THE BARBADOS FISHING INDUSTRY

The Development and Economic Importance of a Fishing Industry in the Tropics

by

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I N T R O D U C T I O N

Despite the generally underdeveloped state of tropical countries, only in recent years, as a result of the agitation by frustrated peoples and the rivalry between two dominant ideologies, has there been any real effort to improve conditions by investigation into and modernisation of various aspects of economic life. Tropical fisheries have not been neglected, though these have not generally been one of the first activities to be considered. Based on this work, a general assessment of these fisheries, including the factors influencing their nature and their development, and the possible trend of future advances, has been undertaken and an attempt is made to fit the Barbados Fishery into the general pattern. In the main body of the paper, a detailed treatment of the Barbados Fishery illustrates more graphically the development of a fishing industry in the Tropics. Inseparable from the main topic and constituting subsidiary themes, are discussions of the need for balanced diet and adequate employment, pressing problems in many tropical countries.

CHAPTER I

AN ASSESSMENT OF TROPICAL FISHERIES

The contribution of tropical waters to the commercial fish production of the world has been negligible, never exceeding 2% of the total catch in any year. This disparity in output from the warm and cool waters of the oceans can be attributed to a variety of factors. The first, and that of primary importance, is the difference in the productivity of fish in the two areas.

The production of fish in any area, is directly related to the supply of phytoplankton, the ultimate source of fish food. This supply depends upon the availability of various material - nitrates, phosphates, carbon dioxide, nitrogen, phosphorous etc. - within the euphotic zone of the ocean. While in littoral waters these materials are derived mainly from the land, via the agents of erosion; beyond this, they are formed from the remains of dead plants and animals which are gradually decomposed as they sink, ultimately reverting to inorganic substances. Therefore they are concentrated below the zone of effective penetration of the sun's rays, and must be returned there, before regeneration to life occurs. This can only be achieved by vertical movements of water which are produced either by a disruption of the temperature gradient in the water, or by the effects of ocean currents.[1]

The former produces extensive overturning in the middle and high latitudes, where cooling of the surface layers of water in the winter months causes them to sink and be replaced by warmer water from depths.

1) Robert Morgan, World Sea Fisheries (London: Methuen & Co. Ltd.,1956)

Therefore there is an accumulation of the materials necessary for the production of fish food in the euphotic zone and these burst to life as temperatures rise in spring. The constantly high temperatures of tropical surface waters, however, inhibit this phenomenon, and although conditions of temperatures and sunlight are suitable for the growth of plankton throughout the year, materials for its production are generally deficient, therefore these waters are capable of supporting less fish.

Overturning caused by the circulation of ocean currents is more restricted in extent. It occurs in oceans where off shore winds, coupled with deflection produced by the Earth's rotation, push the surface water away from the land, causing the upwelling of water from depth to replace it. Examples are found on the west coasts of continents in Trade Wind Belts: the coasts of Northern Chile and Peru, Southern California, Southwest and Northwest Africa and Western Australia. Similar upwelling occurs along the Equator where west-moving water is deflected to the right in the north and to the left in the south. This is especially well developed in the Pacific Ocean near the Galapagos Islands. Upwelling is also associated with vertical ocean currents. The high productivity of plankton between 50^{o}- 60^{o} South can be ascribed to an abundance of phosphates and nitrates. This is brought to the surface when water, which has travelled south at depth, rises to replace cooler Antarctic water which is sinking or because of its low salinity, moving out at the surface.[2] While middle and high latitudes oceanic water is affected both by the extensive overturning caused by seasonally low

2) Ibid 7.

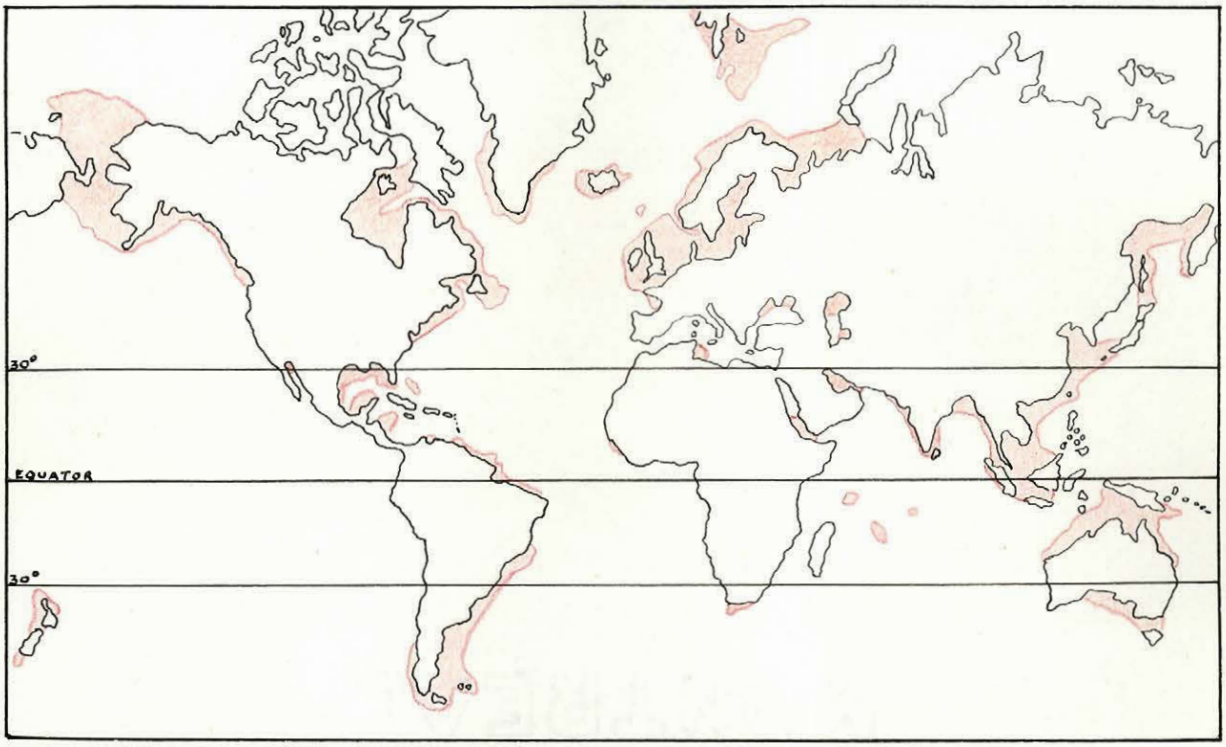
surface temperatures and the more restricted upwelling produced by currents, tropical waters are influenced only by the latter and areas rich in plankton are thus limited. Therefore only a few isolated areas in the Tropics, can be expected to have dense populations of fish.

Another factor which has contributed to the growth of commercial fishing is the extent of the Continental Shelf. One reason for this, is the prolific growth of fish food. Marginal to land, the Continental Shelf receives an abundance of land-derived nutrients necessary to produce plankton and furthermore, it supports a variety of sea bed plants, an important supplementary source of fish food. These can grow to maximum depths of 100 metres in the Tropics and 20 metres at 60° North latitude.[3] Added to this, organic remains fall to the seafloor and provide food for small creatures on which fish feed. This food supply supports large quantities of fish. Apart from this factor, however, the world's commercial fishing is largely confined to Continental Shelves for economic reasons, namely the shorter trips between fishing sites and markets and the greater ease of taking demersal species.

The development of Continental Shelves in the Tropics is poor and as a result the advantages accruing from their existence are lacking. While wide shelves are common in higher latitudes, in the Tropics, extensive shelf areas are restricted to Indonesia and Northern Australia, moderate expanses occur on the east coast of Central and South America, Indo-China and the Indian Sub-Continent. Elsewhere continental shelves are very narrow.

3) Ibid 4.

Figure 1. The Extent of Continental Shelf [x]



x) Robert Morgan, World Sea Fisheries, p. 21

Not only have adverse physical factors militated against the development of large scale commercial fisheries in the Tropics, various economic factors have similarly hindered progress,of these, the relatively under-developed state of tropical countries is important. These countries, lacking a manufacturing tradition, possessed neither the technological skill to develop the more effective mechanised equipment necessary to large scale operations, nor had they the capital with which to buy it. Further, the low purchasing power of the majority of the population did not encourage increased production, for coupled with inefficient transportation networks, elementary marketing systems and only basic, if any knowledge of preserving fish, disposal of large catches proved difficult.

In fact, a variety of unmitigating circumstances has inhibited the growth of tropical fisheries.

Today, fishing activities in tropical waters can be divided into two types. First, there is a more advanced fishery, generally highly localised in character, and associated with the more productive waters in the Tropics. Using more efficient boats and more effective gear, this type is an offshoot of the highly developed fishing activities of northern countries, and the catch is destined for markets in these countries. The tuna fishery carried on by United States clippers off the coasts of Northwestern South America and Central America is an example of this type.

The second type is far more widespread and, in fact, may be considered the typical tropical fishing. The catch is marketed in local coastal areas and primitive, traditional fishing methods remain unchanged, but more generally, in a state of transition to more modern methods. This change represents the work of the past two or three decades, and in most cases is government sponsored, although private enterprise has played a significant role in some countries.

Original impetus to improve these fisheries sprang from food shortages produced by two World Wars, when the main sources of cheap preserved fish were cut off from their markets. This emphasised the peril of dependence on foreign countries for vital foodstuffs, and the need to increase the domestic output of these whereever possible. Undoubtedly too, the growing nationalism throughout colonial areas and an increasing desire to be independent have contributed to the drive by tropical countries to improve their local fisheries. Nor can the

contribution of the services, available through the United Nations Food and Agriculture Branch be overlooked.

Tropical fisheries, then, are on the threshold of their development. For the first time, some of the adverse factors, so far crippling progress, are being tackled. Already the introduction of improved boats and better gear have produced marked increases in catches in some areas, and can in most areas. And development need not stop here; it is likely that research into the habits of tropical fish especially pelagic species, will further increase catches, while intensive exploration and mapping of tropical oceans may well reveal new grounds for demersal fish. More seaworthy, powered boats, better equipped, and manned by more skilled fishermen can bring once inaccessible areas within the fishing range. These increased catches can be absorbed by local markets with the establishment of more efficient communication systems and by the use of improved methods of handling and preservation.

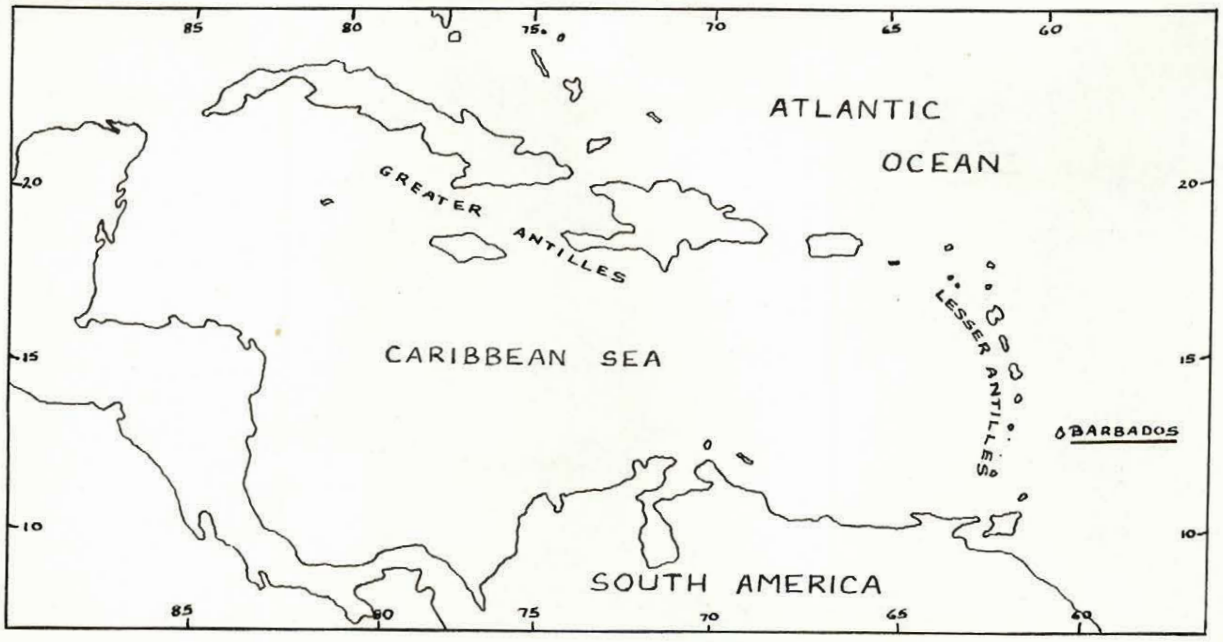
However, lack of large sums of money will mean that development must be spread over a period of time and only gradually can efficient industries be built up. Above all, it must be remembered that the basic physical disadvantages relating to fish food supply and its influence on the quantities of fish available still obtain, and it is inconceivable that production from tropical waters, even while more adequately satisfying domestic demands and in some areas supporting an export trade, could equal that of cooler waters.

CHAPTER II

THE BARBADIAN FISHERY IN RELATION TO TROPICAL FISHERIES

The Barbados fishing industry is an example of the second type of tropical fishery. In the first place, the island's fishery suffers from the same physical handicaps common to this type. Barbados is situated at 13° 10' north latitude and 59° 30' west longitude, where the surface temperatures of the ocean are constantly high, and the North and South Equatorial currents, which alternately sweep the coast represent masses of warm water, poor in plankton. The South Equatorial current however, derived originally from Antarctic water, and enriched by the outpourings of the large rivers of northern South America, is the richer in plankton and in the island, better catches of fish are believed to be associated with the impinging of this current on the coast. The Barbadian fishery then, like those that comprise the second type of tropical fishery, is carried on in poorer tropical waters.

Figure 2 The Position of Barbados



Since there has been no intensive exploration and detailed mapping of the topography of Barbadian peripheral waters, only a sketchy picture can be drawn. It is apparent, that as is the case throughout much of the Tropics, the Continental Shelf of Barbados is very restricted. Varying from .8 of a mile to 2.6 miles wide, the shelf is best developed off the northeast and northwest coasts and off Carlisle Bay, where a gentle slope continues to depths greater than 100 fathoms and the shelf area is broader. An additional area of relatively shallow water is found over the "London Shallows" - an isolated offshore bank, 7 miles long by 2.5 miles wide, enclosed by the 100 fathoms contour, and running from southwest to northeast at a distance of more than 3.5 miles off the southeast coast.[4]

A second aspect of the marine topography affecting tropical fisheries, though not to the same degree as the Continental Shelf, is the extent of coral growth. Active in all the waters surrounding Barbados, coral growth is particularly vigorous on the windward and southeast coasts. Though only one well developed barrier reef, "The Cobbler", occurs off the southeast of the island, navigation is difficult everywhere off the east coasts and approach is possible only through a small number of shallow channels.

Generally then, it can be said that the relief of Barbadian coastal waters is not favourable for the growth of large scale fishing activities, for not only is the fish food supply limited, but on the windward coast, the marine topography hinders fishing operations.

