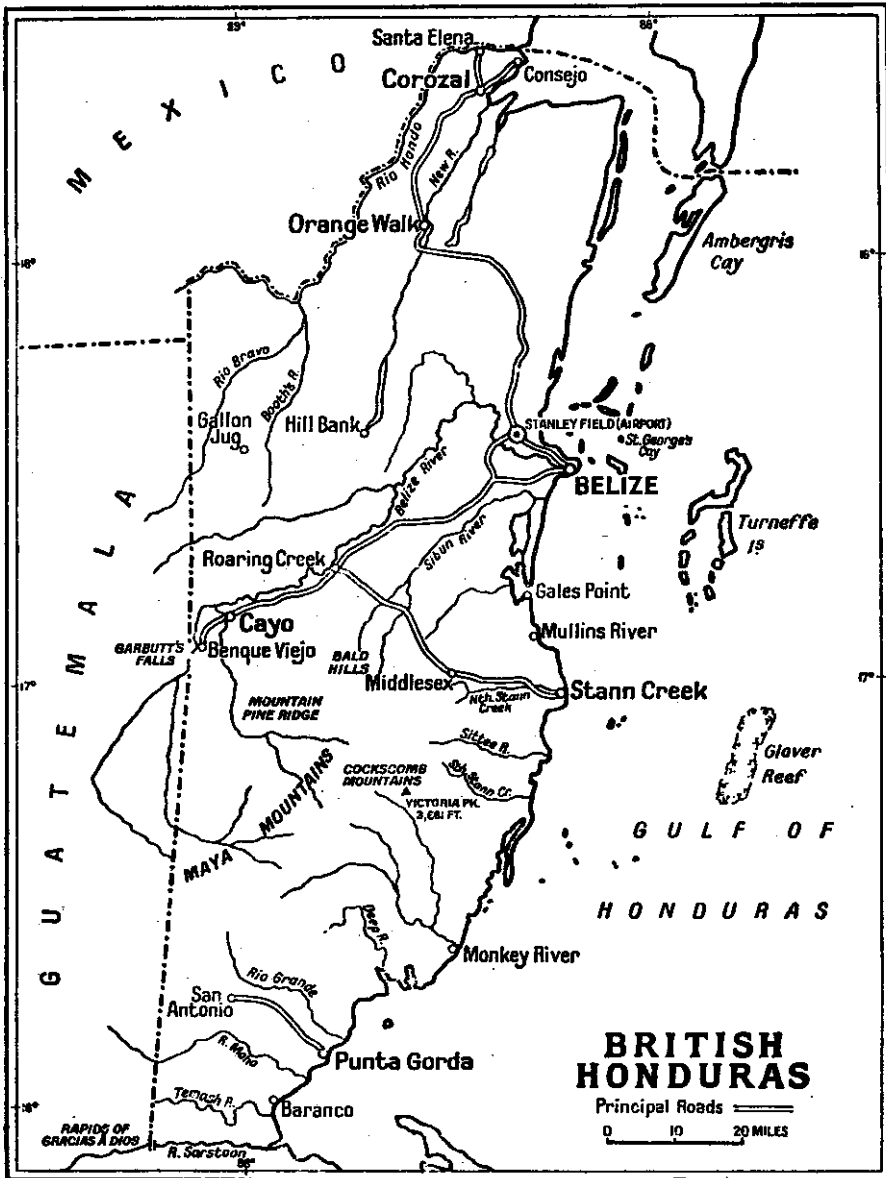


FIGURE 1.

since local markets seemed to be satisfied. He suggested extensive surveys of the fishing potential, trials with several kinds of gear, including purse seines and otter trawls, and trials with modern methods of processing and handling.

In 1947 Dr. Walton Smith, Director of The Marine Laboratory of the University of Miami, spent five weeks in British Honduras. His chief concern was the spiny lobster fishery, but he made observations on the fin fish industry as well (Smith and Gathman, 1948). This report showed that the spiny lobster fishery was almost a virgin one prior to 1946, when an American freezer boat began to operate.

