THE FISHING INDUSTRY OF JAMAICA

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A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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McGill University

Montreal, Canada

March 1974

[sic] Master of Arts

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M.A. Thesis

RESUME

Objectives of this study are twofold:

1) to map and to analyse the sales distribution network of fresh fish in Jamaica and to construct models in order to illustrate this distribution.

2) to describe the problems of a traditional fishing industry in an under-developed country.

In Jamaica the organization of the fishing effort and the organization of the purchase distribution are closely linked together on the shore where the fish are unloaded. The relationship between the level of the fishing activity and the nature of the network of distribution is strongly positive. The shores of Jamaica may be divided into three groups according to market characteristics served and the type of fishing activity.

The continuous development of fishing activity at a traditional level has led to an excessive fishing on the coastal plateau of the island. In the future, the development of off-shore fishing will depend on the availability of funds and on programmes of organization.

RÉSUMÉ

Cette étude a deux buts:

1) dresser la carte et analyser le réseau de distribution des ventes de poisson frais à la Jamaique et construire des modèles pour illustrer cette distribution.

2) décrire les problemes d'une industrie traditionelle de la pêche dans un pays sous-développé.

A la Jamaique l'organisation de l'effort de pêche et l'organisation de la distribution des prises sont étroitement unis sur la plage où le poisson est débarqué. La relation entre le niveau de l'activité de pêche et la nature du réseau de distribution est fortement positive. Les plages de la Jamaique peuvent être divisées en trois groupes selon les caractéristiques des marchés desservis et le type d'activité de la peche.

Le développement continuel de l'activité de la pêche à un niveau traditionnel a conduit à une pêche fortement excessive sur le plateau côtier de l'île. Dans l'avenir l'exploitation de la pêche lointaine dépendra de la disponibilité des capitaux et des programmes de formation.

PREFACE

A statement of those elements in the thesis considered to be a contribution to original knowledge.

The only account of the Jamaican fishing industry, apart from two anthropological studies limited to a few chosen communities, is the Fisheries of Jamaica, Development and Welfare written by E.F. Thompson in 1945. Since that time there have been important changes in the nature of the fishing effort. The most important of these have been the increase in the number of fishermen from 3500 to 8500, the motorisation of a substantial proportion of the canoe fleet and the development of longer range fishing. The impact of these changes upon the Jamaican fishing industry and on the traditional fishing grounds is discussed in this thesis.

In 1963 the Ministry of Agriculture and Lands published a Sample Survey of the Fishing Industry of Jamaica which contained considerable statistical information on such matters as the numbers of boats, engines, length of fishing trips, quantity of fish caught according to class, method of fishing, time of year and location. This statistical record though valuable was not accompanied by an interpretative text and was largely based on parish units rather than fishing beaches. This study looks at the Jamaican fishing industry from the viewpoint of the fishing beach and its relationship with its market area as a functioning economic unit.

Thompson's work paid little attention (beyond suggesting that setting up of government markets to control price) to the marketing and distribution of the catch. This thesis looks for the first time at the distribution of the catch and shows that each major beach or beach complex has its own well defined market area the size of which, whether measured by areal extent, total population or population density bears a strong positive relationship to the size of the catch landed on the beach which itself is a function of the fishing effort. This thesis also looks for the first time at the methods of distribution and shows

that frequency of visit by fish vendors is a function of distance from the beach, supply of fish and the strength of intervening opportunities for sale.

Finally the thesis looks at the fishing industry as a whole thus giving an understanding of how changes in one part of the system i.e. the supply of fish is reflected in other parts of the system i.e. the distribution of the catch. Such a holistic approach is necessary if investment mistakes are to be avoided. A misunderstanding of this System has already led the Jamaican Development Corporation to construct ice storage facilities which for most of the year stand unused.

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Chapter One

Introduction

Fresh fish is landed on beaches of varying sizes all around Jamaica. Most of this catch reaches the final consumer on the same day. Some of the catch is sold directly at the beach markets, or through markets in major centres such as Kingston, Montego Bay and Linstead. Much of the catch however is sold on the beaches to vendors who travel through the countryside stopping at small settlements. The first aim of this study was to map and analyse these marketing and distribution networks and to construct models to illustrate these networks.

Each beach can be thought of as a central place supplying a single good to a dispersed population. The bases of central place theory are the two concepts of the threshold and the range of the good. The threshold can be defined as the minimum market i.e. the price of the good, times the quantity sold needed to bring the production of the good into being and to maintain production. Under Jamaican conditions a market will occur as long as there exists a surplus above the fisherman's own requirements, so thresholds can be very low. The range of the good can be defined as the average maximum distance people will go to purchase the good. In the case of fish the good is perishable, of low value, needed frequently and purchased only in small quantities. Under such conditions the range of the good is small and the size of the market is small. The range of the good can be extended in two ways. One, by moving the fish to a market place i.e. a central place supplying many goods. People can afford to travel to such a central place as the cost of transport is spread over several goods. Two, the range of the good

can be extended by spreading the cost of transport over a large number of sales, this can be achieved by a seller travelling from buyer to buyer. A similar situation is found in developed economies for certain types of goods which are perishable, of small value, and in regular use and for which people are unwilling to travel far, such as newspapers, milk and bread.

Central place theory is concerned only with the demand for a good not its supply, it assumes that an increase in demand will via the price mechanism call forth an increase in supply i.e. that supply conditions have no effect on the size of the market. In the case of the single good fish, supply is affected by many variables outside the producer's control and an increase in demand will not bring about an appropriate increase in supply. The size of the market is limited by the supply of the good.