4) Herbert H. Brown, The Sea Fisheries of Barbados (Development and Welfare in the British West Indies; Barbados: Advocate Co. Ltd., 1942)

Not only has the Barbados fishery been subjected to similar physical handicaps, but similar social economic and political pressures have influenced fishing activities over the years, so that the general trend of development of the Barbados fishing industry parallels that typical of tropical fisheries of the second type. The story of fishing in the island can be divided into periods. The first, one of relative stagnation, endured for most of the island's history - approximately up to 1940 - and the activities of this period will be referred to as the "Traditional Fishery". In striking contrast, the second period is one distinguished by greatly accelerated progress, the work of the past twenty years.

CHAPTER III

EVIDENCE OF FISHING FROM THE TIME OF EARLIEST SETTLEMENT AND ITS IMPORTANCE

While for the greater part of the prehistoric era the island of Barbados was uninhabited, the one group of people who appear to have been permanent settlers there, and in fact seem to have occupied the island for many decades, the Arawaks, were primarily fishermen. G. T. Barton agrees thus in favour of the unrivalled importance of fishing, "The tendency to settle on the coast, the vast supply of shell tools, and heaps of shell refuse, all suggest a predominating fishing economy."[5] Such emphasis on fishing activities was unusual in the Indian economy, for on the South American mainland, their original home, the Arawaks were essentially agriculturalists.

This anomaly represents an adaptation to the local environment, for fishing not only provided food, but supplied shell, the raw material for most of their implements including agricultural tools. As to the nature of these activities, Barton envisages this situation: " Such fishing was probably confined to shallow water and to the coral reefs of the coast. Fishing techniques were the hand thrown net ....., a type of harpoon, possibly bows and arrows, and basket traps ....."[6] Fishing, then formed the basis of the Arawak economy of prehistoric Barbados, a situation which has yet to recur in the island's history.

5) G. T. Barton, The Prehistory of Barbados (Barbados: Advocate Co. Ltd., 1953), 71.

6) Ibid.

The Arawaks disappeared from Barbados a century before the British established the first settlement there in 1625. Despite the discontinuity in occupance, fishing again formed a part of the economic life of the island. What first prompted fishing activities one can only surmise; it may have been the difficulty of obtaining food supplies from the homeland during early colonisation or it may have been that the colonists had a tradition as seafarers in their own country. Whatever other factors may have contributed, the unusual behaviour of the Flying fish, the most abundant species in local waters, was noticed by the earliest settlers and no doubt attracted their attention to the sea's resources. These fish are remarkable for their tendency to leap out of the water and glide through the air with outstretched fins when pursued by predators, the dolphin in particular. This characteristic evoked comment in the first history book on Barbados.[7]

While reference to the eating of fish in Ligon's book indicates that there was fishing as early as 1657, actual record of the nature of the fishery is found much later in Griffith Hughes' work. He wrote that the Flying fish "suffer themselves to be taken up with the Hand, or with a small Hoop net, which is the common and most expeditious way of taking them."[8] Mention of the capture of Flying fish also occurs in Schomburgk's history, published in 1848.[9]

While reference to the taking of Flying fish is more frequent and

7) Richard Ligon, A True and Exact History of the Island of Barbados (London: 1657)
8) Griffith Hughes, The Natural History of Barbados (London: 1750), 300.
9) R.H. Schomburgk, History of Barbados (London: 1848)

this is natural since they are found in greatest numbers even today, other fish are also mentioned in the early writings on the island. Hughes[10] records the capture of Jacks in nets, while Schomburgk[11] writes that Bream were caught for food. Though early literature is not abundant, scattered references indicate that there was fishing during the early colonial period, and that it continued to be practised over the years.

In direct contrast with the prehistoric fishery, that of the early colonial era was of minor importance to the island's economy, for from the beginning of British rule, agricultural pursuits eclipsed fishing activities. The frequent absence and brevity of references to fishing in period literature is evidence of this, while such mention as is made conveys the impression of an essentially disorganised activity, practised as the individual's inclination guided him. Schomburgk[12] writes that a large number of small boats were engaged in fishing, and Sinckler[13], in 1913, points out that although some fish were provided seasonally, there was no organised fishing except whaling. It is probable that originally fish were taken by individuals to supply their personal needs, but seasonal abundance of the Flying fish and consequent large catches, encouraged the sale of fish to the public and led to the emergence of full-time fishermen.

So long as catches were satisfactory, fishing was practised unnoticed. When however, declines in the catches of some species provoked

10) Hughes, op. cit. 307.

11) Schomburgk, op. cit.

12) Ibid.

13) E. G. Sinckler (ed), The Barbados Handbook, 1913

complaints, official interest was for the first time aroused, and the importance of cheap, local fish to the diet of the poorer classes, which constituted the bulk of the population, realised. The official policy is revealed by the various laws which were passed concerning fishing. It was essentially negative in character and aimed primarily at regulating the capture of those fish whose stocks seem to be becoming depleted.

As early as 1724, there was an Act for the Preservation of Fish[14], prohibiting the poisoning of fish and fining white persons 5 pounds (sterling) for the offence, while Negroes were liable to as many as thirty-nine lashes for this crime. Similarly the dynamiting of fish was early outlawed. The Sea egg was one of the first items to attract attention, for not only did numbers decline but fishermen complained that they were no longer to be found in some of their usual habitats. This prompted an investigation into the fishery which resulted in the passing of the Sea Egg Preservation Act 1879[15], prohibiting the taking of the urchins from April to August, and making the buyer or seller who contravened the law subject to penalties of 40 shillings fine or one month's imprisonment with hard labour. These acts represent early sporadic attempts by the government to regulate fishing activities.

The first comprehensive law pertaining to fishing was the Fisheries Regulation Act 1904-1905[16], legislation prompted by the diminution of turtles, sea-crabs, lobsters and fish caught in pots, the continued decline in sea eggs, and the persistence of dynamiting. In essence,

14) Richard Hall, The Acts Passed in the Island of Barbados 1643 - 1762 (London: 1764)

15) Official Gazette (Barbados: 1879)

16) Official Gazette (Barbados: 1906)

it reproduced the laws that had preceded it: the size of turtles, and the area within which they could be captured, was restricted; more severe penalties than those of 1879 could be incurred for the taking, sale and purchase of sea eggs during the prohibited season; the dynamiting of fish was made punishable by 3 months imprisonment or a fine not exceeding 50 pounds (sterling); the mesh of wire used for fish pots could not be less than 2 inches, and the taking of lobsters and sea-crabs while they were spawning was illegal. Such were the official efforts to control fishing activities and amendments, similar in character, were proposed at regular intervals.

It is noteworthy that these acts are deterrents, and constructive measures are lacking. This is particularly striking, for simultaneously, there was a public outcry against the returning of Flying fish to the sea, and their use as manure, when seasonally very large catches were made. There was also a realisation of the need to preserve these fish, either by smoking or salting, to make them available during periods of scarcity. Mention of this occurs in Schomburgk's[17] history and the problem continued to exist, for at the turn of the twentieth century, some consideration seems to have been given to the idea of exporting Flying fish to neighbouring islands. Despite this abundance which, it would seem natural, could have been exploited to compensate for the paucity of other fish, reference to the Flying fish is conspicuously absent from official records.

Equally apparent is the fact that many of the clauses were very difficult to enforce and infringements continued to be made. Nor were fishermen to be summarily condemned. As some people even at the time

17) Schomburgk, op. cit.

realised, it was impossible for a poor man whose livelihood depended on his catch, to turn away from a turtle laying its eggs on the beach, or to leave sea eggs in the water in August when they appeared as mature as in September. What did he know or care about the relationship between propagation and supply when hunger threatened him? Indeed the frequency with which amendments were proposed suggests that the laws were not particularly effective in inhibiting old practices nor in improving the diminishing supply of some species.

Apart from the laws controlling the whale fishery, the one enactment of this period which merits wholehearted commendation is that of 1908[18], empowering Commissioners of Health and Sanitary Inspectors to enter any shop selling fresh fish and inspect the product. If this was found unfit, it was to be disposed of, and a fine not exceeding 40 shillings inflicted. Generally, the official policy sought mainly to maintain the status quo rather than effect any major improvements. Consequently it is reasonable to assume, that the nature of fishing activities changed little throughout approximately three centuaries of British Colonial Administration, for in view of the small scale of fishing operations, the fishermen themselves lacked the capital, and certainly were ignorant of the first steps necessary to effect any major improvements. Any changes that did occur were undoubtedly minor adaptations, discovered empirically with years of experience.

18) Official Gazette (Barbados: 1908)

CHAPTER IV

THE TRADITIONAL FISHERY

An attempt to describe the practises that typified Barbadian fishing for most of its history is fraught with difficulty because so little has been written on the subject. It was not until 1942, that a comprehensive report on fishing in Barbados[19] was published. This report will be used as the basis for an account of traditional fisheries since it is unlikely that any major adaptations in methods or gear occurred through this period.

The fishing boats will be discussed first. In size and appearance, the typical fishing boat used in Barbados had no counterpart in any of the other West Indian Islands where canoes have been the traditional vessels. They were sturdily built, open vessels, ranging in length from 18 - 24 feet, measuring 6 - 8 feet at the widest point, with a draught of up to 6 feet[20] and a maximum capacity of 2000 - 4000 lbs. of fish.

Driven by the wind, the boat carried two sails, a main sail and a powerful jib. This form of propulsion was reasonably reliable since there were steady winds from the northeast for the greater part of the year, with but a short period of light and variable winds in the summer months, June to August, - a period when fishing activities are considerably reduced in any case. Nonetheless, fishing activities were critically dependent on wind conditions, a crucial factor determining the number of fishing days; when winds were light, boats remained beached because of

19) Herbert H. Brown, The Sea Fisheries of Barbados (Development and Welfare in the West Indies; Barbados: Advocate Co. Ltd., 1942)

20) Ibid.

the danger of being becalmed, while on days with very strong winds, operations were likewise suspended because of the peril of capsizing or of having the mast broken and the sails torn.

The sailing vessels' most unusual feature was the absence of outboard ballast and the custom of taking about one ton of old iron inside for stability. The handling of this ballast required not only great manual effort, since it had to be moved from side to side as the boat changed direction, but also consumate skill, for any miscalculation could cause the boat to capsize. This resulted in a large number of accidents involving the loss of many boats as well as lives, an occurrence which from time to time caused great concern.

Three-quarters of the boats were owned by fishermen, though it was not unusual for people, other than fishermen, to own boats and engage fishermen to take them to sea. All types of fishing was carried out from the sailing boats; while the capture of pelagic fish was done exclusively from them, the taking of some demersal fish and sea eggs was frequently carried out from dinghies locally known as "moses". This arises from the fact that demersal fisheries were confined to that part of the year when winds were light, and the "moses" was better suited for the collection of sea eggs.

These dinghies were numerous, and it is not unlikely that they may have preceded the sailboat as the main fishing vessel; for it is dubious whether Schomburgk, writing in 1848[21], could have been referring to sail boats when he mentions that a large number of small boats were engaged in fishing. This may indicate that the sailboat was a late

21) Schomburgk, op. cit.

Figure 3 "Moses" at Anchor

introduction, however concrete proof of it is lacking.

From these boats fishing was carried out the year round. Two distinct seasons - "The Flying Fish Season" and "The Hurricane Season", were recognisable. In the "Flying Fish Season", fishing was based on the occurrence of migratory pelagic species which congregated in local waters to spawn or prey on the spawning fish. In the "Hurricane Season", fishing consisted of the capture of demersal fish inhabiting the banks and shelf areas surrounding the island. In view of the restricted shelf area, the stocks of these were limited in comparison with the relatively abundant supplies of pelagic fish, therefore the "Flying Fish Season" was the dominant one.

The pelagic fisheries of this season can be divided into two sections (a) The Flying Fishery and (b) the capture of larger fish: dolphin (Coryphoena hippurus), Kingfish (Acanthocybium Solandri), Albacore (Neothunnus Albacore) and a variety of sharks - to mention some of the most important. While the Flying fish (Hirundichthys Affinis) is small - it takes three to weigh approximately one pound - the larger fish can weigh several pounds, therefore methods of capture vary, and it is necessary to discuss these activities separately.

During the "Flying Fish Season", the capture of Flying fish (Hirundichthys Affinis) was the fisherman's most important business. The fish were found in local waters from November to July, but the main catches were made in the period stretching from January to June, when the Flying fish was most abundant.

When in pursuit of Flying fish, boats, carrying three fishermen, left the shore at about 4 a. m., so that by 6.30 or 7. a. m.[22],

22) M. Rose, "Memorandum on the Barbados Fishing Industry", Official Gazette, 1955.

a school of fish would probably have been encountered. On setting out, the fisherman sought to determine the direction of the ocean current. This he frequently achieved by looking for chips of Sargassum moss, on which the fish spawned and which drifted in the current, and trailing them. Once he was sure that his boat was in the current, generally at a distance of 3 - 4 miles offshore, the sails were lowered, the mast unstepped and the boat allowed to drift with the current.

The fisherman's first task was to attract the fish to his boat, a practice locally called "chumming". A wicker bait-basket, filled with a variety of rotting fish mixed with vegetable oil, was placed overside and adjusted so that as the boat rolled, it was raised above the surface of water and partially submerged in turn. The constant agitation caused bits of bait and oil to be dispersed over the water. The smell of the bait attracted the fish, while the oil becalmed the area and enabled the fisherman to see the fish more clearly.

Half an hour to several hours could be spent "chumming" before the Flying fish began to collect. The first few to congregate were caught with a short, handcast line of fine cord (Number 0 in 1942) or crochetted thread, fitted with a small hook (No 12-14 English in 1942)[23]. As larger numbers gathered nearer the boat, hooking was abandonned and the fish were scooped up in an elliptical dip net 4 feet by 3 feet, made of 1½ ins. mesh supported by a hoop of cane[24]. This operation was known as "baling" and two of the fishermen engaged in it. By this method, Brown[25] estimated that 2,000 - 3,000 fish could be taken by

23) Brown, op. cit.

24) D. N. F. Hall, Recent Developments in the Barbadian Fishery and Contributions to the Biology of the Flying Fish -Hirundichthys

25) Brown, op. cit. /Affinis (Gunther) 1956

a boat at the peak of the season. If however large numbers of fish failed to gather alongside the boat, hooking had to continue and catches were considerably smaller.

How long the fishing continued depended on the numbers of fish available and the necessity to catch the market. If fish were numerous, boats stopped fishing at 11.00 a.m., so that they reached land between 2 - 3 p.m., and could sell their fish before large quantities arrived and prices fell. If the supply was small, fishing might continue until 1 p.m. and boats arrived home between 5 p.m. and 6 p.m.[26]. The direction of the current also influenced the length of time spent fishing. If it was offshore, it meant that at the end of the day boats were far from home and a long journey was necessary, therefore fishing was abandonned sooner. Conversely, if the current was onshore, only a short distance home was involved and fishing could continue longer[27]. Thus a fisherman's day was 10 - 14 hours long; 6 - 7 hours of which were spent travelling and 4 - 8 hours in actual fishing.

The capture of large pelagic fish was subsidiary to that for Flying fish. Their occurrence roughly coincided with that of Flying fish - though in October and November there were reliable schools of king fish (Acanthocybium Solandri) bonita (Katsuwonus pelamis) and barracuda (Sphyraena barracuda). The dolphin (Coryhoena hippurus) was prevalent from the middle of February to May, off the east and southeast coasts. It was customary while in search of Flying fish, to tow a line or two, either held in the hand, or attached to

26) Rose, op. cit.