Smith agreed with Thompson that development of the fishing industry depended largely on the building of an export market. He judged that red snapper was the only fin fish species of real interest in the United States market, while groupers and other varieties might find a sale in the West Indies and other countries near British Honduras.

Hickling (n.d.) reported on a visit made in 1949 to British Honduras as part of a survey of the fisheries of the British West Indies. He made recommendations which led to the establishment of a Fisheries Scheme, including the appointment and training of a fishery officer. The Scheme had as its overall objective, "To consider measures for improving the supply of fish in the colony, with special regard to the export trade;" and as its specific objectives, "(1) To improve the present 'corned' fish into a high class . . . product . . . (2) To improve the rate of capture of fish . . . (3) To improve the equipment and status of fishermen by fostering cooperation . . . (4) To keep check on progress . . . by an efficient collection of statistics . . . of quantities and values . . . of fishing effort . . ."

The information reported here was obtained during a short trip to British Honduras in February, 1961, made at the request of the government of the Colony. Since that time, in November, 1961, a disastrous hurricane struck the colony, doing immense damage to Belize, Stann Creek, and other coastal areas. This may have altered conditions in the colony so that observations made in this report are invalidated; on the other hand the fundamental situation is unlikely to be altered.

This report is published with the kind permission of Mr. John Fann, Principal Secretary, Ministry of Natural Resources of British Honduras. Grateful acknowledgement is given to Mr. Fann, to Mr. David Bradley, Comptroller of Customs, and to many other government officials and citizens of British Honduras for their kindness and cooperation during my visit there.

Crawfish Industry:

After rising sharply to 625,000 pounds in 1951, exports of whole lobsters from British Honduras declined steadily to 279,000 pounds in 1955 (Table 1). Then exports began to rise once more, exceeding 500,000 pounds in 1957, and more than doubling the next year. In 1959 record exports were made when 1,146,000 pounds were shipped. The 1960 landings were 919,000 pounds.

In 1948 Dr. Walton Smith predicted that, after an initial period of higher catches due to cropping off of older animals, the total production of crawfish would stabilize itself at about 400,000 pounds. Landings did indeed rise to a peak in 1951 and then fall to roughly the predicted figure. The Government at that time regarded 400,000 pounds as the allowable maximum export and granted concessions partly on this basis.

Smith also ventured a tentative suggestion that if fishing for lobsters spread to deeper water and to areas then underexploited or not fished at all, the total

TABLE 1
EXPORTS OF CRAWFISH FROM BRITISH HONDURAS, 1932 TO 1960,
IN THOUSANDS OF POUNDS.

		1941	0.5	1951	625
1932	5	1942	2	1952	586
1933	8	1943	1	1953	442
1934	10	1944		1954	381
1935	8	1945	2	1955	279
1936	13	1946	433	1956	409
1937	54	1947	186	1957	507
1938	34	1948	324	1958	1,017
1939	14	1949	219	1959	1,146
1940	8	1950	280	1960	919

production might safely be set at 800,000 pounds of whole lobsters. At the time of his survey, in 1947, most of the fishing was in the northern and middle parts of the colony, with areas to the south and large areas such as Turneffe Reef being lightly exploited.

As landings and exports began to rise sharply beginning in 1956, peaking at over a million pounds in 1958 and 1959, the maximum allowable export was raised from the former 400,000 pounds to 800,000, using Smith's second figure as justification. Dr. Smith put this figure forward with some reluctance in view of the scanty information he had at hand; he regarded the figure as reasonable only if the whole area of the Colony where lobsters occurred were being fully exploited. As a matter of fact, fishing in 1961 was carried on in nearly the same areas as it was in 1947, and only to a limited extent has exploitation of deeper waters, waters in the southern part of the colony, and waters on the Turneffe and other reefs been carried out. In 1958 vigorous efforts by one of the American firms succeeded in getting moderate quantities of lobsters from south of Belize, but less fishing was carried out there later.