For trade to be possible between two points two conditions must be satisfied, suggests E. Ullman, complimentarity and transferability. Given that these conditions are satisfied between any two points trade will be affected by the existence and strength of intervening opportunities. All three are important in understanding the distribution of fresh fish in Jamaica. Complementarity is satisfied as there exists a supply of fish on the beaches and a demand for fresh fish in the villages inland. Transferability is satisfied for although fish is rapidly perishable under tropical conditions and refrigeration is almost entirely lacking, the island is small and the entire store of fish can and is sold on the same day by travelling vendors. The existence of intervening opportunities is crucial in determining whether fish reaches any particular village. As fish vendors sell along their route, the quantity of fish still available for sale falls.

Whether the fish vendor will reach any particular location on any particular day depends on the supply available to the vendor and the demand for fish along the route i.e. the strength of the intervening opportunity. So the extent of the market area is controlled by the supply of fish and the strength of the intervening opportunity, that is the number of possible buyers which is a function of population characteristics.

The thesis suggests that the size of the final market is dependant upon the level of fishing activity at the beach. Size is defined in three ways, as area served, as population density of the area served, and as the total population of the area served. The level of fishing activity is defined as the catch landed at the beach.

Approach

The investigation of the marketing and distribution networks necessitated a thorough understanding of the fishing industry and from this grew an appreciation of the problems faced by the industry. As the supply of fish is so important in determining distribution patterns the second aim of the thesis is to describe the problems faced by the Jamaican fishing industry in it's attempts to increase production.

Research Method

1. Literature Survey

The only full account of the Jamaican fishing industry is "The Fisheries of Jamaica", by E.F. Thompson 1945. Since then there have been two studies by anthropologists; "A Comparative Study of Two Jamaican Fishing Communities", by W.C. Davenport 1956 which describes the fishing pattern in great detail for the two villages of Rocky Point and Whitehouse. The other is "Fishermen and Co-operation in Rural Jamaica", by Lambros Comitas. Comitas describes the fishing pattern of several villages and gives an exhaustive

description of fishing methods and fishing craft. Apart from the publications of the Fisheries Division, the last of which appeared in 1962 and the 1962 Sample Survey of the Fishing Industry of Jamaica there have been no other publications of length concerned with the Jamaican fishing industry. As the most recent of these accounts relates to 1962 and none are concerned with the distribution patterns, it was necessary before forumulating a research plan to gain an up-to-date knowledge of Jamaican fishing conditions and methods of marketing and distribution.

2. Pilot Study

A pilot study was made of Alligator Pond fishing beach. Basic data about the beach was collected by observation and informal conversation with fishermen. From this was drawn up a list of questions that was used on all the beaches visited. This was not entirely a questionnaire as many points could be answered by observation, for example the number of boats on the beach. (See Appendix A). Information was also collected from conversations with fish vendors and this proved helpful in constructing a second questionnaire (See Appendix A). The pilot study revealed great variety in the level and scope of operations, varying from small purchases carried only short distances, to operations involving investment in transport and storage and requiring large amounts of working capital.

3. Field Tactics

A short visit to the north coast revealed that fish catches were very small, canoes were in poor condition, very few had outboard engines, and the distribution of fish was only local. The low intensity of fishing effort on the north coast is probably due to a lack of accessible good fishing grounds. See Chapter 2. The situation on the south coast was quite different, catches were larger, outboard engines common and all the large fishing beaches are

found on the south coast. It soon became obvious that the larger south coast beaches dominated the distribution pattern. Nearly all the south coast beaches (the only exceptions being very small beaches) were visited and the answers to the first questionnaire sought.

The information necessary to plot the market areas was obtained in two steps. The first step was to interview the vendors on the beaches to discover how often they visited the beach, if they visited other beaches, which villages they visited to sell their fish and how frequently. Certain regularities became apparent which helped to simplify data collection and the identification of market areas. Notably it was very rare that a vendor visited more than one beach,* unless the beaches were very close together or very small or both. An exception to this were vendors who visited many beaches concentrating solely on buying lobsters. A second useful regularity was that vendors appeared to follow regular selling routes, with only small variations form trip to trip.

The second step was to follow the vendors routes stopping at villages to find the answers to the second questionnaire. The questions were designed to discover how regularly the village received supplied of fresh fish, how many people were involved and by what methods did they reach the village. The majority of people interviewed were shopkeepers and housewives who happened to be in the shop at the time. Small provision shops were chosen

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* This may be due to the importance of personal relations in transactions and to the fact that throughout the island, Monday, Wednesday, Friday and Saturday are the main fishing days and buying takes place all through the morning as the canoes come in. So unless the vendor arranges for fish to be bought on his behalf and stored until his arrival it is very difficult to visit more than one beach.

as they are to be found in the smallest settlements. They had two advantages, they were centrally located in the village, and their owners were present there all day and every day. Such stores are also places for general discussion and people in the shop would know if any local person was a fish vendor or had been.

Two hundred and fifty villages were visited and investigated in this manner out of a total on the road map of eleven hundred.

Chapter Two

The Organisation of the Fishing Effort

The Jamaican fishing industry is based on the exploitation of reef species. They constitute, at least in the early stages of exploitation a ocalised supply of fish giving catches which repay the fishing effort (See Page). The hunting of pelagic species requires a much higher level of investment in lines, nets and large specifically designed craft, which no fishermen are able to afford. The pelagic species are found in the open water off the edge of the banks and reefs. Outside the shelf area the greater part of the Caribbean is very poor in the production of plankton and supports smaller fish populations than the shelf areas.* The lack of plankton is a result of the lack of nutrient available within the euphotic zone. Because of the great depth and stability of the Caribbean waters, nutrients added by the rivers and decaying fish sink to the bottom, leaving the surface waters impoverished.