27) Brown, op. cit.

the stern of the boat, in the hope of catching one of the larger fish. Apart from trolling, a lurk line was also used for this purpose. While engaged in taking Flying fish, one or two lines with baited hooks were set overside.

Sometimes, however if supplies of Flying fish failed, systematic trolling was resorted to. King fish (Acanthocybium Solandri) was the quarry, and these were sought in the shallow waters over the banks around the island, and especially off the southeast coast. On occasion too, if a school of the larger fish was encountered, they were fished with hand lines. Generally the gear was crude; wire lines were used for larger fish, while string sufficed for smaller bonita (Katsuwonus pelamis) and crevalle (Caranx latus). The lines were fitted with rusty hooks on which pieces of rag or Flying fish were placed to attract the fish[28].

The taking of demersal fish was concentrated in the period from August to October. The catch was small compared with that of pelagic fish, so that at this season many sailboats were beached for repairs and fishing was carried out from dinghies. The catch consisted mainly of snappers (Lutianidae) and groupers (Epinephelus slavolimbatus, Epinephelus mystacinus, Epinephelus morio) - the most desirable fish, - as well as many other bottom species. These fish were found on various banks, the exact location of which, in many cases, was known only to experienced fishermen. Two methods were employed in the capture of demersal species: line fishing and pot fishing.

Line fishing was carried out either from sailboats with

28) Ibid.

a crew of 7 men or from "moses" carrying 4 men, and took place in water ranging from 30 to 100 fathoms deep especially on the "London Shallows", the deeper slopes of the Continental Shelf from Tent Bay to North Point in the Northeast, North of Speightstown in the Northwest, and on the shallow bank off Carlisle Bay[29]. The practice was to embark at about 5 a.m., proceed to one of the banks and anchor. Huge stones were carried for this purpose.

Each man had his own gear, line and hook (No 7 in 1942)[30], tended it and kept his catch separate. The bait consisted of small fish, sardines or pilchards, caught in inshore waters either by a member of the crew or by a fisherman, using a handcast net, from whom it was purchased. Obtaining bait was a problem and inadequate supplies often limited catches. The use of hand lines for bottom fish was hard work for it required the hauling of great lengths of line several times daily. However, prices were good (16 cents per pound in 1942)[31] and fairly stable, since fish were scarce at this season. Thirty to forty pounds of fish constituted an average day's catch, while up to 100 pounds could be taken daily.[32] In payment for the use of the boat, each fisherman was required to pay the boatowner one quarter of his receipts from the sale of his fish.

The pots-traps,- used in demersal fishery, were constructed

29) Ibid.

30) Ibid.

31) Ibid.

32) Ibid.

Figure 4 A Handcast Net

locally. Initially pots were made of bamboo strips[33], but later, because of greater durability, they consisted of a light, wooden frame, covered by wire with $\frac{1}{2}$ inch mesh. The average dimensions were 5 feet by 2 feet by 20 inches, but sizes varied a great deal. In the shorter sides, were down-turning funnels which became increasingly narrow, through which the fish swam into the pot. It was customary to place a piece of enamel on the top of the trap, which enabled it to be more readily espied from the surface. Ballasted with stones and occasionally baited with crushed sea eggs or fish scraps, pots were set in water up to 40 fathoms deep[34].

Generally the exact location was remembered by choosing two prominent landmarks and recording the pot's position in relation to these. Sometimes the site of pots placed in deeper water was marked by a buoy. The setting of pots was generally done by two men working from a "moses" but on the windward coast a few sailboats were engaged in this activity. Pot fishing was confined to the "Hurricane Season" because the sea was calmer reducing the possibility of the pots being moved by turbulence. Calmness was accompanied by a clearness which made it easier to see the pots. Both of these factors reduced the loss of pots, a factor tending to make this method of fishin unprofitable.

The above represent the main fishing activities in local waters. However the description would not be complete without

33) Bamboo pots are rarely used today. Those in the photograph were recently introduced by St. Lucians who have settled in Barbados.

34) Brown, op. cit.

Figure 5 Bamboo Pots

Figure 6 Typical Fish Pots

mention of some auxiliary activities not strictly confined to either of the two main seasons. The sea egg fishery is one of these. The sea egg (Tripneustes Esculentus Leske) is a large sea urchin, the gonads of which formed a cheap and popular source of food when available. Since 1879 the taking of the urchins had been restricted for a period of the year when they were believed to be spawning. Subject to frequent changes because of inexact information, the Close Season in 1942[35] extended from March to the middle of August.

The gonads were available in largest quantities at the beginning of the harvesting season, September and October. Sea egg fishing generally took place from a dinghy. One or two men would dive down and collect the sea eggs in a net, which when full was emptied in the boat, and the operation repeated. Another fisherman sat in the boat, breaking the shells and removing the gonads. Sometimes they would wait until the boat was filled and return to the beach to remove the edible portion there. While sea eggs occurred in the waters all around Barbados, the area of best production extended from South Point to Ragged Point off the island's southeast coast.

Any discussion of local fishing must also include a description of seine netting, though a minor activity - in 1942 there were only 10 nets and these were little used[36]. Two factors contributed to this unpopularity: first, the rugged bottom associated with active coral growth made operation of the net difficult,

35) Ibid.

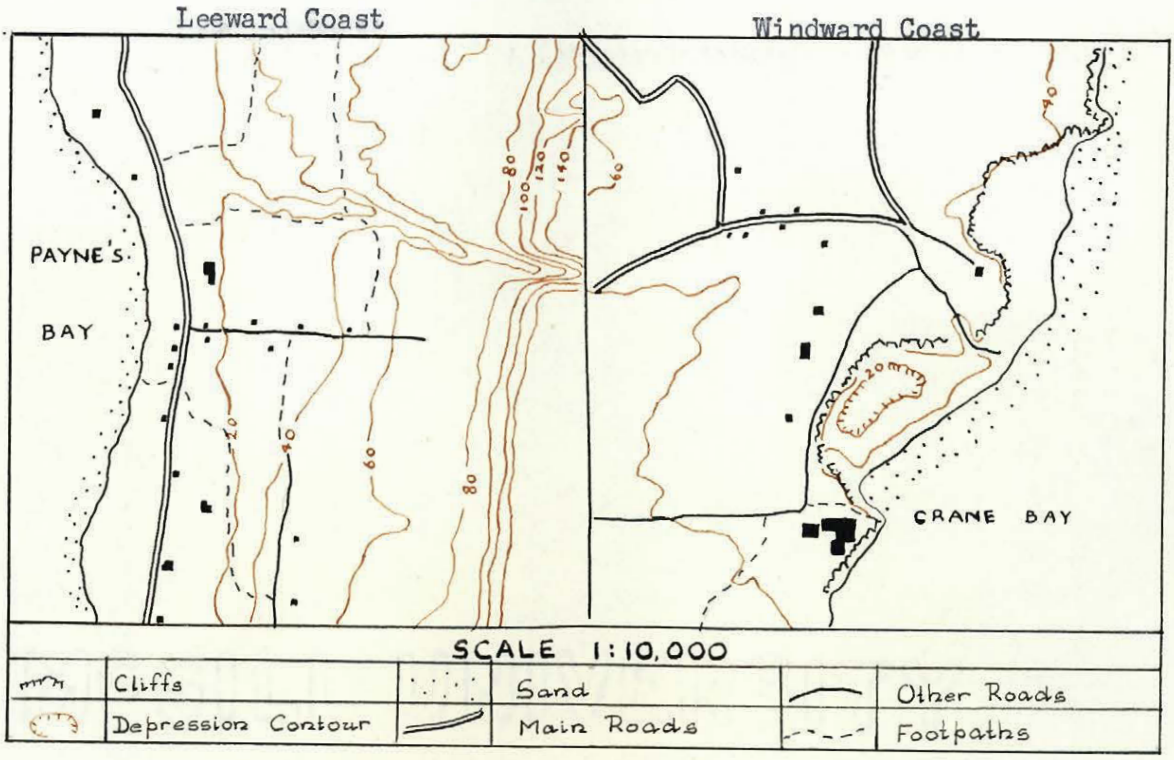
36) Ibid.

since it frequently became entangled and it was necessary to dive and free it; secondly it often proved impossible to assemble a team of men capable of handling the net. Made locally, the net was 120 yards long and 20 feet at its widest, tapering towards the sides. It was operated from dinghies in water about 30 feet deep, where the sea floor was comparatively free of coral rocks. The operation involved the sighting and encircling of a school of fish, a task necessitating 5 to 8 men. Best suited for the exploitation of schools of smaller fish, seine netting was most successful from June to November when good catches of crevalle (Caranx latus) Jacks and Johns (Carangidae) were made.[37]

These fishing operations were carried out from a large number of sites widely scattered around the island. Writing in 1942, Brown[38] stated that there were 27 major beaches from which fishing boats operated. This dispersion was partly the result of physical factors. On the west coast where generally calm seas reduced the necessity for shelter, numerous small mooring sites lined the coast. While on the windward coast, fishing was carried on from fewer, larger sites, situated in the larger bays which offered some shelter for boats left at anchor, or contained stretches of beach on which boats could be hauled nightly. The influence of the physical environment was particularly evident on the windward coast, north of Tent Bay; exposed to the full blast of the prevailing winds and devoid of sizeable indentations this stretch was never used as the base for fishing operations.

37) Ibid.
38) Ibid.

Typical Topography of Fishing Sites on the Leeward and Windward Coasts.



Another factor contributing to the pattern of numerous disseminated fishing sites was the nature of fishing activities. Since fishing was essentially a small scale, even individualistic operation, where the fisherman frequently possessed his own boat and used simple, homemade equipment, it was customary for him to haul up or moor his boat at the most suitable point nearest his home so that it could be within easy access. This rarely presented a problem for the boat's draught was shallow enough to enable it to be moored anywhere so long as the sea was calm enough, and with the aid of six or eight men, the vessel could easily be beached.

The system of marketing fish was as elementary as the methods of catching them. It was habitual to land the catch at the beach from which the boat operated, and there to sell the fish

directly to customers who had foregathered, and who lived in the immediate district. If fish were scarce they may have come from further afield. Excesses were sold, at a slightly cheaper rate, to hawkers, women generally, either relatives of the fishermen or regular buyers from them, who on foot or by bus distributed the fish further inland.

There were three major landing points, Bridgetown, Speightstown and Oistins Town, which owed their importance to the larger nuclei of population. When fish were plentiful, fishermen from the surrounding sites brought their catches to one of these points because they were more likely to be disposed of there. Generally the fish were brought by boat, but if a long distance was involved as in the case of the journey from Tent Bay to Bridgetown, a truck was rented for the purpose.

At these three major landing points, some semblances of markets existed. In 1942 that at Oistins consisted of three delapidated sheds, at Speightstown there was a small building with a concrete floor while in Bridgetown, a small building with concrete slab and tap comprised the market. At the market one fisherman from each boat remained to sell the catch. Again some fish was sold to hawkers, who either sat in the vicinity of the market and made a few extra cents by gutting and boning the fish for buyers, or set out for districts at some distance from the coast.

There was no price control, therefore prices fluctuated considerably. That of Flying fish was particularly unstable since very large catches of these were made seasonally. In 1942 the price

Figure 8 The Bridgetown Market 1942

of Flying fish ranged from 6 - 10 cents each. However when very large catches were made, the existing marketing system could not handle them, and since there were no facilities for storage overnight or for longer periods, prices were drastically reduced in the hope of disposing of the whole catch in the same night. Prices of larger pelagic fish tended to be more stable since large catches were infrequent. In 1942 dolphin cost 12 - 16 cents a pound and king fish and albacore 10 - 14 cents per pound. The price of fish caught during the "Hurricane Season" was not subject to same wide variations as that of Flying fish, and since supply rarely satisfied the demand at this period, higher prices than normal were common. In 1942, snapper was usually sold at 16 cents per pound. Sea eggs were cheap, approximately half a pint of the gonads cost 6 cents in 1942.[39]

This description of the "Traditional Fishing" reveals an essentially haphazard activity from which none of the participants, - fisherman or consumer - nearly derived maximum benefits. The fisherman's catch was restricted because of the use of crude gear and equipment and he was not encouraged to improve these, since the existing system of marketing proved incapable of handling good catches even then. Consequently a fisherman was barely able to eke out a living: Brown estimated that the fisherman who made $ 100 a year, along with fish he kept for his personal needs, was doing well in 1942.[40]

39) Ibid.

40) Ibid.

It is hardly surprising that under these circumstances fishing was often a part time occupation resorted to when other means of employment were not forthcoming. As a result, the amount of fresh fish available to the inhabitants was less than the demand despite greater supplies in the water. The shame of this is particularly striking when it is realised that large quantities of cheap, salted cod were being imported annually. In 1938-39, 5,600,000 pounds worth 55,000 pound (sterling)[41] were bought. For a long time, this constituted the main source of protein in the diet of the masses of Barbadians. Since agriculture was devoted almost exclusively to the cultivation of sugar cane, livestock rearing was confined to the raising of one or two animals by private individuals. Therefore fresh meat was both scarce and expensive.

41) Ibid.

CHAPTER V

EXTRAORDINARY ACTIVITIES.

There was one type of fishing carried out in local waters which has so far been omitted because it was not truly typical. Not only was whaling a very restricted activity, but it was also short-lived, and there is no likelihood of its being resumed. It was only early fishery to be organised and this is not surprising, for the capture of these huge mammals necessitated a considerable outlay of capital and the co-operation of several men. The hunt for whales was a year round activity, but the main season extended from January to June. Boats operated out of Speightstown and Holetown and at the turn of the twentieth century, when whaling reached its peak, there were 8 boats, four based at each town. The whalers were open boats 25 feet long, fitted with both sails and oars, and manned by a crew of seven[42]. The men were paid weekly wages in advance and, over and above this, received a bonus according to the profits cleared by the capture of whales.

When a whale was sighted, it was hotly pursued and harpooned. Once harpooned, one of the crew leapt overboard and sewed the whale's mouth shut so that no water could enter the body and reduce its ability to float, for this would hinder towing the dead whale to port. The whalemen approached their quarry with caution, since any noise would scare away the easily frightened whale. Exploiting the affection of cows for calves, the whalemen, when they

42) Ibid.

sighted the two together, first harpooned the calf, and as the mother lingered, shot boom lances into her body and harpooned her. Once the cow was securely caught, they completed the capture of the calf. Catching the male proved more difficult. Not only were these harpooned, but they also had to be shot, for when harpooned only, they would often dive to considerable depths and escape capture. There was also the danger that they might dash the boat to pieces with their tails.[43]

In the Fisheries Regulation Act 1904[44], strict rules governing the whale fishery were set down, for keen rivalry existed between the boats operating out of the two towns. The clauses stipulated that once a boat pursued and struck a whale it had sole possession, and if mother and calf were sighted together, the boat that struck one was entitled to the other. It was also ruled that if one boat summoned another boat to aid in the capture of a whale, of if two boats struck the whale simultaneously, it was to be processed at the factory of the boat that struck first, and after expenses were paid, the profits were to be divided equally. When two whales were hit by two different boats and the lines became entangled, the law made it incumbent upon the boat that hit last to cut loose in favour of the other. Any break of these regulations incurred a fine of up to 10 pound (sterling).

