

1922. On a collection of Marine Fishes from the Lesser Antilles, Bijdr. Dierk., Feestn. Max Weber, p. 133-142, 3 figs., Amsterdam.
- PADDENBURG, G. G. VAN
1818. Beschrijving van het eiland Curaçao. Haarlem.
- ROBINS, C. R.
1958. Check list of the Florida Game and Commercial Marine Fishes. State of Florida, Board of Cons., Educ. Ser. No. 12, 44p.
- SALMON, G. C.
1958. Report on the Fisheries Industries in the Countries served by the Caribbean Commission. Rome, F.A.O. Report No. 781, 86p. (Mimeo.)
- SIMONS, G. J.
1868. Beschrijving van het eiland Curaçou . . . Oosterwolde, 56p.
- STEENMEIJER, F.
1957. Food and Nutrition of Arubans. Thesis, Utrecht, 139 p., ill.
- SURVEY OF THE CONSUMPTION OF FRESH OR FROZEN FISH AT CURAÇAO
1952. Dept. Economic Affairs, Curaçao, 89p., 5 figs. (Mimeo.)
- TEENSTRA, M. D.
1837. De Nederlandsche West-Indische Eilanden. Amsterdam, 381p., ill.
- VERSLAG, VAN DEN TOESTAND, VAN HET EILANDGEBIED BONAIRE
1957. Kralendijk, 79p., tabb. (Mimeo.)
1958. Kralendijk, 85p., tabb. (Mimeo.)
- WHITELEATHER, R. T. AND BROWN, H. H.
1945. An experimental Fishery Survey in Trinidad, Tobago and British Guiana. Washington, D.C., 130p., 32 figs.
- ZANEVELD, J. S.
1956. Enige algemeen voorkomende Zeevissen in de Nederlandse Antillen. West-Ind. Gids 37 (1): 5-17, 2 color pls. (Coll. Pap. Car. Mar. Biol. Inst., Curaçao, No. 2).
1958. Laboratory Experiments on raising *Tilapia mossambica* in salt water. Proc. Gulf & Carib. Fish. Inst. (1958), 132-133. (Coll. Pap. Car. Mar. Biol. Inst., Curaçao, No. 13).
1959. Index to the vernacular names of the fishes of the Netherlands Antilles. Port of Spain, Trinidad, 24p. (Mimeo.) (Coll. Pap. Car. Mar. Biol. Inst., Curaçao, No. 16).
1959. The Sea Fisheries of the Netherlands Antilles. Port of Spain, Trinidad, 22p. (Mimeo.) (Coll. Pap. Car. Mar. Biol. Inst., Curaçao, No. 17).

The Developing Shrimp Fishery of Honduras

HAROLD LOESCH
FAO Fisheries Officer
Tegucigalpa, Honduras

Abstract

Honduras exported over 820,000 pounds of shrimp to the United States in 1958, the first year of major production. In 1959 the exports of shrimp decreased to 823,000 pounds. The decrease was due partly to lower shrimp prices and partly to Honduran legislation curtailing operation of foreign vessels. (Under certain conditions foreign boats can now be licensed.) Exports in 1960 reached 343,000 pounds. Currently 15 boats are licensed to shrimp in Honduras.

Honduran shrimping grounds on the North or Caribbean coast are chiefly between 85° west longitude and the Nicaraguan border. White shrimp are most abundant from August to mid-November. Catch per boat per 24-hours fishing varies from 600-3700 pounds. Size of white shrimp is in the 21-30 tails per pound range. Pink shrimp, abundant from October to February, are in the 26-30 tails per pound range. Catch per boat per 24-hours fishing is from 500 to 1600 pounds. These computations are derived from U.S. Fish and Wildlife Service statistics.

During August, 1961, five sampled shrimp boats averaged 131 pounds of white shrimp per hour of fishing. During September, 1961, six sampled boats averaged 244 pounds of white shrimp per hour of fishing.

It is estimated that Honduras can produce one to three million pounds of shrimp per year and can support 20-30 shrimp boats.

Fishing Area

THE NORTH, OR CARIBBEAN, COAST OF HONDURAS runs approximately east and west from about 88° 10' to 83° 10' west longitude. Near the middle of this coast about 10 to 30 miles offshore are the Bay Islands made up of three major islands and a number of small keys.

The eastern half of the North Coast is low and swampy with much mangrove. The largest lagoon, Caratasca, about 30 miles long and 10 to 12 miles wide, is connected to another series of lagoons. Offshore from these lagoons, from Punta Patuca to the Nicaraguan border, are the best shrimp grounds in Honduras. The 100-fathom depth is about 90 to 100 miles off the coast at the Honduran-Nicaraguan border. The bottom is generally smooth sand, mud, or shell, with a number of keys in some areas. The western half of the North Coast is mountainous near the coast; the bottom is generally rough. This area has not been explored.