> 'Except for areas of local upwelling, the surface waters of the Caribbean are thermally stable, stratified and deficient in nutrients. There is little possibility of replenishment of the surface layers with nutrients from deep waters. Consequently primary production is low and relatively constant at all times and marked seasonal cycles, characteristic of high latitudes, do not occur.' (D. Steven 1968)

Therefore the fishing effort is focussed on the areas of reef accessible to Jamaican fishermen. Here, as elsewhere, accessibility is a function of technology and economics.

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* Experiments with live bait fishing the pelagic species around Jamaica by the Fao boat M/V ALYCON have been disappointing.

The most accessible area to Jamaican fishermen is the island shelf. This is an area of over 1,100 square miles with depths varying between four and sixteen fathoms, rapidly dropping at the outer edge to over 300 fathoms.

On the south coast, the shelf has an approximately triangular shape, the apex of which is twenty miles south of Portland Point and the sides taper to within half a mile of the shore just east of Kingston and Launa Point. On the north coast the shelf is very narrow, only rarely extending seaward more than a mile and usually varying in width between one quarter and three quarters of a mile. A number of small banks with a similar environment to the shelf are located within a few miles of the shelf's edge.

This area is fished by a fleet of dugout Cottonwood canoes numbering around three and a half thousand, of which perhaps a thousand are equipped with an outboard engine, the rest being powered by paddle and sail. The time spent at sea is short, rarely more than eight to ten hours. No attempt is made to preserve fish freshness and the fish is sold immediately on the boats return. The dominant method of fishing is by visiting baited pots previously set to trap fish. This may be augmented by trolling en route and on return from the pots. Although there are a variety of different types of net: see Thompson (1945:22) and Comitas (1962:39) large nets are rarely seen; see Davenport (1956:103) for a description of the problems and hazards associated with the ownership of a large net.

These techniques have long been in use in Jamaica and are substantially unchanged from post emancipation days. "An early synthesis of the Island Carib, French and Negro techniques, completed by mid-eighteenth century appear almost totally unchanged in fishing villages throughout the islands today". (Price 1966)

The technology is simple but effective and the level of investment low. A new dugout canoe can be bought for £125 - £200 and pots can be made cheaply from wire and bamboo by the fishermen and if not lost or stolen may last for over a year. Some materials are sold duty free by the Government and the fishermen can get help through the Credit Facilities Scheme (See Appendix B) in the purchase of an outboard motor. The Jamaica island shelf is thus highly accessible to a large number due to the combination of simple technology and low investment levels which has led to the area being the most intensively fished of the Jamaican fishing grounds.

Much less accessible are the Pedro Banks and cays, which at their nearest point are 50 miles S.S.W. of Kingston. At this distance a higher level of organisation, more advanced technology and greater investment is required. This area is exploited in three ways:- 1. By the canoes travelling from Jamaica 2. By canoes based on the Cays and 3. By decked diesel engined boats over 50', crewed by five to ten men.

Canoes travelling from Jamaica have a round trip of 200 miles and spend twenty four hours at sea or longer. There are probably not more than 30 canoes in the whole island that travel this distance regularly, the majority coming from two beaches; Whitehouse and Calabash Bay. The canoes are larger than average being of the order of 27' 6" long and 6' wide to 30' long and 7' wide. They usually carry two engines (35 h.p. to 60 h.p.) and a large quantity of fuel, as well as ice to preserve the fish. Since such boats travel at night and beyond the sight of land they must carry a compass. They concentrate on pot fishing and the catches are far better than those on the island shelf. The technology is almost identical to that of those fishing the shelf, but the level of investment is higher as is the level

of organisation. Returning to the beach outside the normal market hours, special arrangements with vendors are necessary. By pooling of equipment and costs, several fishermen can invest in such a trip.

Approximately 150 men (although not all are present at any one time) live on the three small Cays which lie close together on the Pedro banks (N.E. Cay, Middle Cay and S.W. Cay). These men fish from motorised canoes within a 20-25 mile radius of the Cays. Their level of technology and investment is the same as those fishing the island shelf. The major difference in operation is that their catch is transferred to carrier boats which are 50-80' long decked boats from Kingston carrying crushed ice for the fish and provisions and materials for the men living on the Cays. The higher level of organisation and investment necessary is in part provided by the carrier operations and in part by the Government. The Government built water tanks and huts on the Cays and supplied engines under the Credit Facilities Scheme. Also a beacon was erected to aid navigation, particularly to overcome the difficulty of finding the low Cay (the highest is only 12' above sea-level) from a canoe. Fishing from the Cays began in 1953 reaching a peak of activity in 1961 when 15 carriers were regularly visiting the Cays. Today the figures are between 10 and 12 carriers. Another area was for a while exploited in this fashion, the Morant Cays but these are no longer visited by carriers.