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43) Allan Skinner, "The Whaling Industry", The Barbados Handbook 1913, E. G. Sinckler (ed.)

44) Official Gazette 1906.

The whales caught were belived to have been part of the stock which migrated from north to south in the Western Atlantic, and which formed the basis of the New England Fishery[45].

Humpback whales (Megaptera nodosa) predominated, but an occasional Sperm whale (Physeter catodon) was killed. The whales were caught primarily for oil, derived from the blubber, or the fat which encased the whole body. This brought a gross price of 13 - 18 pounds(sterling) per ton[46]. However nearly every part of the body was used. Some of the bones were used to make corsets, while some were crushed to make manures, the teeth made coarse brooms, and the flesh, sold at 4 - 6 cents per pound, was eaten by the Negro population.

At the peak of the whale fishing in Barbados, 10 - 20 whales were captured annually and the last successful year on record was 1902. A steady decline ensued and gradually whaling was abandonned. In 1913, only two boats and fourteen men were engaged in whaling and no whales were captured[47]. Finally, between 1920 and 1923, these attempted to operate off Grenada where some whales occurred but where strong tides made operations from a sailboat perilous, so that eventually this too was abandonned.

The reason for the decline of whales off Barbados is not known. Writing in 1913, Allan Skinner[48] attributed the decrease in

45) Herbert Brown, The Fisheries of the Windward and Leeward Islands, (Development and Welfare in the British West Indies; Barbados: Advocate Co. Ltd.) 26.

46) Herbert H. Brown, The Sea Fisheries of Barbados,(Development and Welfare in the British West Indies; Barbados: Advocate Co. Ltd.)

47) Skinner, op. cit.

48) Ibid.

in catches to the fact that whalemen were less skilled than formerly. However, the fact that the whales have since disappeared completely, suggests that fewer were available even then. When Brown[49] pointed out that 1902, the last successful whaling year, coincided with the eruption of Soufrère, he may have been implying that there was a connection between the two events. Another explanation, held by some of the older Barbadians, is that the decline coincided with the replacement of wind-driven sugar mills in Barbados. They claim that the reflection of the sun on the rotating mill point attracted the whales which were playful. The fact that the main whaling season, January - June, was also the season for the reaping and grinding of sugar cane, lends some credibility to this explanation.

Also neglected up to now is the Red Snapper Fishery carried out on the banks off the coast of British Guiana. Like whaling, this was a temporary activity and furthermore it was carried out in alien waters. In 1942 there were three Barbadian owned vessels engaged in this fishery. The catch of these, however, was marketed in Port of Spain, Trinidad, and the boats only returned to Barbados intermittently to be refitted. Normally a trip lasted 14 - 16 days, 3 of which were spent in travelling, and the rest, fishing in water ranging from 30 - 90 fathoms for red snappers (Lutianus aya) and a variety of groupers. Hand lines, each containing 12-14 No 4 hooks[50] were used. Fishing was done from sea-going schooners capable of carrying 10,000 - 16,000 pounds of fish. Once caught, the fish were kept wet and in the shade,

49) Brown, op. cit.

50) Ibid.

and every two hours they were gutted and stored on ice. While fish were available throughout the year, the best months were July to November.

The Barbadians affected by this fishery were few and its life span short. One sea captain who took part, said that he fished between Tobago and British Guiana from 1933 - 1942 and again from 1946 - 1948. The practise was discontinued because the high cost necessary to equip the outfit, heavy losses of gear especially when the vessels drifted over rocky bottom, and because the prices obtained did not adequately cover expenses. However, this fishery in alien waters is important since it may have represented one of those far-sighted ventures, introduced prematurely, but worthy of a second try at a later date.

CHAPTER VI

THE AWAKENING OF THE FISHERY AND ITS ORGANISATION

It took a crisis to rouse the fishing industry from its inertia. For years stark and unalleviated poverty bred dissatisfaction in the hearts of the frustrated populace, who finally gave vent to their discontent by rioting in 1938. As a result of this outbreak a Royal Commission was sent to Barbados in 1939 to conduct investigations into all facets of the island's economic life. These revealed a grave need for countless improvements in all fields, and the island's fishery was not excepted.

The members of the Commission found the widespread and disorganised fishing activities wholly unsatisfactory. In the Report on Fisheries, they strongly advocated that development should be energetically pushed forward in an attempt to utilise the supplies of fish in local waters more adequately, since the supply of animal protein in the island was critically deficient. It was felt that the large quantities of cheap, salted cod imported into Barbados, indicated that fish was a popular item in the diet of the inhabitants, and the members of the Commission were convinced that if fresh fish was available, it would be preferred to the imported one. They therefore urged that the existing fishery should be assisted immediately, lest deterioration set in as a result of chronically unfavourable conditions.

The initial efforts to improve Barbadian fisheries were undertaken by the British Government through the agency of Colonial Welfare and Development. The very first step was to have a comprehensive

and detailed investigation of the existing fishing activities in the island carried out. This was done by H. H. Brown and his report was published in 1942. Not only did it confirm the general conclusions of the Royal Commission, but it revealed a situation aggravated by the exigencies of war.

The island's supply of animal protein was even more critical; owing to the interruption of communications with northern countries, supplies of cod were restricted. This shortage, coupled with increased shipping and insurance rates, had produced a considerable increase in the price of salted fish. The local fishermen, however, were unable to benefit from this breach in the market because supplies of gear were also restricted and their boats and equipment suffered from general disrepair.

In his recommendations, Brown[51] reiterated the suggestions of the Royal Commission, but outlined in greater detail how development should proceed. He found the Barbados fishery in critical need of immediate rehabilitation and overall, long-range improvement. He felt that immediate action should include the supplying of equipment and gear to fishermen, the organisation of research and the collection of statistics. For general improvement, he proposed the establishment of a fisheries department to undertake the development and management of the local fishery, the handling of research into all fishing techniques, and their demonstration. He also advocated the collection of statistics and law enforcement; beach improvement and control; and more efficient marketing and distribution of fish.

51) Ibid.

It is doubtful whether any action would have been taken immediately, had not a third disaster precipitated it. In 1941 very rough seas brought severe damage and heavy loss to the fishing fleet, when many boats broke loose from their moorings. Some vessels drifted to neighbouring islands and many were battered in the surf. To rehabilitate the fleet, the Barbados Government initiated a Loan Scheme in 1942. The government authorized the sum of $ 3,840[52] to be lent to fishermen for the replacement or repair of boats. The loans were given on a two-yearly basis; the first year was interest free but after that 3% interest was charged. The Loan Scheme represented the first tangible assistance given to fishermen, and it heralded in a period of active official interest in the fishing industry.

The administration of the island's fisheries constituted a major problem and it was one of the first to be tackled. A Fisheries Advisory Committee, - comprising of Director of Agriculture, and various responsible members of the community, with an interest in and knowledge of fishing, - was formed. As the name suggests, the function of this body was to advise the government on matters pertaining to fishery developments. In 1944 a Fishery Officer was appointed. He and a lone assistant, comprised the Fisheries Department, set up as a branch of the Department of Science and Agriculture. Initially, the new department was financed by funds from Colonial Development and Welfare, allocated on a five-yearly basis.

52) D. W. Wiles "Government Assistance in the Development of the Fishing Industry", Fisheries in the Caribbean, 1952.

The Fisheries Department's first duty was the administration of the Loan Fund.

The Fishery Advisory Committee, including the Fisheries Officer, was enjoined by the government, to draw up a program for development. A comprehensive plan was formulated and the probable expenditure involved estimated. This plan called for the establishment of a fishing experimental station, and the provision of a boat for research,an undertaking estimated to cost $ 116,256. The local government decided to finance this project. Other plans included: the structural improvement of fishing boats, the development of the shark fishery, the modernisation of fishing methods, the multiplication of fishing units, the improvement of beaches, the clarification of beach rights, and better marketing and distribution of fish. The implementation of those plans was estimated to require $ 109,104 initially, with a recurring annual expense of $ 39,696[53].

It is interesting to trace the development of the bodies responsible for fishery administration in Barbados. The Fishery Advisory Committee continues to function and is instrumental in directing the official policy. The Fisheries Department has developed considerably since its establishment in 1944. One of the first steps taken by the government to ensure the efficient operation of the department, was the sending of the Fisheries Officer on a course of study to the United Kingdom in 1946, so that he might be better equipped to perform his duties. In the same year, plans for the experimental station and boat were drawn up. In 1949 the Fisheries

53) Ibid.

Department moved to its own buildings at the Reef, Bridgetown; and the experimental boat, "Investigator", was launched. The boat was later fitted with a depth recorder and plankton indicator. Today the Fisheries Department consists of two sections: a) clerical branch, responsible for the handling of financial transactions, and b) the mechanical branch, whose members operate the experimental boat and are responsible for regular inspection of the island's fishing fleet.

CHAPTER VII

THE PROGRESS OF TWO DECADES

The development of an important fishery demands five basic requirements: A. The primary need is a supply of fish. The relative abundance or scarcity of this supply is determined by physical factors already discussed. B. A set of conditions favouring the exploitation is a second requirement. These conditions are influenced by topography - affecting the suitability of coastal sites as bases for fishing operations; climate, which can facilitate or hinder fishing operations; cultural factors such as the maritime skill of local inhabitants and economic factors - namely the ability of the land to support its population. C. A third requirement is capital. D. Next, a market is essential and its importance will be decided by the density of population, its purchasing power and its tastes. E. Finally an efficient means of distribution is indispensible. Since fish is a perishable commodity, speed of transportation and some form of preservation are essential.

An examination of the "Traditional Fishery" reveals that while some of these basic needs were fulfilled in varying degrees, many were lacking. Obviously fish were available, but an assessment of the factors determining fish stocks have indicated limited supplies. While a rapidly increasing population on a limited extent of land, concentrated in large holdings and devoted to a monoculture demanding large supplies of labour only seasonally, encouraged the use of the sea's resources as a means of livelihood, the suitability of coastal

sites as fishing ports was limited, and the maritime skill of Barbadians restricted. Supplies of capital for investment in the industry were virtually non existant. Since neither private concerns nor government showed interest in the fishery, the fishermen themselves would have had to supply the money, and they were extremely poor. While a relatively dense population with a liking for fish offered a good market, the low purchasing power of Barbadians greatly reduced the importance of these factors. The system of distribution was unquestionably inadequate, for despite small total production, gluts occurred frequently and fish were rarely seen in the interior parishes. In fact, the primitive state of the "Traditional Fishery" was the result of the handicaps imposed by a number of unfavourable conditions.

When, following the riots, a desire for social reform pervaded official policy, the improvement of diet was deemed imperative, and an increase in local fish production offered a partial solution to the problem. Therefore a program aimed at the systematic improvement of the conditions necessary for the growth of an efficient fishery was undertaken.

Capital.

The first measure of government support took the form of the provision of capital to be invested in the industry. This was channelled into the fishery in one of two ways. Money went directly to the fishermen by way of the Loan Fund, initiated in 1942 with the allocation of a modest $ 3,840, increased in the following year by $ 10,800 and subsequently augmented. In the second case, money was spent on various

projects beneficial to the fishery. This investment in the industry was imperative in the initial stages of development, for all other aspects of improvement depended upon it.

Conditions favouring fishing.

One of the objectives of the fisheries development program was to improve the sites from which fishing boats were operated. The seaward approaches to the sites received early attention. In many areas and especially on the windward coast, approaches were obstructed by coral reefs, and consisted of narrow channels which were becoming increasingly constricted as a result of coral growth. To facilitate navigation through these passages, attempts were made to widen and deepen them by blasting, an operation performed in the summer months, when the sea was generally calmer and clearer. In 1944 Conset Channel and Meg's Channel were blasted, and in 1945, the approaches to Tent Bay were widened. Similar work was done at Martins Bay, Skeete Bay and Crab Hill between 1946 and 1947[54].

These operations can be viewed as a direct effort to overcome one of the physical limitations impeding fishing activities and the outcome was successful, for in all cases navigation of the channels was made easier. Furthermore damage to boats on the reefs was considerably reduced, and since it was now possible to pass through the gaps when the sea was more turbulent, the number of fishing days was increased and consequently the total production.

Not only physical but legal problems needed to be resolved.

54) Department of Science and Agriculture Annual Reports 1945 - 1948 (Barbados: Government Printery)

Ownership of beach areas and access to them were considered important issues, to be early clarified, if the fishermen were to be assured free use of beaches and unmolested entry to them. While friction is yet to occur between the major contenders for the use of beaches - fishermen and the promoters of the tourist industry - and the official policy has always upheld unrestricted use of all beaches by the public, with an expanding tourist industry proving a lucrative source of revenue, this rivalry is inevitable. Thus the government's policy of purchasing stretches of beach around the island for prior use by fishermen is a farsighted one and highly commendable. In 1949, a stretch of land at Shermans was bought, and in 1951, some land at Payne's Bay[55] was acquired. Similar purchases of coastal strips have been made at Tent Bay and Oistins.

There have been other efforts to improve various beaches as bases for fishing operations. These include the provision of a tractor and winch at Tent Bay. Tent Bay is located on the island's windward coast where constantly rough seas and a rugged coastline make it disastrous to attempt to anchor boats overnight, and it is necessary to beach them every evening. It is for this purpose that the tractor and winch were installed in 1949. The building of good road to remote and inaccessible fishing sites represents another of the government's projects to achieve its objective, this time by facilitating the distribution of fish from the point of landing. The road to Foul Bay, and that to Skeete Bay which was being completed in 1961, are examples.

The above represent the first efforts to develop fishing

55) Department of Science and Agriculture Annual Reports 1950 - 1953 (Barbados: Government Printery).