The information necessary to make a rational judgement as to the maximum production possible from the British Honduras lobster stocks is not available. In theory, fishing should be permitted as long as sufficient lobsters are left to reproduce the stock and maintain it at a steady level. Overfishing occurs when, despite increased effort, catches decline. Underfishing can also occur, whereby effort is so small that lobsters not needed for reproductive purposes are allowed to die. To determine the balance point, where exploitation is neither too heavy nor too light, it is necessary to have accurate records of total catch, catch by area, the size of the lobsters and the amount of fishing effort. Then the classic tests of overfishing can be applied: steadily declining total catch, declining catch per unit of fishing effort (which is more precise than total catch, since it takes into account vagaries of markets, weather, etc.) and declining average size of lobsters.

The collection of such statistics has been urged upon the Government by all scientists who have successively advised the Colony (Thompson, Smith, Hickling). A statistical system was begun under the Fisheries Scheme, but it was not continued.

The evidence available as to the status of the lobster resource is nearly restricted to the total landings (or, more accurately, total exports) plus opinions of fishermen and wholesalers. It was believed, prior to 1956, that the rise and

fall of landings was following the pattern predicted by Dr. Smith and that therefore the stocks were capable of supporting roughly 400,000 pounds of catch. If that is so, then the considerably greater catches of recent years are the result of overfishing, and this should be followed in the future by a steadily declining catch, an increasing difficulty of capture, and a declining average size of lobsters.

It is not at all certain that overfishing has taken place, however, and Dr. Smith's 400,000 pound maximum may have been conservative. That this possibility exists seems to be borne out by the almost universal opinion of fishermen and wholesalers that, in fact, the average catch per fisherman has not declined, and the average size of lobsters has not become smaller. More credence may be given to these opinions in view of the notorious tendency of fishermen to take the pessimistic view and normally to regard their fishery as on the road to doom. It would appear proper to regard 400,000 pounds as an overly conservative figure for safe continuous production and instead to adopt 800,000 pounds as the limit.

Fin Fish:

The fin fish populations of British Honduras are underexploited. This results chiefly from the small population of the colony relative to the area of the fishing grounds and the available fish resources and the consequent low domestic consumption of fish. Exports of fish have been small since the largest market, in the United States, has absorbed chiefly crustaceans from the Caribbean area, and lesser quantities of fish. Markets in other countries have been difficult to develop, chiefly for lack of transportation and preservation facilities. These markets have to a large extent been dictated by the demands for fish during Lent and have thus been very uneven.

There are no available statistics of current fish production in British Honduras. Using the estimated "number of fishermen chiefly or wholly dependent on fishing the price obtained for fish and the average living costs of each fisherman," Thompson (1944) produced a rough figure of 4 million pounds. He recognized "the unreliable nature of such calculations;" whether they were near the proper value at the time Thompson wrote is uncertain. No attempt is made here to estimate present-day production.

There appears to be a small unsatisfied demand for fish in British Honduras, although fish is cheap and of fairly good quality. It is certain that more fish could be sold and that the increase could eventually be large if proper marketing methods were employed. These involve chiefly devices for holding fish during periods of abundance and distributing them as required by demand. It also involves the promotion of the sale of fish. Prejudices against frozen and iced fish (in the past well founded, since formerly the fish frozen or iced were usually unsold stocks, beginning to spoil) will have to be broken down, and people, especially in interior areas, who are unused to eating fish will have to be shown that they are flavorful and nutritious food. This can be done, and the results will be worth the effort. Such promotion is a slow business, however, and results will require years of patient and persistent effort in promoting the use of fish in British Honduras.

Faster results can probably be obtained by developing export markets. The United States market is not closed to the kinds of fish produced in British Honduras, and efforts should continue to be made to provide products wanted in that country. Meanwhile, the most promise seems to be in the development of markets in Puerto Rico, Jamaica and other countries near British Honduras.