The third way in which the Banks are exploited requires considerable financial investment and much higher running costs than the canoe operations. It is characterised by an entirely different type of fishing vessel, a decked diesel-engined boat of over 50' in length carrying a crew of 5 to 10 men and undertaking a trip of 5 to 7 days. The boats are unlikely to stay at sea

for longer than 10 days as none carry refridgeration equipment, but store fish in crushed ice. These boats are equipped with navigational aids and ship to shore radio telephones and undertake fishing trips of several hundred miles. These boats are going as far as the Rosalind and Seranilla Banks and Alice Shoals which lie 220 miles S.W. of Kingston. This type of operation is relatively new in Jamaica and no boats of this kind were operating prior to 1956. There are today some four or five of these boats operating from Kingston plus the Fisheries Division's boat "Blue Fin". Two such boats operate from Whitehouse (largely on the Pedro Banks), one is said to have operated from Yallahs and one from Manchioneal. The latter is of great interest because it is at present (though another boat will soon begin operations from Old Harbour Bay) the only co-operatively owned boat on the whole island.

Beyond the Rosalind Bank lies the Central American shelf some 300 miles from Kingston, accessible only to the large decked boats. This large and productive shelf area is at present comparatively little fished commercially, partly because of its distance from Jamaica and partly because most of the shelf is claimed by Nicaragua and Honduras as lying within their territorial waters and cannot be fished without a permit. Confusion over permits and the areas they cover had led in the recent past to confiscation of Jamaican boats and the detention of their crews until substantial fines have been paid for their release.

The level of organisation, investment and technology all rise as fishing operations are undertaken at increasing distance from Jamaica. The lowest levels are found in short range operations, but although investment is low so are catches. All the short range fisheries are approaching

TABLE ONE : CHARACTERISTICS OF THE FISHING INDUSTRY IN JAMAICA

	LOCATION OF FISHING GROUNDS	DISTANCE	TIME	EQUIPMENT	REWARD SYSTEM	LOCATION OF FISHING BEACH
SHORT RANGE	ISLAND SHELF PEDRO CAYS	5 - 30 miles ROUND TRIP 60 miles	8 HOURS OR LESS	DUGOUT CANOES OUTBOARD ENGINES/ SAIL POTS	CREWS SHARE CATCH	FOUND ON ALL FISHING BEACHES THROUGHOUT JAMAICA
LONG RANGE I	PEDRO BANKS	60 miles ROUND TRIP 200 miles	24 HOURS OR LONGER	DUGOUT CANOES TWO OUTBOARD ENGINES POTS ICE CARRIED	CREWS SHARE CATCH	WHITEHOUSE CALABASH BAY occasionally from other beaches
LONG RANGE II	PEDRO BANKS	6o miles ROUND TRIP 120-200 miles	5-7 days CARRIER BOATS 2-3 days	DECKED CRAFT DIESEL ENGINES SHIP TO SHORE TELEPHONE POTS ICE CARRIED	CREWS RECEIVE WAGES	KINGSTON WHITEHOUSE MANCHIONEAL
DISTANT WATERS	ROSALIND BANK SERANILLA BANK AND THE CENTRAL AMERICAN SHELF	220-300 miles ROUND TRIP 600 miles or GREATER	7-10 days	DECKED CRAFT DIESEL ENGINES SHIP TO SHORE TELEPHONE POTS ICE CARRIED	CREWS RECEIVE WAGES	KINGSTON MANCHIONEAL

biological exhaustion. Technological changes such as the further motorisation of the canoe fleet would not help the situation. What is needed is a reduction in the number of canoes fishing these nearby shelf-cay areas. This is already happening; out of the nineteen south coast beaches investigated, twelve had fewer or approximately the same number of canoes that they had in 1962. For fishermen in this category alternative employment opportunities are more vital than increased investment in fishing.

> "Canoe operations is not the first stage in the development of a fishery. It is the first and last stage of something that has served and will continue to serve a very useful function - exploitation of the bottom dwelling fish and a few other species in the waters ten to fifteen kilometers off our shores. It provides a living for a small number of sturdy independant mind men ..... for whom the greatest need is more in the nature of welfare than development."
>
> Kingston Daily Gleaner
> September 1959

In contrast to the situation on the island shelf most of the Pedro Banks outside the area fished from the Cays is underfished. The necessary investment required to fish these areas is not much greater than that required to fish the shelf. Engines can be pooled, and expenses shared and instruction in navigation is available. This level holds considerable promise for the canoe fishermen.

The exploitation of the remoter banks requires considerable investment in boats and equipment. The problem of raising capital for such ventures is considered in the following chapter. However, such boats are able to reach very rich fishing grounds "..... about four thousand square miles of shallow offshore banks lying in international waters within three hundred and fifty miles off Jamaica are virtually unexploited by Jamaican fishermen." (Munro) The carrier boats which previously visited the Pedro Cays are

increasingly moving their operations to the distant waters to take advantage of these rich fishing grounds ...."the main ferrying operations are now centered around the Seranilla Serrano and Mosquito Cays owned by Nicaragua and Honduras." (Munro 1968). It is in this area that the future of Jamaica's fishing industry must lie.

Chapter Three

The Economics of the Fishing Industry

Demand for fish in Jamaica is met in two ways: firstly by home production and secondly by imports.

Home Production

Estimates of home production by weight exist only for the Survey year of 1962 when production was estimated at approximately thirty million pounds, valued at £2,264,794. Without a survey the estimation of production is difficult as fish is landed throughout the island and sold immediately. No records are kept and there are no government marketing facilities which might keep a record, as exist in Barbados. However the Economic Survey of Jamaica 1967, includes this statement.

> "the contribution of the fishing industry to gross domestic product at current prices increased by 3.1% to £2,317,000 in 1967 from £2,247,000 in the previous year. Local output continued to lag significantly behind demand as retail prices in the Kingston area rose by 9%."