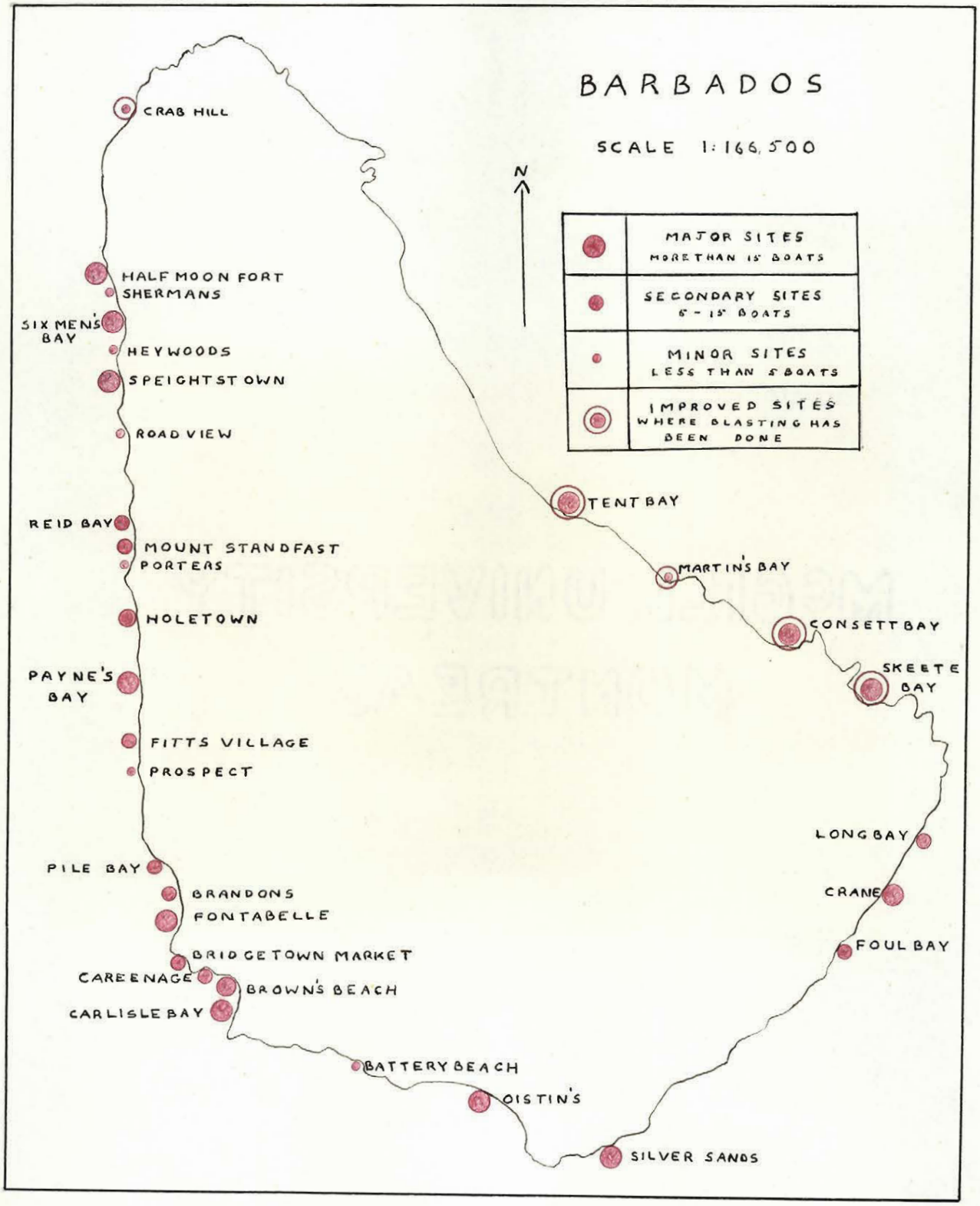
Figure 9 Beaching Fishing Boats at Tent Bay

bases in Barbados. As a result, areas from which fishing is done, are gradually assuming peculiar characteristics and are certainly more utilitarian than formerly. No longer is the presence of fishing boats, drawn up on the beach or moored a few hundred yards off the coast, the only evidence of fishing activities in an area. Today, increasing numbers of marketing sheds, the ubiquitous fuel dispenser which has come with mechanisation, the occasional buoy placed to mark a navigable channel, all indicate the presence of a fishing site. No doubt as the tourist industry expands, and fishing activities become increasingly restricted to areas that have been specially allocated, fishing sites will grow even more specialised.

At present, one cannot yet isolate a true fishing village in Barbados. Fishing is still too insecure an occupation to encourage large numbers of men to make it their sole means of livelihood. Furthermore, it is doubtful whether a sizeable community could be supported by fishing alone. The small size of the island, the fact that it is amply and evenly populated and thoroughly cultivated, have also militated against the growth of fishing villages, since one is never forced by isolation to be restricted to a single job. Certainly, there are coastal settlements where fishing constitutes one of the major economic activities of the inhabitants, but the tendency for the fisherman to be a"jack of all trades"still persists.

A second phase of government support sought to supplement the fisherman's limited maritime skill. Undoubtedly the Barbadian possessed certain qualities as a seafarer. His ability to construct relatively sea worthy craft and to manipulate the sailboat attest

Figure 10 Main Areas from which Fishing Boats Operate



to this. However he may be accused of some deficiency, since he failed to display initiative by developing improved equipment with which to work. This the government attempted to supply.

The typical fishing boat was an object of constant and intense concern from earliest official intervention in the local fishery. As already stated, the first act of official support took the form of the initiation of a Loan Scheme, designed to rehabilitate the fishing fleet. The frequent accidents and consequent loss of lives caused great anxiety. As an early palliative, the Fisheries Department negotiated with a private Insurance Company, and in 1947 it was possible to insure fishing boats for the first time[56].

It was generally felt, however, that a change in the type of vessel used was desirable. Before any radical adjustments could be undertaken, it was necessary to have an idea of the size of the fishing fleet and to establish a closer liaison with the fishermen. To achieve this, the Fishing Industry Control Act of 1947 required the registration of all fishing boats and full-time fishermen. Registration took place for the first time in 1948; 954 boats were recorded.

When in December 1951, heavy seas wrought havoc with fishing fleet, it was considered a good opportunity to introduce some changes. The new boat, like the old one, was wind-propelled. The change was aimed primarily at eliminating the hazard of carrying loose inboard ballast. It was felt that a heavier keel would give the desired stability. While one of iron was considered

56) Department of Science and Agriculture Annual Report 1947 - 48. (Barbados: Government Printery)

admirable, the cost of this proved too great, and as a compromise, a mixture of cement and steel, weighing 1,100 pounds, was used. These vessels were known as the "Calvert models" after their designer. The first were built under supervision at the grounds of the Fisheries Department, where thirty boats were constructed. This model had the advantages of being more stable, easier to handle, and furthermore was so designed as to be easily converted to a powered craft. However they were slower than the old sailboats and their widespread use was never strenuously advocated. If there was to be a change in design, much greater benefits would have to accrue from it.

A powered boat was generally favoured. Experiments from the research boat "Investigator", helped to emphasise the benefits of mechanised craft. Gradually a model, designed to suit the demands of the industry and, equally important, the means of the fishermen, was developed by the Fishery Officer and Fishery Advisory Committee. Now that the mechanisation of the fishing fleet was being undertaken, the original Loan Fund, established in 1942 and which had been increased at intervals, was sizeably augmented. The period over which a loan could be repaid was extended. Loans of up to $ 500 were still available for the building and repair of sailboats, for it was realised that these cheaper boats were all that some fishermen could afford. However loans up to $ 2,160 were offered to anyone contemplating the building of a new powered boat or the conversion of a sailboat to power. When building a new boat the owner was expected to pay 40% of the cost, and if converting a sailboat he was expected to contribute 25%[57].

57) D.W. Wiles, "The Mechanisation of the Barbados Fishing Fleet", The West Indies Fisheries Bulletin July/Aug. 1959.

Naturally the benefits, to be derived from the Loan Scheme, were not offered without reservations. Once a loan was made, the boat had to be built according to the regulations specified by the Fisheries Department, and its engine had to be approved by the department. The boat had to be insured for its full value, - money for insurance payments could also be borrowed from the loan fund, but it had to be repaid within 90 days of taking. It was obligatory to keep repayments of the loan up to date, have the boat regularly inspected by a member of the Fisheries Department and carry out any repairs suggested by him. Failure to comply with any of these could incur seizure and sale of the boat, if the money owing on it was not paid within five days. These were the conditions covering the issuing of loans and they are clearly stated in the Fishing Boat Regulations 1958.

The new boat, which today predominates, is a small, powered launch. Its general dimensions[58] are: 22' - 30' long; 7'6" - 11' beam; 3' - 3'9" draft. The body, weighing 1 1/3 - 2 tons for small boats and 3 tons for larger vessels, represents the fisherman's contribution or 40% of the total cost. Its construction is done by various shipwrights, who have learnt their trade as apprentices under older men. These shipbuilders may have one or two assistants working with them. The boat frames are made from mahogany or white cedar - local timber. The body consists of imported pitch pine and spruce-pine, up to the waterline and spruce above it. The keel is made either of pitch pine or green heart. Of these, green heart is superior because of its greater durability, however its cost is prohibitive. As a compromise, it is common to have the

58) Ibid.

Figure 11 The New Fishing Boat

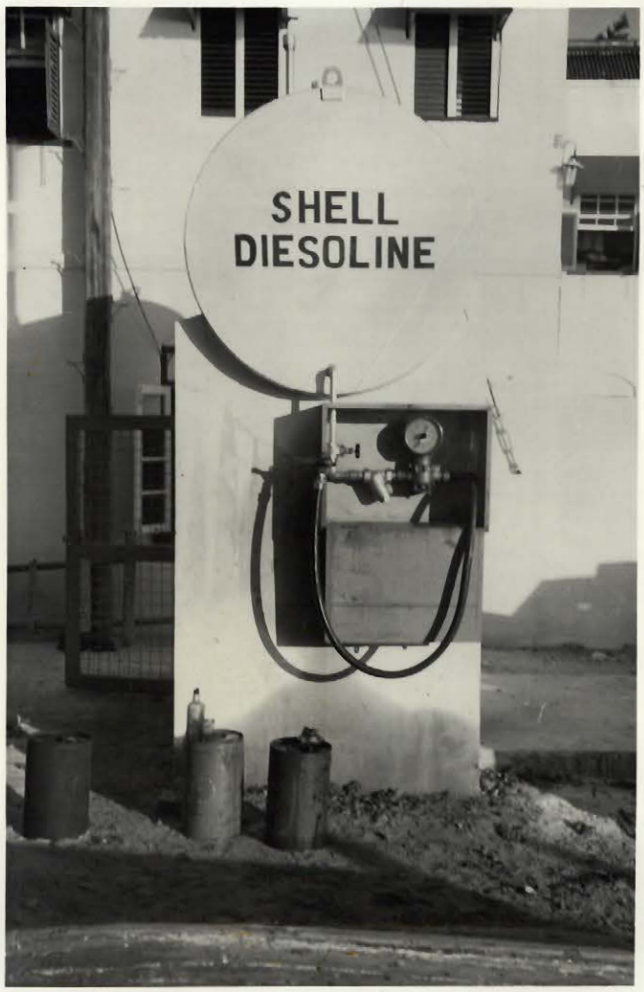
upper portion of the keel made of pitch pine and the lower strip of tougher green heart. This can be easily replaced when worn.

Since it is customary to built without shelter, the skeletons are painted with a preservative to reduce weathering. The hulls are built all over the island and frequently in the owner's yard, where he or she can supervise the shipwright's activities. If a shipwright is conscientious, and a good relationship exists between himself and the owner, construction of the hull can be completed in eight weeks. Under less favourable conditions it can drag on for a year or longer, and many a hull is the work of several shipwrights.

A cabin house 7 ft. x 8 ft. is erected in the middle of the boat. This provides cover for the engine, storage space for fishing gear and shelter for the crew. While under construction, the body is inspected at intervals by a member of the Fisheries Department and when completed to his satisfaction, application for the loan is presented to the Fishery Advisory Committee. The money obtained through the loan is used mainly for the purchase of an engine. Diesel marine motors varying from 10 - 36 horsepower, depending on the size of the boat, are being used, so that the average travelling speed of launches varies from 7 - 9 knots. Diesel engines have been chosen because the fuel is much cheaper than gasoline. When the engine has been installed, a mechanic from the Fishery Department takes the boat on a trial run to ensure that the engine is functioning efficiently. Thereafter regular checks are made and labour for repairs is free of charge until the loan has been repaid.

The advantages of mechanised boats over sail craft are

Figure 12 Diesel Fuel Dispenser



tremendous. In the first place, they are easier to handle and do not require many of the time consuming activities necessary to operate a sailboat. Secondly, they are safer than their forerunners. Next, their use has produced an increase in the number of fishing days, for the powered launches are less dependent on wind conditions. The fourth benefit derived from the use of launches, and this is particularly significant, is an increase in the number of fishing hours. Owing to their greater speed, and because they can travel directly to a fishing ground, far less time is spent travelling and an increasingly longer time fishing. While in a sailing vessel six to seven hours a day were spent travelling, powered launches take four to five hours per day, so that two more hours are available for actual fishing. All of these factors have, either directly or indirectly, contributed to increased catches over the past ten years.

The introduction of powered boats began in 1951 and thereafter, the number of launches increased rapidly at the expense of the sailboats, for these were unable to withstand competition and their abandonment was swift.

Table 1. The Mechanisation of the Fishing Fleet [x]

YEAR	SAILBOATS	POWERED BOATS
1953	-	12
1954	-	18
1955	288	32
1956	232	157
1957	103	319
1958	30	412
1959	4	451
1960	5	463

[x] Figures obtained from the Fisheries Department.

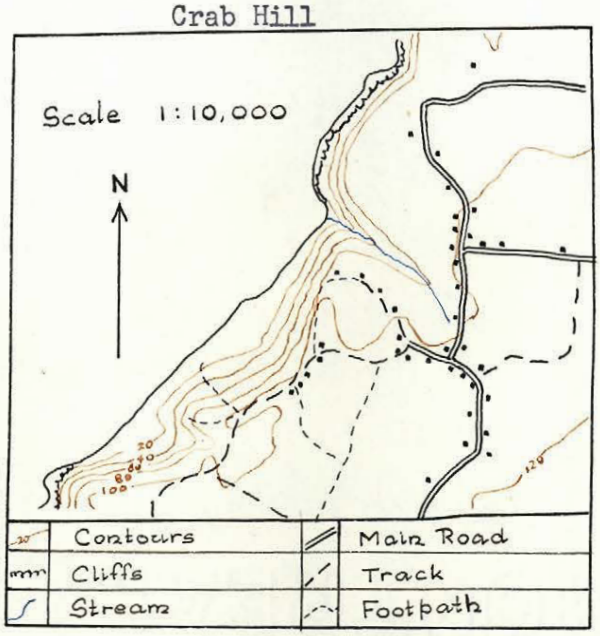
Figure 13 Launches at Anchor

Apart from its effect on production, the introduction of powered boats has influenced other aspects of the fishing industry. High initial cost - three to four times that of a sailboat - coupled with greater maintenance and operating costs, has placed the launch beyond the means of many fishermen, so that the fishing fleet consisting of launches is considerably smaller than that of sail vessels. Furthermore, a larger number of boats are owned by non-fishermen who are more solvent financially than the average fisherman. This tendency would no doubt have been even more pronounced but for the Loan Scheme; this fund made it possible for the reasonably successful full-time fisherman to continue to be a boat owner. The fact that only a very small number of launches have been built without some measure of financial assistance, attests to the importance of the Loan Fund in helping to keep the ownership of fishing boats in the hands of fishermen.

The Loan System has not however been able to eradicate entirely the pressures created by increased costs. The decline of some fishing sites illustrates this point. Crab Hill is an example. This has always been a marginal site physically. Not only are coastal waters shallow, but rock formations make navigation difficult despite blasting. The beach area is restricted, backed by a scarp, over which passage is possible only by a foot track. Furthermore the residents complain of frequently rough seas especially during the early months of the year. Economically too, the area has its limitations. Situated on the island's north coast, the fishing site is remote from the main population centres, and its immediate market is a small settlement located at the

top of the scarp.

Crab Hill



On account of these adverse conditions, the fishermen were generally poor and, when their old boats were worn out, they were unable to contribute enough money towards the building of a new launch to be eligible for a loan. Furthermore, it was inexpedient to replace a sailboat, since they were incapable of competing with the far superior launches. Therefore while twelve sailboats used to operate from Crab Hill, only three launches are registered there today, and these are not owned by fishermen. Fishing activities from this site have diminished considerably; pot fishing from "moses" constitutes the main fishing now. The history of this site demonstrates how the introduction of costlier fishing boats is tending to produce the growth of fewer, larger and more prosperous fishing sites.

