

THE FISHERIES OF BRITISH GUIANA

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The present paper is intended to be an introductory description of the existing fisheries of, and the aquatic environments which form potential fisheries in, British Guiana. It also includes information about work which is now being started. These observations are not entirely original. They have in fact been obtained, for the most part, from the fishery survey reports of the Colonial Development and Welfare in the West Indies and of the Anglo American Caribbean Commission, with personal ideas and suggestions interpolated here and there.

Geography & General Topography (Illustrated with maps)

As in all bio-ecological studies, regions have to be considered according to their natural limitations and not as sections limited by boundaries which are really only of historical importance. Such a biotic study as this, is therefore facilitated by the fact that the Guianas do form a geographical unit on the North east coast of South America. Guiana, an old Indian name for "land of waters" lies between the basins of the Amazon River on the east and the Orinoco on the Northwest, being delimited in the South and South westerly sides by the watershed of the Guiana highlands. These highlands trend eastward from the Venezuelan plateau descending the highlands in a series of abrupt steps which give rise to numerous waterfalls, cataracts, and rapids, the rivers eventually carve through the flat alluvial coastal region to the sea. Portions of this coastal plain, which typically is very low-lying, are below the high tide level, and are empoldered behind dykes and other sea defences. The hinterland consists of valuable tropical hardwood forests, savannahs and mountain ranges.

Marine Fishery

The fisheries of British Guiana are both marine and fresh water. It is proposed to give a brief account of the marine habitats and species and subsequently to review as concisely as possible the conditions in the freshwater systems.

Littoral waters fall naturally into about six distinct types, viz:

- (1) Clear brown estuarine water.
- (2) Muddy brown water - with mud kept in suspension by wave action; extends 10 miles offshore and to a depth of about 6-8 fathoms.
- (3) Muddy green water - about 15 miles further to the 15 fathom line.
- (4) Clear green water - especially in the vicinity of the Gulf of Paria.
- (5) Continental sea water - blue or bluish green.
- (6) Oceanic sea water - clear brilliant blue, off-shore.

Distribution of marine fish

According to Whiteleather and Brown the fish found off the Guiana coast fall naturally into the following categories:

- (1) Oceanic pelagic species including blackfin, bonito, crevalles, kingfish and barracuda.

(2) Continental pelagic species such as Spanish mackerel, kingfish, bluefish, spotted bonito, leatherjack, pompano, sennet, etc.

(3) Continental demersal species occurring in the 20-110 fathom zone most abundant of which are snappers, groupers and greymannock. This fishery is perhaps the best developed for this particular species in the British West Indies, the fish being gutted and iced on board the schooners.

(4) Estuarine and coastal pelagic species include many plankton feeders and are mostly herrings, sardines, anchovies, bumpers, etc. as well as a few of the larger predacious species.

(5) Estuarine demersal species are dominated by the Sciaenidae - weakfish, croakers and corvinas. There are many shrimp and as in most South American waters numerous Siluridae - sea-catfish, tampoco, kokwarri, etc.

(6) Shrimp - large shrimp or prawn reported as abundant are Penaeus schmitti, P. aztecus and a smaller species termed Palaemon (Leander) tenuipes.

Present Fishery

Brown observed that the present fishery is almost entirely confined to the continental demersal and the estuarine demersal species, leaving a large intermediate area, varying in depth from 5 to 15 fathoms, which is largely untouched.

This gives some idea of the extent of our marine fishery. It should be mentioned that recommendations which have been made include the adoption of otter trawling, purse seining, gill netting and improvements in trolling methods and handline and longline fishing. The types of gear now in use are handled with considerable dexterity but could be much improved.

Importance of the Fishery Industry

It may not be fully realized what an important source of animal protein fish is, as regards the food supply of British Guiana. This is perhaps best illustrated by the 1941 figures for fish and fish products. The human population was approximately 371,000. Imports of fish and fishery products in that year totalled 5,250,000 pounds valued then by the Commodity Control at \$562,000. This was largely salted fish. Local fresh fish production is estimated at four and a half million pounds valued at an arbitrary price of \$450,000. The total of these two would amount to a consumption of about 29 pounds of fish and fish products per capita for 1941. This figure is subject to alteration as it probably was not a comprehensive estimate for the entire colony.

The Freshwater Fisheries

These fall into two rather distinct classes: first, those of the rivers - the extent of which you may readily visualize from a glance at this map; and secondly that of the irrigation canals and trenches, of which this larger scale map of part of the coastal plain could give you some idea. In keeping with their geographical situation, the Guianas comprise a section of the rich zoogeographical Amazon region. The freshwater fish fauna is therefore rather similar to that of Brazil, there being during the wet season, a direct link from the Amazon to the Essequibo river, according to reports; when the flooded savannahs of the Rupununi district form a continuous sheet of water between Rio Branco tributaries and the headwaters of the Rupununi.

A remarkable feature of the Amazon and Guianese freshwater fauna is the abundance of Siluridae (catfishes) and the presence of such geologically ancient teleost families as the Osteolepidae. The fresh water fish range in size from the largest to nearly the very smallest. The largest in the world, the Osteolepid *Arapaima* is known in Brazil as

Marajo or Pirarucu runs up to 15 feet and over 400 pounds. This claim to be the largest of freshwater species is disputed, as the Lake Sturgeon of Russia attains even more enormous proportions. However this dwells not entirely in freshwater, being an anadromous species. The Arapaima occurs above the rapids in the Essequibo and in the Potaro and Rupununi. Among the world's smallest fish are the so called "million-fish" Lebistes (Acanthophaelus) spp.