Over the period 1963 to 1967 according to the same survey, the price of foodstuffs rose overall by 11% in the Kingston area (15.5% in rural areas). It is reasonable to suppose that the price of fish rose by at least a comparable amount over the same period. One indication that this is so is that the rise in retail prices for foodstuffs over the period 1966 to 1967 was 3.7% while that of fresh fish was 9%.

TABLE TWO : FISH PRODUCTION BY VALUE

1962	£2,264,794
1966	£2,247,000
1967	£2,317,000

The value of home production fell between 1962 and 1966 in a period of

rising prices which must mean that the quantity offered for sale has fallen. Also the small increase in total value of 2.3% over the whole period 1962 to 1967 is far less than any likely price rise in that period would account for.

Imports

Most of the imported fish arrives in salted or canned form. Canada is the leading supplier with a value of £2,665,855 followed by the Netherlands, £275,024, Norway £222,509, U.S.A. £158,602, France £50,281 and India £10,229. The value of preserved fish is apparent in a country where protein deficiency is common, agricultural land scarce and overpopulated, transport time consuming and costly, and refridgeration almost totally absent outside major centres. Salted and canned fish can be bought in small quantities and will keep indefinitely, two important qualities to low income purchasers in remote areas. In spite of these advantages, fresh fish is generally preferred when it is available.

Within the period 1964-67 the value of imported fish rose in response to the increasing protein needs of a rapidly growing population, from £2,992,000 to £3,567,000. This figure exceeded that of meat imports for that year which were valued at £3,371,000, representing an increase of 19% in value. The price of imported fish has risen by 11.3%; that is about the same as foodstuffs generally and therefore probably less than that of fresh fish. The figures clearly show that Jamaica's increased need for fish is being met by imports and not by increased home production. This is a serious drain on foreign currency reserves particularly when viewed in the light of Jamaica's continuing trading deficit.

TABLE THREE : HOME PRODUCTION AND IMPORTS OF FISH

	Home Production Weight in lbs.	Home Production Value	Imports Weight in lbs.	Imports Value
1962	30,000,000	£2,264,794	34,422,000	£2,992,000
1967	n.a.	£2,317,000	37,789,000	£3,567,000

The Theory of Fishing and Population Dynamics

It is of great importance to the fishing industry to be able to make some assessment of the present state of the fish populations and of future populations.

When an area or species is being fished for the first time, catches are high per unit of effort and as more operational units are attracted into fishing the total catch at first continues to rise, though the average catch per operational unit does not. As the intensity of fishing effort continues to increase a point is reached where the total catch also begins to decline. What is important to the individual operator is not however the decline in total catch, but whether he can continue to make a profit. The determinants here are the catch per unit of effort (or the cost of one unit of catch) and the value of a unit of catch.

The biological explanation for this sequence of a rise followed by a fall can be understood by using the concept of equilibrium. The concept of equilibrium is that any population is in long term equilibrium with its environment. (The phrase 'long term' needs qualification, in this context it may be taken to mean several thousand generations). That is to say, disregarding yearly fluctuations, recruitment (new additions to the population) and growth equal mortality. Any increase in recruitment is met at some point

by great mortality, through increasing competition for food and space between species, increase in the number of predators and canabalism. Also the removal of fish will result in a rise in the rate of recruitment and growth due to greater space, more food and fewer predators.

The productivity of a species determines its natural rate of increase. If fishing removes just this rate of increase, an equilibrium population is maintained, and this catch is referred to as the equilibrium catch. However, at lower levels of abundance, recruitment and growth increase i.e. the rate of natural increases rises even though the population falls (having been removed by fishing) hence the total catch can increase. It does so until removal becomes greater than the new natural increase and then declines. What this means in terms of the level of intensity of fishing can be seen from figure one. At the top of the curve which represents total catch and hence indirectly revenue, the population is stable and the equilibrium catch is being taken. Beyond this point if fishing intensity increases (either by more fishermen entering or more frequent trips or by the introduction of a more efficient technology) the equilibrium catch falls with the falling population. Beyond point A the fishing resource is being overfished. As total catch falls cost per unit of catch rises until at P revenue falls below cost. At this point or before, fishermen will leave the industry, hence fishing to the point of extinction is theoretically impossible due to rising costs.