Also aimed at compensating for the fishermen's deficiency in maritime skill, was the program for improving fishing techniques and gear. Initially steps were taken to ensure that the fishermen could replace or repair worn out and damaged equipment. The Loan Scheme of 1942 made provision for the lending of money to purchase equipment, a practice which has subsequently been continued. Early consideration was also given to the cost of fishing gear, which is imported and sold by private concerns at a profit. The prices of fishing materials have always been a source of dissatisfaction among fishermen. Some reduction in costs was achieved in 1949, when various articles used in the fishery: hooks, lines, nets etc., were allowed to enter the island duty free[59].

The business of improving fishing methods and equipment fell to the Fishery Department, and as soon as the "Investigator" was launched, experiments began. It is natural that the first efforts were directed towards increasing the production of Flying fish (Hirundichthys Affinis), the fish that occurs in largest numbers in local waters. From December 1949 to July 1950[60], the Fisheries Officer used a gill net for the capture of these fish, to determine the mesh size most efficacious in their capture. With nets made from twelve ply cotton, a mesh size, which when stretched measured 1 7/8 inches, was found to be critical to success, since the slightest increase produced a marked decrease in catch. Elastic nylon nets with the same mesh size proved useless, but nets with a smaller mesh size were

59) Department of Science and Agriculture Annual Report 1949 - 50 (Barbados: Government Printery)
60) Ibid.

were worked with greater success. Between 1950 and 1951, two gill nets were used from the "Investigator" which persistently outfished other boats. Simultaneously experiments were carried out to determine the most suitable net colour. These indicated that dark green, light blue, dark blue and purple were equally good.[61]

Because of the success of these experiments, the use of the gill net in the capture of Flying fish (Hirundichthys Affinis) was advocated by the Fisheries Officer, who by demonstration of the net's efficiency sought to encourage its widespread use. Early in 1952, seventy boats were using gill nets and, by the end of the 1952 - 1953 fishing season, the whole fleet was supplied with them. Most boats used one net, but some operated two - one from the bow, the other from the stern. The gill net commonly used by Barbadian fishermen is twenty yards long and twelve feet wide. Thirty-three corks are attached to the headrope, and lead weights, totalling three pounds, are spread along the footrope. Green in colour, the nets are made from white cotton and dyed with Cuprinol, a preservative.

Not only had the Fisheries Officer to convince the fishermen of the merits of the gill net, he also had to persuade the importing agents that the fishermen would purchase the material for nets, once it was available. At first all the nets were knitted by the owners, but as their use spread, it was realised that the importation of net would greatly increase the speed of introduction. To prove that the net would be bought, the Fisheries Officer imported the first 1000 yards

61) Hall, op. cit.

of net. These were rapidly purchased and by the middle of 1952, net had arrived in the island in quantity.

The introduction of the gill net has brought about major changes in the Flying fishery of Barbados. Today launches are set to drift in the current, and the process of "chumming" continues as of old. While some fish are hooked - these are used mainly for bait - the overwhelming majority are gilled. Gilling is facilitated by the fact that Flying fish (Hirundichthys Affinis) congregate in Barbadian waters to spawn, and the females are looking for floating objects on which to deposit their eggs. They are therefore attracted to the gill net and become enmeshed; the males following to fertilise the eggs are similarly gilled.

The use of the gill net and the mechanisation of the fishing fleet represent two major advances in the Barbados fishery. These two are largely responsible for the marked increases in the catches of Flying fish (Hirundichthys Affinis).

Table 2 Flying Fish Production 1955-1960

Y e a r	Catch of Flying Fish (lbs.)[x]
1955	1, 689, 600
1956	2, 509, 440
1957	3, 507, 360
1958	4, 084, 800
1959	4, 049, 280
1960	9, 644, 400

[x] Figures from the Fisheries Department

Catches are undoubtedly influenced by natural factors, as the disparity in the totals for 1959 and 1960 indicates. The increase of boats and gill nets between these two seasons does not justify the great difference. In view of this, it is reasonable to assume that in some years, the fish are more plentiful than in others.

The use of the gill net has not been without its drawbacks. Consequent on the increased catches has been an aggravation of the marketing problem and an intensification and multiplication of the gluts, which even before occurred regularly whenever good catches of Flying fish (Hirundichthys Affinis) were made. Since no storage facilities exist, prices must be reduced in an effort to sell the whole catch, and profits are severely cut as a result. It has become customary for fishermen, once they have a reasonable catch, to leave off fishing, since more fish on the market will only further depress prices. This sentiment they express in the common saying, "Don't let what's in the sea spoil what's in the boat". It would seem then, that adverse marketing conditions have so far prevented the full potential of the gill nets from being realised.

The Fisheries Department has also carried out some experiments with the gear used in taking large pelagic fish. Most of these have been made to determine what materials are best suited for this purpose. In 1950 experiments with wire lines were made. Though crude wire lines had been used even before World War II, scarcity of this material during and after the war had led to a decline in its use. Hemp lines were widely used, but were far from satisfactory. They did not last very long and when wet, became darker and hence more visible to the

fish. In tests, wire lines proved more desirable because of their tendency to sink and their greater durability. Experiments with nylon lines indicated that they were better than hemp lines because they were stronger, but their tendency to float made weighting of the line necessary.

The ability of lines to sink has, in recent years, assumed new importance, since experiments not yet conclusively finalised, indicate that various pelagic species tend to be concentrated at certain depths. Although conclusive evidence is lacking, depths ranging from thirty to thirty-five fathoms have been found fairly productive, hence the desirability of lines that tend to sink.

In recent years wire lines have been preferred and nylon lines are also popular. The latter are weighted with sinkers, weighing up to four pounds. When trolling, lines are set at various depths. It is common to have two lines set at thirty to thirty-five fathoms, and one line set at ten fathoms. When drifting, one or two lurk lines are set at about twenty fathoms. In experiments, live bait was found to be especially effective, since the movement of living fish invariably lured predators to the line. Live Flying fish (Hirundichthys Affinis) and Bally-ho are now widely used as bait for larger pelagic fish.

Although the work done on the techniques of taking large pelagic fish has been little so far, some advantages have accrued to fishermen, who are now using more serviceable lines which need to be replaced less frequently. Furthermore an increase in the catch has possibly occurred because the big fish cannot break the lines as

readily as before, and the bait used is more effective.

All these introductions and improvements represent applications of new skills to the fishery and their beneficial effects are readily apparent. While the limited techniques of the "Traditional Fishery" achieved a total production of less than 2,000,000 pounds annually, production in 1961 was more than 16,000,000 tons[62].

Market.

The low purchasing power of the populace - the major limitation of the local market - was not one to be easily remedied, for it entailed a general improvement in the standard of living only to be achieved by an overall boosting of the economy. In this case the needs of the consumer were given priority and a system of price control established. Increased since originally set up, the ceiling prices in 1961 were: - Flying fish - 24 cents per lb.; albacore - 28 cents per lb.; dolphin and kingfish - 36 cents per lb.; shark - 16 cents per lb.; snapper and grouper 40 cents per lb.

The system of price control is intended to benefit the consumer, in an island where meat is scarce and expensive. It was considered imperative to make available to the local populace a cheap, nutritious and tasty source of protein. The fishermen, and in fact all those engaged in production, have suffered as a result. When catches are large prices fall drastically, but when fish are few, the producers cannot increase prices to their own advantage. The only exceptions to this rule occur during the "Hurricane Season" when the supply of fish is so limited that black market prices can be obtained.

62) Estimates from the Fisheries Department.

Thus while in instituting a price control system it was hoped that by ensuring a large market, low prices would be partly compensated for, the fishermen, and boat owners in particular, have been hardpressed. Mechanisation of boats and the introduction of new types of gear have caused them to incur debts, while inadequate distribution and price control have restricted their profits.

The island's population, however, has certainly benefitted from the price control. This is apparent in the decline of cod fish consumption. Since 1954 there has been a small but fairly steady decline in the imports of salted, dried and smoked fish - of these salted cod constitutes more than 95%. In fact, the falling off has produced some anxiety among the Newfoundland suppliers, who in 1961, sent a representative to investigate the cause. The preference for fresh fish is even more evident, when it is realised that the population in 1946 - 192,580 consumed 3,696,224 pounds, while in 1961, a population of 232,000 consumed 2,347,731 pounds of salted, dried and smoked meat.

Table 3 Quantities of Imported Preserved Fish and Local Fresh Fish Consumed in Barbados

Year	x 1) Imports of Dried, Salted and Smoked Fish (lbs.)	Value (B.W.I. $)	x 2) Local Production of Fish (lbs.)	Value (B.W.I. $)
1954	3,188,393	748,385	-	-
1955	3,007,574	719,010	2,816,000	704,000
1956	2,983,386	792,562	4,182,400	1,045,600
1957	2,922,345	822,330	5,845,600	1,461,400
1958	2,500,696	675,522	6,808,000	1,702,000
1959	2,639,952	770,687	6,748,800	1,687,200
1960	2,347,731	713,355	16,074,000	4,018,000

x 1) Barbados Statistical Yearbook.

x 2) Figures from the Fisheries Department.

Distribution.

Every aspect of distribution required attention and very early in its program for fishery development, the Barbados government set about improving the conditions under which fish were sold. This included the erection of better markets in the more populous areas. In 1946 a new market was completed in Bridgetown, that in Oistins Town was finished in 1950, and the Speightstown market was opened early in 1954. In 1960 a second market was opened in Bridgetown. Though not elaborate, these were a far cry from the old buildings, for each contained cement slabs on which fish could be cut, counters from which fish were sold and water taps were provided. A general caretaker was responsible for cleaning the markets daily. At some of the larger mooring sites, sheds were built. In each of these cement slabs were erected so that fish could be handled more easily. By 1949 there were sheds at Martins Bay, Consett Bay, Skeete Bay and Reid Bay and in 1953 a shed was completed at Chapel Bay. Sheds have since been built at Half Moon Fort, Holetown, and Pile Bay.

At each of the markets, there is a man employed by the government whose duty it is to weigh, and keep records of all the fish entering the market for sale. This is done partly to assess the toll - each fisherman is charged twenty-five cents per hundred pounds of fish entering the market. Apart from this, these records are particularly valuable since they constitute the first efforts at the collection of statistics.

Monthly tables are made and the figures are sent to the Fisheries Department. The information contained in these tables

Figure 15. Fishermen Taking Their Catch into the Market.

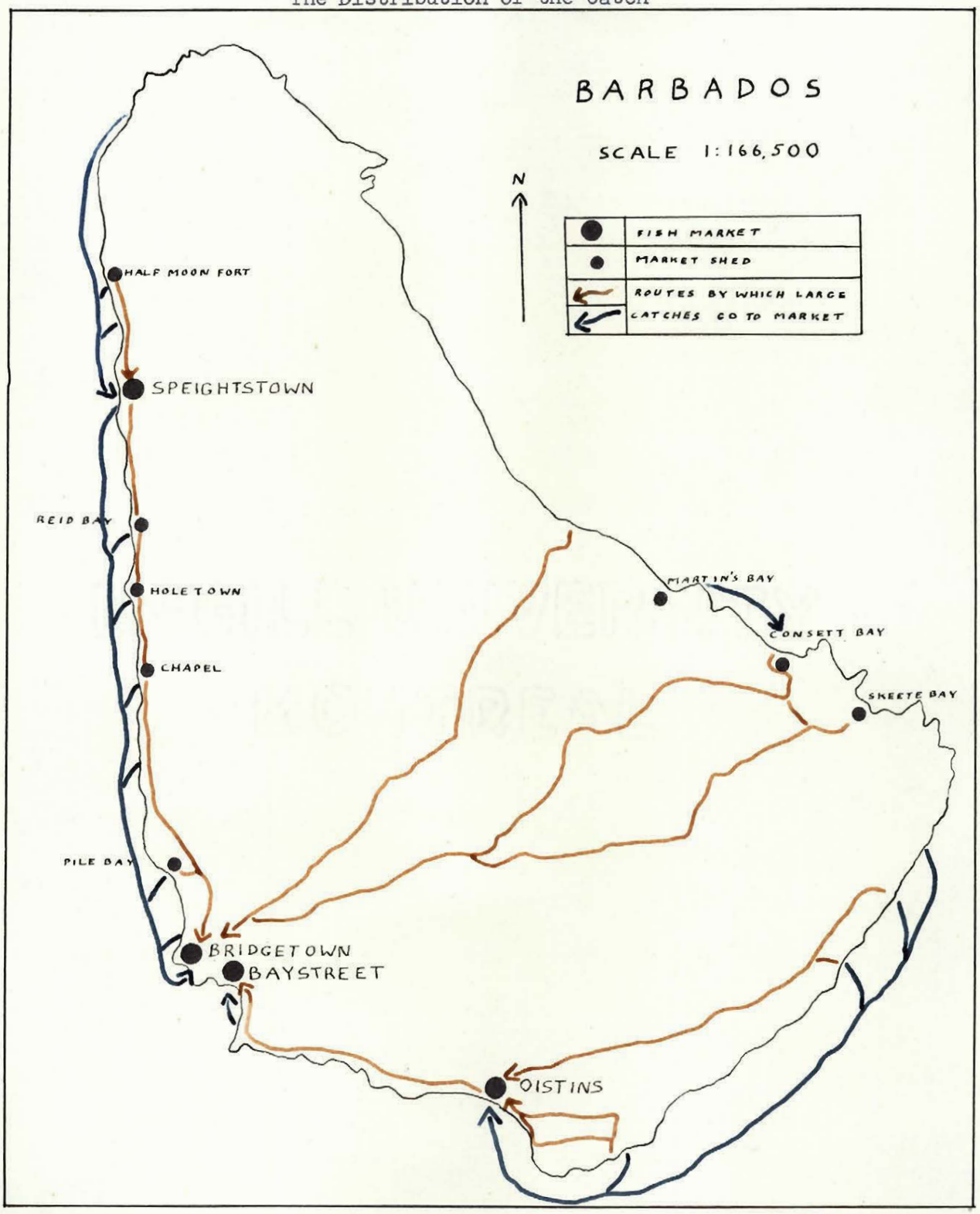
Figure 16. The New Fish Market at Bay Street, Bridgetown

includes the number of landings made by boats and the weight of fish landed - by species: Flying fish (Hirundichthys Affinis),kingfish (Acanthocybium Solandri), dolphin (Coryhoena hippurus), sharks (Ginglymostoma curratum and others), albacore (Neothunnus Albacore), Bill fishes (Makaira nigricans, Makaira Albida), Red fish (a variety of snappers and groupers). In cases where many species of less popular and smaller fish are caught, they are classified according to the method of capture e.g. Seine fish, Pot fish. From these records one is able to discover many of the characteristics of the Barbados fishing industry.

From the number of landings made by boats, it is possible to learn many things. First of all, since the number of landings made, is an indication of the abundance of fish available, it is possible to recognise definite season of abundance and scarcity. Furthermore, the statistics bear witness to the fact, that when catches are good it is common for boats from surrounding sites to land their catch at a market. There are eighteen boats registered at Speightstown. If everyone of these put to sea every day, in any one month - and this is unlikely since the need for minor repairs, religious scruples, etc. might cause the fishermen to remain ashore sometimes - a maximum of 540 landings would be made in a month (approximately thirty days). Therefore when landings exceed this number, there is conclusive proof that boats from other areas are bringing their fish to be sold through the market.