There appears to be a growing demand, for example, for good quality fishery products in Guatemala and Honduras. A company now operating in British Honduras is attempted to develop markets for fin fish in several countries.

Most of the fin fish resources of British Honduras are not in danger of overexploitation in the near future and perhaps none of them are being overfished. Nonetheless, they cannot stand unlimited fishing. It is characteristic of tropical regions to have many more species of fish, each with relatively few individuals, than temperate regions, where the number of species is small but the numbers of individuals in each may be very abundant. This complicates management of tropical species in several ways. In the first place, a heavily exploited species may become depleted quickly, due to small numbers in the populations. Secondly, fishing regulations may be difficult to design, since size limits, gear regulations, and other laws may be harmful in respect to one or more valuable species, while protecting another. Finally, investigation of tropical fisheries is complicated by the large number of species; statistics are harder to gather; life histories and other biological data are multiplied in number.

Despite these problems, efforts should be made to anticipate overfishing, and this is most easily done before overexploitation occurs. The "maximum sustained yield" aimed for in management of commercial fisheries depends on careful measurement of the rate of growth of the fish, the rate of entry of the fish into the fishable stock ("recruitment") and the rate of death. Theoretically, at a certain size, the total weight of the fish population is at a maximum increase by recruitment and growth just balancing decrease by death. At this point the maximum yield should be obtained; catches over the amount produced at this level of exploitation constitute overfishing, catches less than this, underfishing. In practice the determination of these rates and the consequent control of the fishing rate requires years of concentrated research, and by no means all fisheries are valuable enough to justify the effort and expense required. Furthermore, separate investigations are required for each of the numerous species of fish. It is certain, in view of this, and in view of the value of the fishery resources in relation to the financial resources of British Honduras, that it will never be justified to carry out the detailed research which would determine accurately the amount of fishing proper for each species.

There are, nonetheless, simpler procedures which will give useful indications of the trends in population size in response to fishing and which will help safeguard the stocks against disastrous overexploitation even though precise management is not possible. These simpler management practices should be applied to the British Honduras fish resources, since the value of the latter amply justifies the effort and expense involved. The procedures depend upon statistics of catch and effort.

The information will be as important in preventing the imposition of unnecessary restrictions on the fisheries as in designing regulations. Too often crippling laws are applied to fishing because of prejudice or hearsay. Thus good fishing management aims to develop as well as to protect the resource.

Shrimp Resources:

During the 1950's several trials were made by American vessels to catch shrimp in British Honduras waters. Small quantities of pink shrimp (*Penaeus duorarum*) and white shrimp (*P. schmitti*) were caught, especially off the southern part of the coast, but there were no populations located which promised to support a commercial fishery.

Sport Fishing:

Sport fishing offers excellent potentials in British Honduras. The Colony is fortunate in the possession of considerable populations of highly popular game fishes which are certain to attract tourists.

The underdevelopment of the commercial fin fisheries, while representing a loss of food and revenue, is an advantage in respect to the sport fishery. No very deeply entrenched industry depending on the commercial sale of game fish will be seriously dislocated by the expansion or protection of the sport fishery; conversely, exploitation has proceeded so little in respect to most species that sport fishing success is still very high.

A somewhat different approach is required in managing commercial fisheries compared to that in managing sport fisheries. In the former, ideal management aims at a level of fishing pressure which will result in the capture of the maximum quantity of fish possible, consistent with maintenance of the stock. It regards underfishing as well as overfishing as wasteful, since in both cases less fish are captured for human use.

Sport fish management, on the other hand, aims for a high frequency of fishing success by the individual and thus attempts to keep the population at the highest possible level. There is no underfishing in marine sport fish management.