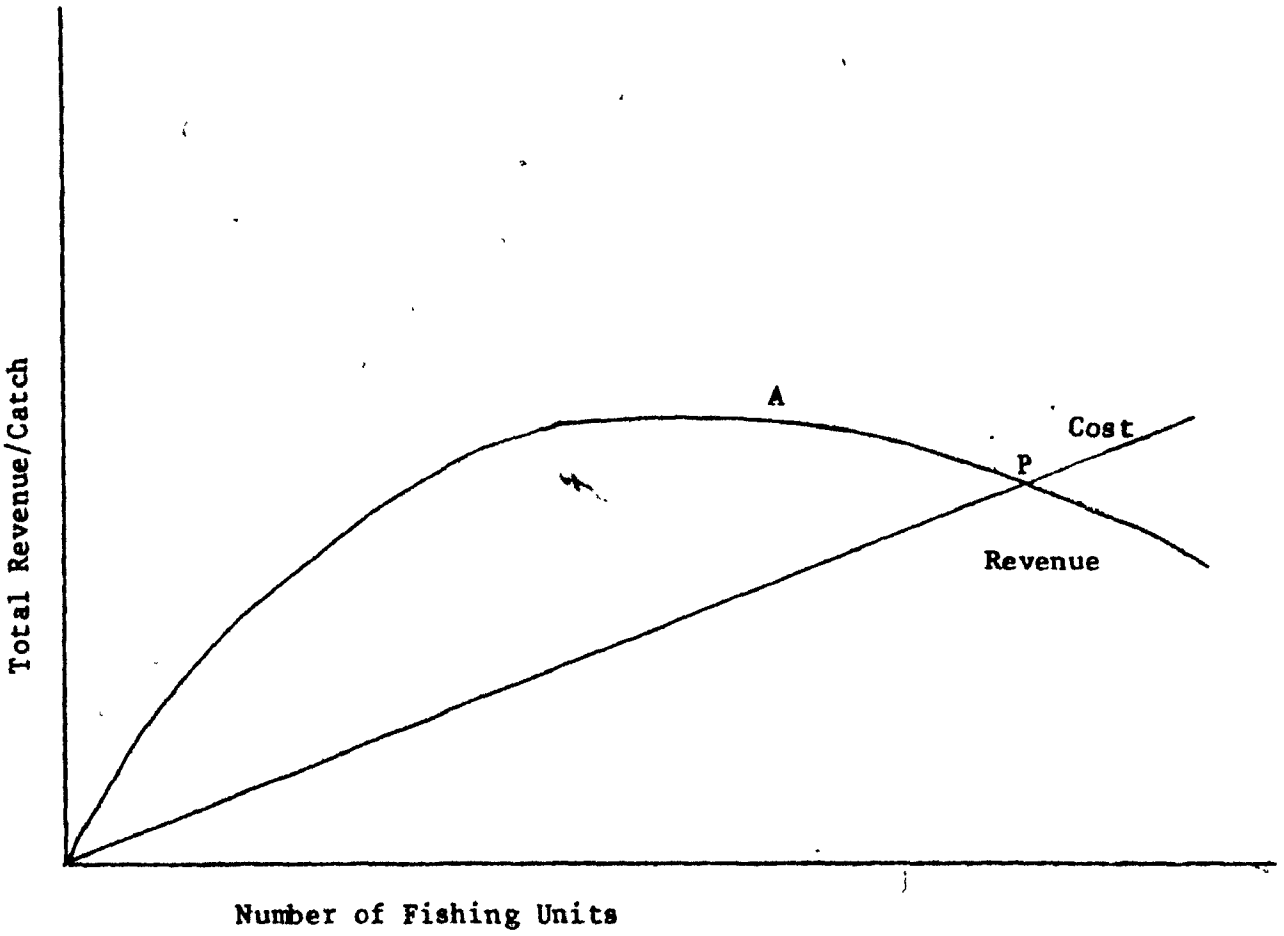
The Situation in Jamaica

Overfishing of the Jamaica island shelf is the result of three factors: 1. the use of pots, 2. an increase in the number of fishermen, and 3. the adoption of the outboard engine.

Thompson writing in 1945 considered the island shelf overfished at a

Figure One

Graph Showing Relationship Between Total Revenue/Catch And The Number Of Fishing Units



time when there were only 3,500 fishermen of whom no more than a handful had motors, compared to approximately 8,500 today of whom perhaps a thousand own engines. Men can easily enter the industry with only a small capital outlay. Operating costs are low, only fuel and fishing materials have to be paid for (both of which are subsidised). Wages to the crew are on a share of the catch basis, after operating costs have been met. The normal restraint to fishing activity, i.e. low catch per unit of effort, is set very low and the other determinant, value per unit of catch (price) is high and rising annually. This situation combined with restriction of most fishing activity to the island shelf must inevitably lead to a serious depletion of the resource. The wider problem is that in the absence of alternative opportunities fishing remains attractive in spite of very low returns.

The long term disadvantage of fish pots is that the small mesh size traps many small, immature and unsaleable fish which are not returned to the water when the pot is emptied. For the reef dwelling species to be found off Jamaica it is doubtful if a more effective fishing method could be devised.

> "The island shelf of Jamaica appears to have been fished by means of wire meshed traps for about thirty years and for a much longer period before that by wicker work traps. It is our belief that the remarkably low standing crop of fish on the near shore Jamaican reefs, which compares very unfavourably with that which can be observed in other parts of the Caribbean is a direct result of intensive trap fishing."
>
> Munro.

The adoption of the outboard motor reduced the travel time to and from the set pots, allowing many more pots to be set. Davenport 1956, mentions sixteen pots as being the maximum that one fisherman could handle. It is not uncommon today for a fisherman to have two sets of twenty, visited alternatively, giving a total of forty pots worked. Today there are of the order of 800 canoes

fishing the island shelf which in recent times by fitting motors* doubled their fishing effort in an area considered overfished in 1945.

For the first users of engines catches undoubtedly increased but with the larger number of pots now being set most fishermen are of the opinion that catch per pot has declined to very low levels and that the increased number of pots now do not produce as much as did the lesser number of pots in pre-motorisation days.

> "The mechanisation of canoes resulted in an increase in landings as the whole of the island shelf and various offshore banks were brought within the regular operational range of the canoes. However the yield from these areas appears to have stabilised at a low level of catch per unit of effort." Munro.

Munro is of the opinion that the entire shelf is now overfished both biologically and technically. Biological overfishing is defined as occuring when fish are being removed at such a rate that insufficient numbers are able to survive to maturity to sustain the population. Technical overfishing occurs when the intensity of the fishing effort is increased without adjusting mesh size, the result being that larger numbers of immature fish are caught, with adverse effects on future population totals. Since the object of increasing the fishing effort is to catch more mature fish it is obvious that a larger mesh size will not in any way inhibit this whilst at the same time cut down on the wastage of future populations.