Prevailing winds are from the east throughout the year. Winds are generally strongest at midday; during late afternoon and night there are often calms and offshore winds. During November and December strong north winds and torrential rains may occur for 24 hours a day for several days. The first of these northers generally signals the end of the white shrimp fishing. Tropical storms are most common in September and October.

Freezers

There are three shrimp processing plants in Honduras at present. The freezers located at Caratasca and Guanaja process only fishery products and presently have six boats working. These two plants are the same size; the Caratasca plant uses ammonia and the Guanaja plant uses Freon 22. Each has a 10kw powerhouse for lights only. Each has a daily capacity of 5 tons of flake ice and an ice storage room for 35 tons. Freezing tunnels are capable of freezing 14,000 pounds of shrimp every 24 hours and there is cooler space for 125,000 pounds of processed shrimp.

The third freezer, located at Puerto Cortes, has six licensed shrimp boats with only three working at present. Its capacity of 350,000 pounds is used chiefly for beef. The nine shrimp boats working for all freezers range from 38 to 70 feet, all have Diesel motors.

Laws

Applicants for a fishing concession must deposit 10 per cent of the proposed investment as a provisional guarantee. The Ministry of Natural Resources requires that a deposit of one per cent be deposited in the Central

Bank of Honduras at the time of application. When the concession is approved by Congress the balance of nine per cent must be deposited. Once the operation begins, the 10 per cent guarantee is returned. Construction of freezing plants, warehouses, etc., is required to be started six months after the concession is granted. Export tax on shrimp amounts to U.S. \$0.50 per gross metric ton plus 10 per cent ad valorem established on a basic price of \$0.40 per pound.

The closed season from 1 December to 30 April is not enforced at present and boats may work for 12 months of the year. This closed season was serving little purpose because at its present underexploited stage the shrimp fishery does not exert enough pressure on the stock to warrant protection of the brood stock, for which it was designed. Furthermore, conservation measures to protect the brood stock are not considered effective.

Shrimp fishing operations in Honduras were greatly curtailed as an effect of the 1959 fishing law limiting fishing activity of foreigners. The law states that only resident Hondurans and Honduran corporations with 51 per cent Honduran capital may obtain permits or licenses to fish for export or profit. However, the Minister of Natural Resources was subsequently given authority to grant temporary permits.

Catch Per Day

In the following observations, derived from U.S. Fish and Wildlife Service statistics, catch per boat per day of 24-hours fishing time is used as an index to abundance of shrimp at the time of fishing and in the area being fished. White shrimp, (*Penaeus setiferus* or *P. schmitti*) are abundant from August to about mid-November. Omitting October, 1960, when the majority of boats were fishing for pink shrimp (*P. duorarum*), the catch of white shrimp ranged from 583 to 2781 pounds per boat per 24-hours fishing (Table 1).

TABLE 1
POUNDS OF SHRIMP CAUGHT IN HONDURAS
PER 24-HOURS FISHING

month	1959 Pounds per day				1960 Pounds per day				
	days	brown	pink	white	total	days fished	pink	white	total
Jan	153.5	15	458	27	506				
Feb	1.0		1083		1083				
Mar	7.0		612		612				
Apr	22.8		296		296				
May									
June									
July									
Aug						14.8	222	1147	1369
Sept						117.8	640	583	1223
Oct	13.8		930	2781	3712	96.5	1233	60	1293
Nov	13.5		1682	1167	2849				
Dec	28.2		1067		1067				
TOTAL	240.0					229.1			
Lbs. per day		9	618	243	870		863	399	1262

Pink shrimp become abundant in late September or October, then gradually decrease after November until March or April, when neither white nor pink shrimp are found in commercial abundance until the following July or August. The total catch is usually reduced in February or March by bad weather.

TABLE 2
POUNDS OF SHRIMP CAUGHT PER MONTH IN HONDURAS*

month	1 9 5 9				1 9 6 0		
	brown	pink	white	total	pink	white	total
Jan	2240	70381	4095	76716			
Feb	0	1083	0	1083			
Mar	0	4283	0	4283			
Apr	0	6753	0	6753			
May							
June							
July							
Aug					3293	16972	20262
Sept					75406	68713	144119
Oct	0	12833	38377	51210	118952	5830	124782
Nov	0	22707	15761	38468			
Dec	0	30097	0	30097			
TOTAL	2240	148187	58232	208610	197651	91515	289166

Size Distribution

Pink shrimp: In 1959 all pink shrimp (except for 525 pounds caught in water of less than 5 fathoms near the Nicaraguan border) were caught in water 16-25 fathoms deep. During 1960 all pink shrimp were caught in 16-25 fathoms of water. All pink shrimp were reportedly caught to the east of 84° longitude. Little exploration has been carried on in water deeper than 25 fathoms.