Fortunately some of the species most sought after by game fishermen are not valuable food fish in British Honduras, and there is much less conflict of interest than is often the case in other areas. Bonefish and tarpon are abundant in British Honduras waters. Both these species are among the most eagerly pursued of game fishes, having world-wide reputations. Neither is a popular food fish. In most areas they are not eaten at all because of the many bones in the bonefish and the coarse, poor-flavored flesh of the tarpon. In addition, neither will stay alive long in live wells and thus cannot be brought fresh to market by most British Honduras fishermen. Bonefish are, consequently, often "barbecued" in a very crude manner and offered in this form in the market. Some bonefish and tarpon are also offered fresh, but the total quantity sold appears to be small.

The sport fishery of the Colony is an almost untapped resource of great potential value. In the end it may provide greater wealth, directly and indirectly, than either the lobster or commercial fin fisheries. It is inevitable that sport fishing will decline as the country develops and the population increases, but at this point very little has been done to damage the stocks, and their decline can be minimized by intelligent governmental control.

REFERENCES

- BRADLEY, E. P.
1956. Fish in British Honduras, Commodity Series Paper No. 12.
- FIEDLER, REGINALD H., MILTON J. LOBELL AND CLARENCE R. LUCAS
1947. The Fisheries and Fishery Resources of the Caribbean Area, U. S. Fish and Wildlife Service, Fishery Leaflet 259, p. 145-151.
- HICKLING, C. F.
n.d. The Fisheries of the British West Indies. Report on a Visit in 1949, Development and Welfare in the British West Indies, Bulletin 29, p. 27-31.
- SMITH, F. G. WALTON
1959. The Spiny Lobster Industry of the Caribbean. The Caribbean Commission, Trinidad, and the Florida State Bd. of Conservation, Tallahassee, 39 p.

- SMITH, F. G. WALTON AND CRAIG GATHMAN
1948. The Spiny Lobster and Scale Fish Industry of British Honduras, with Recommendations for its Control and Development, The Marine Laboratory, University of Miami, Mimeographed.
- SMYTH, J. ADGER
1957. The Fisheries and Fishery Resources of the Caribbean Area, U. S. Fish and Wildlife Service, Fishery Leaflet 259, p. 60-69.
- THOMPSON, E. F.
n.d. The Fisheries of British Honduras, Development and Welfare in the West Indies. Bulletin 21, 32 p.

Recent Developments in the Brazilian Fisheries

CECIL MILES

*FAO Regional Fisheries Officer
Rio de Janeiro, Brasil*

Abstract

This paper gives a concise summary of the present position of the fisheries in Brazil. The latest development is the formation, at the national level, of a Fisheries Development Council for the purpose of placing fisheries management on a sound basis throughout the United States of Brazil.

Because the coastline of Brazil extends some 4,600 miles from tropical to sub-arctic waters the various major fisheries of Brazil are discussed on a regional basis.

In the north and northeastern States bordering the Amazon River freshwater fish and shrimp dominate the catch. As there is little mechanized shrimping in this region there appears to be excellent possibilities for the development of this resource. Spiny lobster fishing and tuna long-line fishing are also important industries of this area.

In the eastern zone sardine landings are most important. Southward from Rio de Janeiro considerable sardines are still landed, but mechanized trawling for species of croaker, seatrout and cod dominate the landings.

Location

THE UNITED STATES OF BRAZIL (Figure 1) occupy one half of the South American continent, with an area comparable to that of the United States of America. There are 24 individual States and Territories, three of which are each about the size of Alaska. The population was officially estimated at 66,000,000 in 1960, with 11,000,000 concentrated in the highly industrial State of São Paulo in the South, and 3,200,000 in the ex-capital city of Rio de Janeiro.

This vast country, the interior of which is still an Indian frontier, stretches from 5° north of the equator well into the southern temperate zone, with a corresponding climatic spectrum. Temperatures are generally more moderate along the inhabited coastal belt than might be expected from the geography, but humidity is high in most parts of the country.

Oceanographic Conditions

There are 4,600 sea miles of coastline bordering the Atlantic Ocean and the "bulge" of Brazil cuts the warm, nutrient-poor South Equatorial Current