The combination of wire meshed traps and motorised canoes is capable of rapidly reducing fish populations and this can be seen in the newer fishing

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* The rapid spread of the outboard motor, there were 12 in 1945, 699 in 1962, and around 1000 in use in 1968, is in a large part due to government encouragement through the Credit Facilities Scheme 1956 see Appendix.

areas.

> "The shallow waters around the Pedro and the Morant Cays appear to have been fished intensively only over the past eight to ten years. Nevertheless the small Morant Bank is now regarded by the ferry boat operators as being relatively unproductive, while those parts of the Pedro within regular operational range of canoes based on the Pedro Cays are said to yield a greater proportion of 'trash' fish than do unexploited areas." Munro.

Until the present Fishing Survey is published it is only possible to guess at Jamaica's present total production, however the stagnation and perhaps decline can be inferred from the value estimates of the Jamaican Survey at the beginning of this chapter.

Owing to the exhaustion of the island shelf any sizeable expansion of production can only be achieved by enlarging the long range and distant waters fleet. The problems here are, 1. the training of crews and 2. the raising of sufficient capital to buy and equip a boat and sustain the initial high operating costs.

To overcome the first problem a government sponsored training scheme has been in operation for anumber of years centred around the Fisheries Division's boat 'Blue Fin' with the assistance of a master fisherman loaned by the FAO. Although the programme experienced initial difficulties it can be said to have contributed to the success of the Manchioneal venture. Elsewhere the effects of the training programme have been less tangible and may have been largely lost as the newly trained men who were drawn from different beaches were forced to return to their original methods of fishing as there was no craft available for them.

The problem of raising capital has been successfully approached in a number of ways.

1. Share issuing, as at Old Harbour Bay and Whitehouse
2. Private saving by a fisherman, as at Whitehouse and Kingston
3. Government loans, as at Manchioneal
4. Co-operatively financed as at Manchioneal

The raising of capital for fishing ventures by co-operative methods had largely been a failure in Jamaica until 1965. Many fishermen had had unfortunate experiences with co-operatives which had left them with a distrust of any co-operative scheme. Among other difficulties discussed by Comitas 1962, perhaps the most significant had been that of leadership. In particular the finding of both an honest and a competent man who was able to bridge the barriers of class and colour between the largely illiterate, negro fisherman and the coloured literate middleman and storekeeper. With the collapse of many of the earlier co-operative ventures many fishermen lost the money they had paid on membership dues. These experiences inhibited the development anywhere on the island of an organisation which could have acted as a natural focus for group saving and perhaps the eventual financing of a long range fishing venture.

From 1965 onwards the work of the Peace Corps in Jamaica has concentrated on revising or establishing co-operative groups among fishermen. The island now has several very successful co-operative organisations due to the energy, enthusiasm and hard work of the Peace Corps volunteers. Most of these co-operatives have concentrated on developing organisational, administrative, and accountancy skills. Also they have purchased equipment in bulk for resale to fishermen at prices lower than those charged at local stores. In one case with assistance from the government, the Fisheries Division and the F.A.O., a co-operative was able to purchase a large decked boat, train a crew and start

commercial fishing operations. This achievement is unique in Jamaica and deserves study in the hope that it can provide guide lines to similar ventures at other beaches.

Manchioneal - an example of co-operation

Manchioneal is a small fishing village on the eastern coastline of Jamaica some fifty-six miles by road from Kingston and twenty-two miles from Port Antonio. However, this is the main coastal road and as such is among the best in Jamaica. The fishing beach is located on the southern side of an almost circular bay which gives only a small exit to the sea hence forming a fine natural harbour. As a fishing beach Manchioneal is very small having only twelve canoes which travel thirty to forty-five miles out to sea, fishing the Albatross Bank (thirty) and the Formigasse Bank (forty-five). The only point at which Manchioneal appears to differ from many similar beaches is in fishing technique, it being mainly line fishing rather than pot fishing. Another factor which may have helped to pre-condition attitudes towards long range/ distant waters fishing is the narrowness of the island shelf at this point and the existence of small banks offshore so the fishermen were used to making longer than average trips to sea. Since the purchase and operation of a large boat the 'Chiquita', there have been few trips out to the banks by canoe, as most of the Manchioneal fishermen are involved with the crewing of the 'Chiquita'. Those canoes that still operate from Manchioneal fish up and down the coast rather than out to sea.

Prior to the purchase and operation of a large boat the Manchioneal fishing effort was at the traditional level, very similar except for the emphasis on line fishing, to many other small fishing beaches throughout Jamaica. Indeed her position is less favourable than many, having a narrow shelf area, and little

settlement inland. Most villages to the south and west are served by other more favourably placed beaches notably Port Morant, Morant Bay, Rozelle Falls and Yallahs.

Fishing operations with Chiquita started on the 7th November, 1968 and by August 1969 over 100,000 pounds of fish had been landed, a great amount of it good quality snapper Lutjanidae. The fishermen have experienced no difficulty in selling their fish very soon after landing. Indeed it must be sold straight away for although small amounts can be stored in insulated boxes close to the beach, a catch of some 15,000 pounds cannot be stored at Manchioneal. Any part of the catch not sold immediately can be stored in cold storage rooms in Kingston but only small amounts have been involved and this has only been during the glut period of the year.