These figures can also indicate, that boats from less favourable sites are being operated from a larger, better protected

The Distribution of the Catch [x]



[x] While average catches are usually sold in the area from which the fishing boat operates, large catches are generally taken to one of the markets, which are located in towns.

mooring. This migration of boats usually occurs in the early months of the year when rough seas are frequently experienced. While it is more pronounced on the windward coasts - boats registered at Tent Bay frequently move to Bridgetown during this period; boats from Foul Bay are often operated from the Crane or Silver Sands or Oistins,- migration also occurs on the leeward coast; boats from Crab Hill may be moored at Speightstown or Half Moon Fort during the period December to March.

Table 4 Landings of Boats at Speightstown 1958 - 1960[x]

Month	1958	1959	1960
January	398	482	299
February	792	798	335
March	796	768	370
April	560	716	671
May	902	918	1,369
June	839	905	1,250
July	646	446	786
August	148	102	159
September	95	74	105
October	80	77	129
November	113	98	379
December	379	156	981

[x] Figures from Speightstown Market records

From these figures along with those of catches of fish, one can deduce the average catch of a boat per month or per year and from this estimate the earnings of a typical full-time fisherman operating in

the area. From estimates of this sort one might be able to distinguish more and less prosperous areas and the relative importance of various fish in various areas. Furthermore this information would be invaluable in determining whether the fishermen's claims that some fish prices are too low are valid.

The statistics of catches by species clearly indicate which types of fish are most prolific and when they are available. This information could help to direct research by revealing which species can be most profitably sought out.

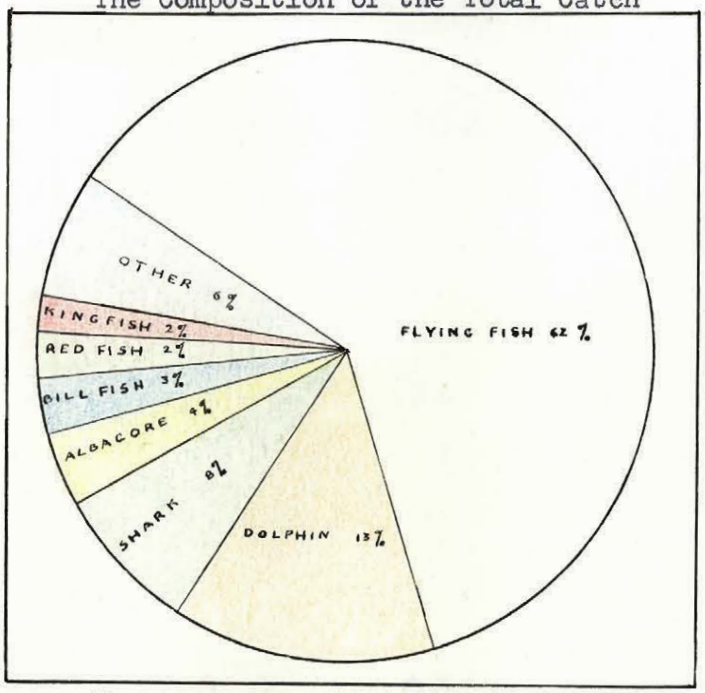
Table 5 Catches Landed at Bridgetown Market 1960[x] (lbs.)

1960	Pelagic		Demersal		
	Flying Fish	Dolphin	Red fish	Pot fish	Seine and other fish
Jan.	13,312	12,344	524	-	1,188
Feb.	14,608	33,600	80	-	1,268
Mar.	12,788	28,476	156	-	876
Apr.	87,672	36,220	-	-	300
May	154,620	16,376	-	-	152
June	167,420	6,624	-	-	280
July	39,836	1,772	1,304	460	6,892
Aug.	1,908	496	6,756	284	14,648
Sept.	576	254	5,672	1,844	18,732
Oct.	856	336	692	-	12,344
Nov.	40,728	588	-	400	3,692
Dec.	125,408	1,188	-	60	240

[x] Figures from Bridgetown Market Records.

The Table shows the predominance of pelagic species from December to June, the virtual restriction of demersal fishing to the summer months and the year round character of seining. It also emphasizes the importance of pelagic fish in the industry.

Figure 18 The Composition of the Total Catch[x]



[x]Estimates from the Fisheries Department

Although the keeping of records at markets has made it possible to understand better the nature of the local fishery and its functioning, this collection of statistical data is still far from satisfactory. While records of catches are made at the four major landing sites, there are catches being landed daily at five times as many beaches. The size of these can only be guessed, therefore all attempts at generalisations are subject to a wide margin of error[63]. Furthermore the statistical data recorded at markets suffer from many limitations, and even these may lead to erroneous deductions concerning the condition of the local fishery. When first established, the official market hours extended from 6 a.m. to 6 p.m., and it was only during this period that fish entering the market were weighed.

63) Total landings are deduced by multiplying recorded landings at Bridgetown by 5, those at Oistins by 2 and those at Speightstown by $1\frac{1}{2}$.

However large quantities of fish entered and were sold through the markets after this time. Hence the daily catches recorded at these points represented only a part of the actual amount landed. To rectify this, the official market hours have since been extended, and today markets are officially open until 9 p.m. This means that records are more accurate, but a new problem is introduced. When comparing the total catch made at any market in a series of years, increases recorded do not necessarily indicate an actual increase in production, they can be partly accounted for by an improvement in the collection of data.

Another factor, which affects the reliability of statistics, is the attitude of the collector towards his work. While some of them are conscientious, others are careless and indifferent, and the figures presented by them are highly inaccurate. However inadequate, the records made at markets represent the beginning of a practice vital to the intelligent development of the local fishery, and as the system of collection is made more accurate and comprehensive, knowledge of the fishing industry will be considerably increased.

The establishment of better organised markets has produced a further improvement in distribution since it has led to the emergence of fishmongers - men who rent some counter space in the market and who sell the fish caught by several boats. Sometimes a fishmonger may be the owner of several fishing boats and he handles their catch, though he may sell fish caught by other boats. The fishmonger receives one cent from every twelve cents of fish sold. This system is gaining favour, for after a days' work at sea, fishermen are loath to remain

Figure 19 Inside a Fish Market

in the market until 10 p.m. or whatever hour the boat's catch is sold.

There is a second aspect of distribution of which the agencies regulating fisheries development have been keenly aware; this is the pressing need to spread the catch more evenly throughout the year. The general idea has always been to preserve the fish in some way, so that excesses from one period could be kept in storage and disposed of during seasons of scarcity. As early as 1947-48[64], plans for a cold storage unit were discussed, but the idea was abandonned because of the great expense involved. Again between 1952 and 1953, the idea was resurrected and the Fisheries Department carried out a series of experiements to determine how the taste and quality of Flying fish (Hirundichthys Affinis), dolphin (Coryphoena Hippurus) and kingfish (Acanthocybium Solandri) were affected, when the fish were stored at various temperatures[65]. It was felt, however that expert advice was necessary to the success of this project, and in 1955 an English engineer was invited to the island to make recommendations.

After years of consideration, in June 1961, the construction of a Cold Storage Plant was started. The Plant will hold two hundred tons of frozen fish, stored at a temperature of $0^{\circ}F$. This frozen fish will be kept for long periods and will probably be marketed during the "Hurricane Season". In addition there will be storage

64) Department of Science and Agriculture Annual Report 1947-48 (Barbados: Government Printery).

65) Department of Science and Agriculture Annual Report 1953-54 (Barbados: Government Printery).

space for sixty tons of iced fish. This can only be stored for short periods and will probably be marketed at times during the "Flying Fish Season" when catches are poor. The main plant, which is being erected at the Deep Water Harbour Site in Bridgetown, is expected to go into operation sometime this year. Later, depots with storage facilities will be established in inland districts and fish will be transported to these in refrigeration vans.

Since the project is only now being implemented, it is difficult to obtain details concerning the manner in which the Plant will be operated. However it seems that the government intends to purchase all fish that cannot be marketed fresh on the day of capture, and keep it in storage until catches decrease. It is hoped that the consumer prices of frozen and iced fish can be the same as that of fresh fish, and the fishermen will be assured a set minimum price at the Cold Storage Plant.

The advantages to be derived from the construction of storage facilities will affect all branches of the fishing industry. Without doubt catches will increase. Assured of a minimum price and market, the fisherman will be encouraged to take as many fish as he can and thereby augment his profits. Motivated by the hope of greater returns, he is likely to seek out, on his own, ways of increasing production; longer fishing hours, increased range of fishing and even fishing at night may result. All this will be to the government's advantage for it will mean that loans on boats and equipment are more likely to be repaid and certainly they will be paid at a more rapid rate. Furthermore, the fishermen, certain of a more regular and

adequate income, will constitute a more satisfied and stable element in the community than formerly. With the problem of glutting the market eliminated, the Fisheries Department will be free to press on with its program for improving fishing methods. Finally the consumer stands to benefit from the increased production and better distribution that will be made possible.

In view of the obvious advantages that will accrue from its construction, one wonders at the protracted delay in erection. Although the idea has been fairly constantly considered since the Royal Commission first suggested the need for storage facilities in 1939, several problems have impeded swift action. First, the form of preservation: wet salting, dry salting, pickling, smoking or refrigeration, had to be settled. Perhaps the major factor influencing the final choice was the tastes of the local population. While large quantities of salted cod were consumed, it was apparent that fresh fish was favoured, for even in periods of glut, none had ever had to be dumped. Since the quality of refrigerated fish was nearest to that of fresh fish, this method of storage was finally chosen.

The icing and refrigeration of fish introduced its own problems. For best results, fish that are to be refrigerated, need to be in excellent condition if the product is to be satisfactory. This necessitated a review of the customary methods of handling fish after they had been caught, and an assessment of the degree of deterioration which occurred between the catching of the fish and their arrival at a marketing point. This revealed that very rudimentary

methods are being used; the fishermen only threw buckets of water on the catch at intervals, to ensure that the fish were kept moist. However, despite exposure to the sun, fishing hours were short, so that fish were generally in good condition for immediate sale. If the fish were to be refrigerated greater care was desirable, and at least, along with the present custom of wetting the fish, the catch should be sheltered from the sun's rays. It was also necessary to determine at what temperatures the fish caught in local waters could best be stored, and how storage for various length of time affected their flavour and condition.

In direct connection with icing and refrigerating of fish, the question of gutting and filleting had to be resolved, for while it is possible to store whole fish on ice for short periods with no ill effects, storage for more than a couple of weeks demands gutting. How this difficulty will be overcome under the present plan is not known. There are in Barbados a number of hawkers who are quite adept at the boning and gutting of fish, and who might be employed for this purpose. However large numbers would be required, and the allocation of space for this operation would have had to be considered along with other plans.

The use of machines could eradicate the space problem and furthermore do the job at a much greater speed. The Fisheries Department has been negotiating with a firm in Germany which produces filleting machines, in the hope that it might adjust one of its models to suit the dimensions of the Flying fish (Hirundichthys Affinis). Difficulty was being experienced in getting samples of

the fish to Germany, and up to August 1961, a stalemate existed.

The principal problem delaying action was one of cost. A series of questions had to be studied: Was the surplus of fish enough to warrant the erection of such a plant? Was it economically feasible? Could the price of frozen fish be kept within the means of the average Barbadian? From the beginning, it was felt that the Plant should not be used exclusively for the storage of fish, and that it should have other uses, so as to distribute costs and to ensure year-round operation - (Excesses of fish only occur for short periods during the "Flying Fish Season", generally in the months April to June).

Basing estimates on conditions existing in the United Kingdom, it was found that if frozen fish were to be sold at eight cents each, it was necessary to be able to have an annual surplus warranting the construction of a 600 ton plant. The surplus of fish in Barbados was considerably less than this. For a long time a plant with a capacity of 160 tons was contemplated, but taking into account the fact that its construction was likely to produce an increase in production, the projected capacity was increased to 260 tons. The decision to continue with this method of storage can be attributed to the fact that one of the major factors influencing the price of frozen fish is the length of time it is kept in storage, and in Barbados, this period will hardly exceed a few months. It is hoped that the rapid turnover of iced fish will compensate for the cost of longer storage for frozen fish.

Although the delay in construction has been long, it can be partly explained by the necessity to solve several difficult problems. One can only assume that the time taken was requisite, for the lack of storage facilities, one of the major requirements for efficient distribution, has been a major obstacle hampering the development of local fisheries.

The Supply of Fish.

Only one of the requirements for the growth of an efficient fishery has been omitted from the government's program. In this respect, however, the Barbados fishing industry has benefitted from the work of another agency - The Bellairs Research Institute of McGill University. These services the island acquired quite fortuitously, when a wealthy benefactor bequeathed five acres of land on the St. James coast and a sum of money to McGill University, to be used for oceanographic research. The Institute, established as a result of this bequest, is engaged primarily in marine biological research, though other branches of study are being introduced. There is close co-operation between the government departments in charge of fisheries development and the director of the Institute, so that the research which is being done, tackles problems of immediate concern to the fishing industry.

So far, the research done at the Institute, has served partly to give the prestige of scientific fact, to some ideas which fishermen have long held on the basis of their experience. When this has happened, not only has methodical research verified the main theory, but it has been able to describe and explain it more exactly.

Dr. Lewis' first project, an investigation of the biology of the sea egg (Tripneustes Esculentus, Leske) illustrates this point.

In the late nineteenth century when a decline in the number of sea eggs awakened official concern, the need to understand the behaviour of the urchins was realised. However, there was no one equipped to carry out such an investigation then, nor had there been since. It was believed, that the decline was produced by indiscriminate taking of the urchins, particularly when they were young, and had not yet had time to propogate. When spawning occurred was however unknown, so basing their action on the reports of fishermen, who claimed generally, that sea eggs were small during the middle of the year, but attained full growth and contained large gonads (the edible portion) late in the year from August and September, those responsible for enacting laws, prohibited the taking of sea eggs from April to August. Lacking definite knowledge of the exact spawning period, uncertainty dogged the steps of the policy makers, and as complaints of decline persisted, so resolutions were moved in the House of Assembly for changes in the duration of the prohibited season.

With the release of Dr. Lewis' report[66] on the biology of the sea egg, decades of indecision have been terminated. His research has revealed that spawning occurs during the three summer months. Thus the present prohibited season, May - September, based as it is on scientific fact, is hardly likely to be modified. Further

66) John B. Lewis, The Biology of the Tropical Sea Urchin, Tripneustes Esculentus - Leske, in Barbados. (1960)

declines in the stocks of sea eggs can now be attributed to some other factor, and should this occur, the general information concerning the life cycle, habitat and characteristics of the sea urchin, contained in the report, will undoubtedly be invaluable in helping to solve the problem.

The research being carried out at Bellairs has a second, more important function - namely the addition of new information to the existing store of knowledge. The second study undertaken by Dr. Lewis is a case in point. Since the Flying fish is the most abundant in local waters, and any increase in production is likely to be supplied mainly by this species, its biology constituted the next subject for investigation. Already mechanisation of the fleet and new methods of capture had multiplied the catch, perhaps a greater knowledge of the behaviour of this fish could continue the trend. This piece of research has revealed many new facts of general interest which are not immediately of great import, though their application later may be useful. For instance, the investigation has made known, for the first time, the species of Flying fish which comprises the bulk of the catch. This is Hirundichthys Affinis, Gunther. Prior to this disclosure, as a result of Brown's claim[67], Hirundichthys Speculiger was believed to be the dominant species.