River fisheries

The rivers afford the chief means of hinterland transport in the heavily forested but sparsely populated interior. The population is mainly distributed along the coastal region, on a strip between 10 and 15 miles wide, running along the whole coastline, and also in scattered communities for some distance up the rivers. Guianese have devoted themselves doggedly and assiduously to consolidating their position on the coastlands and to the opening of the hinterland at the same time. The river system is therefore not subjected to a very heavy fishing pressure. In fact the Amerindians or Aborigine are the chief fishermen. They exercise considerable ingenuity in the capture of fish, shooting them with the bow and arrow, stopping off or impounding fish, using fish poisons, and also using very cleverly devised traps. The use of fish poisons was first observed, it is believed, among the Amerindians of this region. Many books and papers have been written on this subject and for those who are interested, the publication by L. Krumholz (Indiana University), now in press, would be as complete a coverage as any yet published. Rotenone is very widely used by fishery biologists in this country. There are at least 150 species of plants used as fish poisons in South America. The rivers have numerous cataracts and waterfalls, of which the Kaieteur Fall, 5 times the height of Niagara, is perhaps the most magnificent.

Canal and trench fisheries

The area devoted to sugar and rice cultivation is supplied with a very elaborate system of canals and trenches which gives rise to a remarkable fishery that contributes a very significant amount of protein to the plantation populations. One should have some idea of the situation and operation of our irrigation system so as to realize fully the importance and potentialities of this as a fishery.

Coastal and Irrigation Canal System

The canal system of a typical 10 acre sugar field serves the triple function of drainage, irrigation and navigation. Excess water gathers in the drains and flows to the low-level side-line trenches and thence to the sea wall via canals; being then well below high tide level, and having to be pumped over into the sea. In the rainy season most of the water is removed by this method. Flood fallowing is a standard practice of the irrigated sugar plantations and 10% of the cultivated land is at any time under water. The usual method is to flood the fields to a depth of 3 to 12 inches from six months to one year. The area of the canal system is estimated at 100,000 acres and it has been estimated that for every square mile of ten-acre field there are 65 miles of waterway with ditches or trenches from 2 to 4 feet deep and varying in width from 4 to 20 feet.

Existing Fishery

As one travels along the coast people of all ages and either sex may be observed working the trenches for a pot of fish. In village districts and plantations areas so little control is exercised on fishing, that fish which will normally attain a size of about 8 or 10 inches, or even more in some cases, are removed when only 4 to 6 inches in length. It will however, be a formidable task to have restrictions enforced and to see that they are observed in such areas; especially as such restrictions would, in effect, curtail the food supply of our indigent folk. The type of gear now used in this type of fishing include the hand cast net, the dip net for shrimp and the trench seine. These singly or in conjunction would effectively deplete, or even remove entirely, the fish in an enclosed body of water.

Freshwater Fish Culture

In Poland, Czechoslovakia, Germany, China, Java and in the United States, the culture of fish, involving somewhat similar processes to stock-raising, has been rather well organized into small industries. Latest reports from Java, indicate that they have obtained as much as 4,000 kilograms per hectare - 3,600 pounds per acre - of carp. In British Guiana it is felt that the canal system provides a considerable amount of water entirely under control which could profitably be utilized for fish culture. By this means an inexpensive but abundant source of protein could be made available to the plantation folk whose diet is generally considered as being markedly deficient in that essential food. A previous attempt at fish culture did not meet with success as, after a long period of nurturing the fish, the pond was drained with the keenest anticipation, to reveal, not the fat bouncing fish expected but two very fat and contented alligators.

The application of these waters to fish culture would require a sustained supply of fish from nursery waters to meet the demand for fish where the fishing pressure is sufficient to remove the fish faster than the natural rate of replacement.

A thorough study of the ecology of the irrigation systems and of the life history of suitable fish will have to be carried out. In fact, these will have to be such as would be of immediate practical importance, and those that will be of long term significance which will perhaps modify some tentative conclusions drawn from initial studies.

Mosquito control fish will be not merely desirable but absolutely necessary in every fish culture population. There are at least 13 species of genera which are known to feed on mosquito larvae, 7 of which are suitable for human consumption.

It is highly desirable that the fish used be confined only to indigenous species, as introductions have been known to be immediately or eventually detrimental both directly and indirectly to local conditions.

Subjects requiring research

In conclusion I should mention problems in our fishery generally, which could be helped by direct research. They include hydrography of coastal waters, fishing methods, improved trolling methods for off-shore pelagic fish, preservation methods, ecological studies, keeping quality of coastal fish, mosquito control, hatcheries or nursery streams, shrimp trawling, various types of nets for coastal and estuarine fisheries and the collection and preparation of statistics.

The fisheries of British Guiana are very important today and may prove to be of importance to the West Indies generally, in the future. Progress is being made in the fisheries of Venezuela and of other Caribbean countries and it is to be hoped that British Guiana will not be left behind.

This outline has been hastily prepared but it is hoped it will give some idea of the present conditions and the potentialities of the fisheries of British Guiana.

Finally, an appeal is directed toward Institutions represented at this Institute for reprints, publications and contributions which will help to establish a proper biological library in Georgetown. (The Great Fire of 1945 destroyed what was perhaps South America's finest Natural History Museum and also an excellent library.) When publications are begun it will be a pleasure to reciprocate such kind gestures.