Over 20,000 pounds of pink shrimp were caught each month of January, November and December in 1959 (Table 2). In these three months as well as in October the majority of the shrimp were 26-30 tails per pound. In February most were 31-40, in March 41-50, and in April 31-40. During 1960 pink shrimp were caught during August, September, and October. During all of these months the majority were of 31-40 count. At all times shrimp caught near the Nicaraguan border were larger than those caught in the western part of the area. This may indicate a general eastward movement of shrimp.

White shrimp: In 1959 about two-thirds of the white shrimp were caught in water 11-20 fathoms deep and one-third were caught in water less than 5 fathoms deep. In 1960 about 90 per cent of the shrimp were caught in water less than 10 fathoms and only 10 per cent of the shrimp were caught in water of a depth of 16-20 fathoms. As was the case with pink shrimp, all white shrimp were caught to the east of 84° west longitude.

During 1959 white shrimp were caught during the months of January, October and November and the majority were 21-25 tails per pound (Table 3). In 1960 shrimp of 26-30 per pound predominated in the catch except during October when the majority of shrimp were 31-40 per pound.

*Data derived from Gulf Coast Shrimp Catch by Areas and Depth, USFWS.

Very small white shrimp are reportedly present in bays during April or May through September.

Brown shrimp: Brown shrimp were taken only in January, 1959, in the reporting years of 1959 and 1960. These were 26-30 per pound.

All species: Shrimp caught in 1960 were a little smaller than shrimp caught during 1959. There are no data indicating the cause of this size difference. Shrimping began in August of 1960 and in October of 1959, but it is doubted that this would decrease the size of the shrimp caught. Nothing is known about the spawning seasons of the shrimp, and it is quite possible that shrimp spawned later in 1960 than in 1959.

Data are not available on the size of shrimp caught in 1958, but over 821,000 pounds of shrimp were exported to the United States during that year.

TABLE 3
SIZE DISTRIBUTION (IN POUNDS)
OF SHRIMP CAUGHT IN HONDURAS

year species	15-20 per lb	21-25 per lb	26-30 per lb	31-40 per lb	41-50 per lb	total lbs
1959 pink	125	10862	100076	35974	1110	148137
1960 pink	0	2935	48101	146615	0	197651
1959 white	1630	33144	22160	1299	0	58233
1960 white	0	6581	54837	30097	0	91515
1959 brown	0	0	2240	0	0	2240
1960 brown	0	0	0	0	0	0

DISCUSSION

Ingle (1960) stated "It is desirable to catch the greatest number of pounds of shrimp, this desirability being enhanced as the size of the shrimp are increased." This statement might be expanded to read "It is desirable to reach a balance between the greatest number of pounds of shrimp caught and the greatest catch per unit of effort of the fleet." In Panama the pounds of white shrimp caught per boat per day decreased as the total number of boats increased, and the overall pounds caught by the fleet remained fairly constant while the number of shrimp caught increased (Borema, personal communication, 1960). This indicates that as fishing pressure increased smaller shrimp were being caught, but the total pounds of catch changed little. In El Salvador the overall catch per month in early 1961 was a little lower than for the same months during 1960. The catch per boat decreased, especially for white shrimp, as the fleet increased by about 30 per cent.

Data from these two countries indicate that a given area may produce near a given amount of shrimp. Therefore, if these shrimp can be harvested with a minimum of effort, it would be economically advantageous to control the fishing pressure. This could be done several ways. First, the fleet might be restricted to a given number of boats. Second, the time of operation could be restricted, with a moratorium for several months when the small shrimp are leaving the lagoons to go to the sea. For example, during a period of three months only a third of the fleet could be allowed to operate each month. Third, areas may be closed to shrimping during part or all of the year. In

places where much of the bottom is unsuitable for trawling these areas would provide a natural sanctuary for shrimp.

If no restrictions are placed on the size of a fleet it is probable that the fishery would develop into an economically marginal fishery with production almost the same as could be produced by lesser effort. Any restriction of season or area should aim at protection in those areas or seasons during which smaller individuals are found. As Ingle (1960), Gunter (1956), Burkenroad *et al* (1955) and Shaeffer (1959) indicate, protection of the larger, spawning-size individual may actually decrease landings. The number of spawners needed to replenish stocks is very small and therefore protection is not needed.