Apart from its value as a contribution to the general field of information on Flying fishes, the report[68] contains certain facts,

67) Herbert H. Brown, The Sea Fisheries of Barbados (Development and Welfare in the British West Indies; Barbados: Advocate Co. Ltd., 1942)

68) John B. Lewis et. al., The Biology of the Flying Fish, Hirundichthys Affinis (Gunther).

hitherto unknown, which are certainly provocative, and which may well produce some immediate innovations in the industry. One such interesting disclosure concerns the eating habits of the fish; experiments have shown that they feed during the hours of darkness, and especially in the early hours of the morning. This might indicate, that if fishing took place at night, catches should be larger, since hungry fish are more susceptible to the attraction of bait. Nocturnal fishing prospects are further enhanced by the confirmation of the idea, that Flying fish are attracted to bright lights at night.

When the prospects for increased production suggested by these findings are combined with the possibility for increased purchases of fish that are likely to be made, if they are available at the markets throughout the day, it is readily apparent that the research carried out at Bellairs Institute has opened up a new avenue along which efforts for increased production can be directed.

The work done at Bellairs is serving two purposes: to validate or discredit old ideas which up to the present have influenced the development of the island's fishery. Secondly, it is contributing to the knowledge of fish found in local waters, a wealth of information. In fact the services of a qualified marine biologist are essential to the successful development of any fishery, especially one in the Tropics, where a grave need for research exists. The Institute is concerned with the primary requirement of a fishing industry - the supply of fish. While science has not yet

devised a means of increasing natural supplies in a given area, accurate and detailed knowledge of the biology of local species makes it possible to use the natural stocks to best advantages.

In contrast with the apathy that was typical in previous years, the past two decades have seen a concerted drive, undertaken principally by the government, to overcome the limitations of the local fishery. No aspect of the industry has escaped notice and more functional fishing bases, a mechanised fleet, the use of more modern and effective gear, and improved distribution, are all products of this effort. Innovations have introduced their own problems, but in every case, the main effects have been beneficial. The success of the program is best illustrated by the marked increase in local fish production, a direct indication of a more efficient fishery. Not only is this eight-fold increase significant in itself, its contribution to the protein diet of Barbadians and the greater financial security it has offered fishermen are equally important.

In fact, the Barbados fishery stands out as one of the most progressive among those of the British West Indies today. The Windward and Leeward Islands have all, subsequent to the initiation of the fisheries development program in Barbados, undertaken similar projects themselves. Furthermore a total annual production of 16,000,000 pounds compares favourably with 20,000,000 pounds for Jamaica,[69] a considerably larger island.

69) Jamaica Weekly Cleaner, February, 1962.

CHAPTER VIII

The Scope of the Industry.

In attempting to assess the potential of the Barbados fishery, it is appropriate to consider first the plans of the government. Up to now, official aid and direction have been largely responsible for the improvements that have taken place, and this feature is likely to continue for a while; since private enterprise has displayed little interest, and the effect improved marketing conditions will have in awakening the fishermen's initiative will take sometime to be realised. Therefore the official policy will not only determine the course of immediate improvements, but it will probably exert a strong influence on long-term developments in the fishing industry.

The government's plans for the island's development are embodied in a series of five-year plans. The most recent, the Third Five-Year Plan, contains the program for the years 1961-66. Although a political election in December 1961, brought a new party to power, it is unlikely that the program for fisheries development will be radically altered, since several of the projects have already been started. An examination of these plans reveals the government's intention to continue the improvement of factors influencing the growth of a fishing industry.

Improved distribution of fish constitutes the main objective of the program. To achieve this the construction of the Cold Storage Plant, already well underway, the formation of fishermen's co-operatives and the renovation of the Oistins market are contemplated.

The development of fishing sites is to be continued by further purchases of land and the establishment of repairing facilities at major fishing bases.

Strenuous efforts are to be made to develop maritime skill. One part of this program concentrates on the fishermen's ability. The task of educating the fishermen has fallen to the Fisheries Department. It takes the form of a series of lectures given by various members of the department. The program began in December 1961, when talks dealt with the mechanics of diesel engines and their maintenance. Dissemination of this information to the local fisherman is invaluable. Frequently he has had no experience with engines of any kind, and many a launch has gone adrift, when its engine failed to start after a days' fishing because of some minor disorder, which could easily have been rectified had the fisherman an elementary knowledge of engines. Furthermore, with proper care, the life of marine engines could be prolonged, and frequent engine troubles, which cause boats to be beached for many days, would be reduced.

Simultaneously, some instruction in the rudiments of navigation was given. This again opens up new horizons to the fisherman, who cannot use even a compass and is thus compelled always to fish within sight of the land.

The second part of this program involves the continued development of better fishing techniques. In the immediate future, the results of work already carried out by the Fisheries Officer, should be having a forceful impact on the industry. The ring gill net, a variety of purse seine will undoubtedly be encouraged for

the capture of Flying fish, while the miniature long line is likely to supersede the lurk line in the capture of larger pelagic fish. Both pieces of gear have been used successfully in experiments, but were withheld from the industry because their use would only have aggravated the already poor distribution system.

The Fisheries Officer now plans to explore the possibilities of nocturnal fishing, using a powerful light to attract the fish. This is hoped to effect an increase in the catches of pelagic fish. No doubt, the experiment has been encouraged by the information concerning the eating habits of the Flying fish contained in Dr. Lewis' report[70], Hall's[71] assertion that large numbers of fish can be attracted by lights at night, and Dr. Hickling's[72] claim that the practice is successful in some of the Windward Islands.

Meanwhile Bellairs Research Institute continues its assessment of the local fish supplies. Presently in progress is a project to trace the migrations of the Flying fish. A second study, being carried out in the summer of 1961, was the mapping of the banks and shelves around the island. This should produce an increase in the numbers of demersal fish caught, since no map of this type exists and young fishermen are frequently unaware of the location of banks. Finally the possibility of introducing prawn - a type of shrimp not known to exist in local waters until recently - is being explored.

The projects embodied in the Third Five-Year Plan represent a more advanced stage in the program initiated in the early forties,

70) Lewis, loc. cit.
71) Hall, op. cit.
72) C.F. Hickling, The Fisheries of Barbados. (1957)

and it is apparent that the government's ultimate goal is the establishment of an efficient local fishery. How successful this will be, and the speed with which it can be realised, will be influenced by a variety of factors.

The local fish stocks will undoubtedly be the most influencial factor affecting the fishery. Up to the present, the dominant theme of fisheries development has been increased production. This trend cannot be pursued indefinitely, for while efficient use of supplies is desirable - it removes mature fish and leaves more food for young ones who consequently develop more rapidly, - overfishing is disastrous, since it results in the depletion of fish supplies. All appraisals so far indicate limited fish stocks in Barbadian waters. In view of this, it might be timely, even now, to attempt to establish some balance between the rate of capture and that of propagation, since the goal of an efficient fishery is to obtain the maximum sustained supply.

One way in which the limitations of local waters can be overcome is by extending the range of fishing activities. This step is inevitable, and such projects as education of fishermen in the principles of navigation and tracing of migrations of the Flying fish, indicate that it is already being contemplated. It is likely that these long range activities will be carried out in the more productive waters of the Caribbean such as those off British Guiana, noted for their stocks of demersal fish - snapper and grouper, and those around the Grenadines, where large pelagic fish occur in greater numbers. Ultimately the fish supply will limit the industry's expansion.

This is by no means vast, but undoubtedly it is capable of satisfying local demands.

Another aspect of the fishery which deserves thorough analysis is it economics. If the industry is to continue to thrive, it must be profitable to the participants, and in an area where a system of price control exists, this responsibility is the government's. Already fishermen's complaints suggest the need for revision of the price scale and as the range of fishing is extended, this will be imperative. The only way in which this problem can be handled adequately is by careful study of comprehensive and reasonably accurate statistical data on the industry.

Arising from this is yet another limitation, one which is not confined to fishing, but is felt in all facets of economic life in the West Indies - the lack of trained staff. Whenever technical advice has been required, whether it concerned boats, statistics, or storage, it had to be sought outside the island. If progress is to be continued the maintenance of a more extensive and better-trained staff will be necessary.

Also militating against progress is the outlook of Barbadians generally. Centuries of unmitigated poverty have tended to snuff out initiative and breed resignation, so that today the average fisherman is too dependent on the government and does not try to tackle his own problems. It has been suggested that as distribution is improved, ensuring a minimum price for any catch however large, the fishermen's ambition will be awakened. In any case, there is a dire need for greater initiative on their part.

Finally, a lack of capital, probably the most important single factor affecting development after the fish supply, must be considered. The government is the largest investor in the industry today. Barbados is a poor island; the revenue is small and demands upon it numerous and urgent. Only small sums can be spent on fisheries annually. Therefore, unless private enterprise shows a keener interest, progress must of necessity be slow.

In spite of the limitations which will tend to retard progress, the Barbados fishing industry can and is making a worthwhile contribution to the island's economy. Already, as a result of the work of two decades, the fishery is making a significant contribution to the protein diet of Barbadians. It is apparent too, that as modernisation continues and the range of activities is extended, the fishery will be capable of supplying the island's basic demands for fish. The decline in the imports of fish - a likely consequence - will produce a valuable saving in foreign exchange. Furthermore the development of an efficient fishery will contribute to the eradication of unemployment - the bane of the island - by affording a remunerative occupation to its participants. Finally, because of the restriction of a Flying fishery in the Western Hemisphere to the Southern Caribbean, one can envisage the development of a small export trade of these fish as a delicacy to urban centres on the North American continent.

While physical handicaps prohibit the development of lucrative commercial fisheries throughout most of the Tropics, nevertheless programs for the building of small, efficient

fisheries are worthwhile. As progress of the Barbados fishing industry illustrates, these industries can play a significant role in the struggle to develop a more viable economy.

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Figure 13 Launches at Anchor

Figure 15. Fishermen Taking Their Catch into the Market.

Figure 16. The New Fish Market at Bay Street, Bridgetown

Figure 9 Beaching Fishing Boats at Tent Bay

Figure 8 The Bridgetown Market 1942

Figure 4 A Handcast Net

Figure 3 "Moses" at Anchor

Figure 12 Diesel Fuel Dispenser

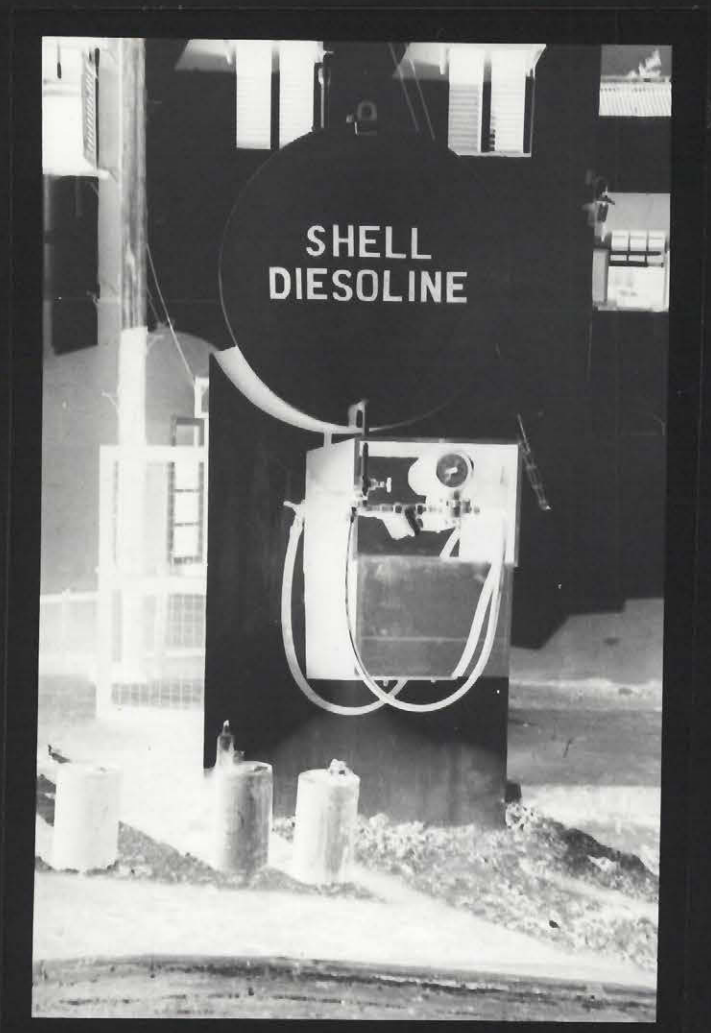

Figure 11 The New Fishing Boat

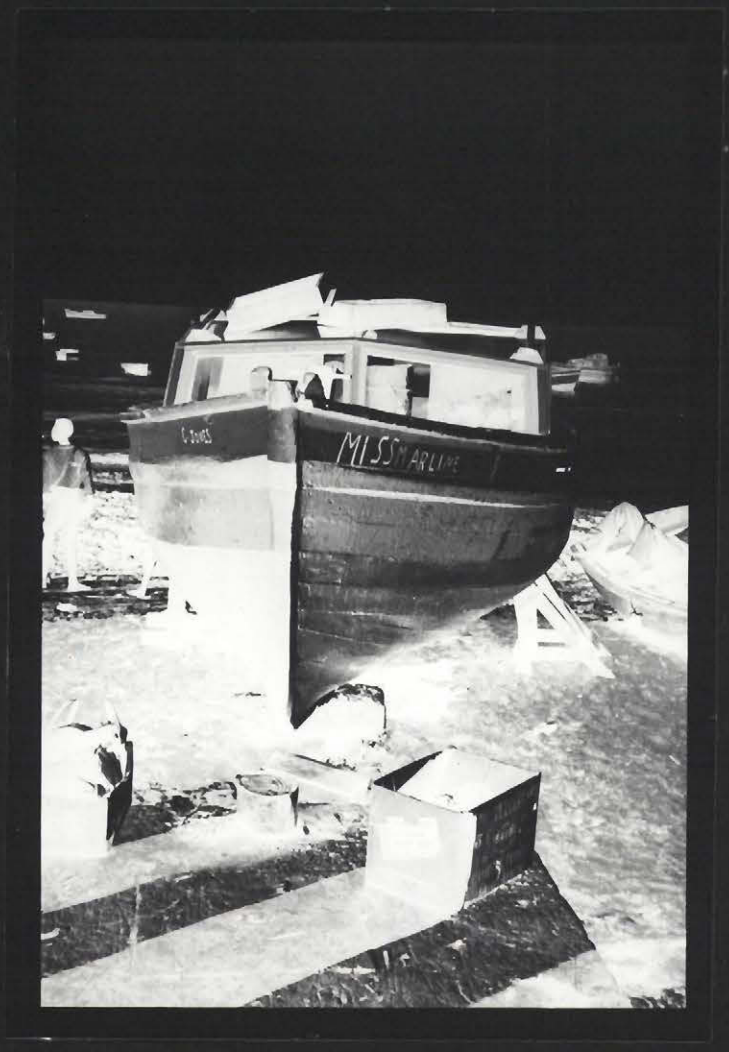

Figure 5 Bamboo Pots

Figure 6 Typical Fish Pots