Late in the 1960 shrimp season a program of collecting statistics from the boats when they landed their shrimp was instituted. Information on area of fishing, days of fishing, number of hauls, and total days on the trip are being collected. From the shrimp plants, the grades, amounts, and species of shrimp caught are obtained. These data, incomplete for 1960, are better for the 1961 shrimp season now underway. Random sampling of shrimp obtained from the commercial catch is also being made.

It is probable that Honduras can produce from one to three million pounds of shrimp tails per year with most of the production occurring from August to January, and that it could support 20-30 shrimp boats. These estimates are based on scanty data and should be revised as more data become available.

APPENDUM

Two boats began operating in late July, 1961, each fishing for only two days. One boat caught 595 pounds of white shrimp and the other boat caught 190 pounds of pink shrimp. Detailed data, available for August and September, 1961, from a portion of the fleet are summarized as follows:

Month	No. boats sampled	No. days fished	No. of hauls	Total time in hours of hauls	White shrimp caught by sampled fleet	lbs. per day	lbs. per haul	lbs. per hour
August	5	52	178	272	35,752 lbs.	688	201	131
September	6	67	218	298	72,941 lbs.	1089	335	245

The boats, ranging from 38 to 70 feet, are Diesel-powered and all but one are double-rigged. Average catch per day for individual boats ranged from 346 pounds to 1617 pounds in August and from 310 to 1560 pounds in September. Average pounds per hour caught for individual boats ranged from 50 pounds to 284 pounds per hour fishing time in August and from 132 to 253 pounds in September. The highest single day's catch per boat in August was 2700 pounds and the lowest day's catch was 0 pounds; the highest day's catch in September was 2830 pounds and the lowest day's catch was 175 pounds. Highest average catch per hour on a given day by one boat was 1377 pounds in August and lowest average was 0 pounds. In September the highest was 833 pounds and the lowest was 65 pounds, both reported by the same boat.

All except 95 pounds of the shrimp caught in August and September were white shrimp. Although pink shrimp were present during these months, the catch of white shrimp was so good that the boats did not fish the pink shrimp grounds.

Random samples were taken of the shrimp landed by the sampled fleet. These data, expanded proportionately to include all shrimp landed in Honduras are given in Table 4. The average size of shrimp landed increased from 25.70 tails per pound in August to 21.04 per pound in September. However growth estimates can not be made until more data are collected.

TABLE 4
DISTRIBUTION BY SIZE AND SEX OF
WHITE SHRIMP LANDED IN HONDURAS

length of tails mm	numbers of shrimp			
	male Aug	female Aug	male Sept	female Sept
63-67	6207	0	0	0
68-72	0	6207	0	0
73-77	0	18620	0	0
78-82	0	0	0	0
83-87	9757	24475	3132	0
88-92	20977	63536	7712	4164
93-97	83255	63451	33680	39560
98-102	103759	58365	80204	45176
103-107	137028	77480	177424	110620
108-112	110192	109077	209936	222004
113-117	54804	33222	182892	272944
118-122	0	60937	100436	127540
123-127	0	7496	32996	66366
128-132	0	0	1696	44872
133-137	0	0	5936	11744
TOTAL	525979	522866	836044	944960
No. both sexes		1,048,845		1,781,004
Pounds		40,802		84,637
Avg. No. per pound		25.70		21.04

REFERENCES

- BETANCOURT, A. N.
1957. Investigacion y estudio de puertos pesqueros de Honduras Costa Norte y Costa Sur. Banco Nacional de Fomento, Division Tecnica, Tegucigalpa, D.C. Honduras C.A. 136 p. (mimeo.).
- BURKENROAD, M. L., J. L. OBARRIO AND C. A. MENDOZA
1955. The shrimp fishery in Panama. I. Evaluation of our wealth in shrimp. Jour. Ag. Com. Ind. Panama. 13 (21).
- COLLIER, A., R. M. INGLE, G. GUNTER AND P. VIOSCA
1959. The Shrimp fishery of the Gulf of Mexico. Biological notes and recommendations. Ed. Series No. 2. Gulf States Marine Fish. Com. N. O. La.
- EL SALVADOR SHRIMP STATISTICS. Unpublished.
- FIEDLER, D. H., M. J. LOBELL, C. R. LUCAS, REVISED BY J. A. SMYTH
1955. The fisheries and fisheries resources of the Caribbean area. Bur. Commercial. Fish., Fish Leaflet No. 259, 211 p.

- 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.