Chiquita's catch is bought by van vendors in large single purchases, the recors show individual sales as high as 2,000 to 4,000 pounds. One individual purchase of 3,564 pounds is recorded as costing the purchaser £410. The majority of the large purchases are made by three vendors, two who come from Kingston where one has his own storage and the other uses the Zero Cold Storage Plant. The third has a cold storage plant at Hope Bay on the north coast and supplies Port Antonio and large hotels and supermarkets along that section of the north coast. Another large vendor from Kingston, a Miss Miller hires a vehicle and purchases 1,000 - 2,000 pounds of fish for resale to Kingston vendors from her stall across the road from Fisheries Division Offices. Other vendors, who take smaller amounts of the Chiquita's catch, include the owner of a Volkswagen bus who sells around the Port Antonio area and a motor bike vendor who comes from Port Antonio and sells along his homeward route. Some of the catch is bought by local women who resell within walking distance of the beach.

Although operations have been very successful so far it is well to remember that the boat is not yet fully on local hands. The captain is American and a very experienced fisherman and it is significant that catches have been lower on the occasions of his absence. Small errors of judgement or inexperience can lead to very expensive results. For example, the failure to lubricate a battery charging plant cost the society £600 - £700, as a new unit had to be purchased in the U.S.A. and air freighted down. It would seem wise to expect a period of teething troubles when Captain Martin leaves.

The success of the Manchioneal venture can be attributed to the combination of several factors.

Firstly, the activities and drive of the Peace Corp volunteer stationed at Manchioneal who managed to sell the idea of a co-operative and persuade fishermen to deposit money with the co-operative. In spite of a small membership of fourteen to sixteen people the co-operative was able to save £1,000 over a two year period.

Secondly the government through the Fisheries Division put the Blue Fin at the disposal of the Manchioneal co-operative for five months. The Blue Fin was captained by Harry Sperling a master fisherman on loan from the F.A.O. and partly crewed by members of the Fisheries Division. The main purpose was to train the Manchioneal fishermen to operate a large boat by themselves. However, the Blue Fin was also operated commercially at the same time. For the loan of Blue Fin, Harry Sperling and the Fisheries Division crew the government take 25% of the catch and the co-operative must sustain all expenses incurred including bait, gear, fuel and food. The Manchioneal fishermen then had a dual task, one to learn the techniques of boat handling, navigation and line fishing and two, the task of catching fish on a commercial basis. In such a situation it is likely that training would play a secondary role but nevertheless

the practical experience and knowledge gained in seeing a large boat operated and in assisting in the operation was invaluable to men who had never before had such an opportunity. The fishermen also received considerable help from Harry Sperling in locating, purchasing and delivering a suitable vessel for their fishing operations.

Thirdly, Chiquita was purchased second-hand in Florida at a cost of $12,000 with the aid of a loan from the Agricultural Loan Board. This loan is now being repaid in regular instalments out of current operating profits. To date the payments have been on time - in fact the co-operative is ahead on repayments and has repaid $1,000 of the original loan. The co-operative is fully paying its way and has no large outstanding debts other than the original loan. Similar combined ventures between fishermen and the Fisheries Division are underway at Old Harbour Bay and Port Royal, but is is as yet too early to assess the results.

Chapter Four

Marketing and Methods of Distribution

General Characteristics of Supply

Fresh fish are landed on many beaches spread around the island. The most important of these are found along the south coast, the Kingston area and Negril. The individual enterprise is characterised by small catches and frequent visits to the fishing grounds. Weather permitting, fishermen visit their pots three to four times a week. Few beaches possess storage facilities other than insulated boxes and the occasional private freezer with a very limited capacity. The exceptions to this are the Kingston beaches which have access to cold storage plants in Kingston and Grants Pen and Nine Miles, the last two having newly constructed cold storage rooms built by the Industrial Development Corporation. Fish arriving on the beaches have already spent several hours out of water at high temperatures as ice is never carried by fishermen unless they are on a long trip to the offshore banks.

The marketing and distribution systems which have evolved are adapted to the supply pattern. The important characteristics of this pattern are, the small quantities involved, the short time period over which the fish is available for sale, the scattered nature of the supply points and the irregularity of landings in combination with the normal fluctuations in output due to the seasons and the weather. Given such constraints the distribution system possess great operational flexibility. This is reflected in the great variety of systems to be found on different beaches.

Marketing of the Catch

Fish is sold on the beach as soon as the boats return. All along the

beach, women and a few men are clustered around those boats which have just been beached, often so thickly that the boat itself is lost from view. Others walk slowly along the beach or wait at the place where their boat will land. Some squat on the sand in the shade of a boat or a palm tree, or on some beaches, under a rude corrugated iron, roofed shelter, scraping the scales from small fish or expertly skinning the rough shark-like skin from the Angel fish Pomacanthus arcuatus. A few make fires, from driftwood and palm tree debris, to fry fish for immediate consumption or later sale with bami bread (bread made from cassava flour).

When a boat touches the shore the nearest women will often wade into the surf and place their bowl and wight scales within the boat and once the outboard motor has been lifted from the stern, help the men to push the boat clear of the surf. On the beach the canoe is prevented from falling on it's side by short lengths of bamboo pole, one end of which is thrust into the sand and the other wedged under a rim of wood which encircles the canoe. The fish are stored in the boat in wicker baskets covered with wet sacking, soon to be removed by buyers anxious to investigate the catch. Sometimes part of the catch is stored at the prow, packed up against it by a shaped piece of wood. Very frequently arguments break out as weigh scales are pushed forward and buyers jostle each other in attempt to obtain the better quality fish. Money changes hands quickly and the fish are all weighed and sold within a short time. Then the boat is soon deserted by all except the fishermen and the emaciated dogs and black pigs scavenging for remains.

Although at first sight the buying process appears to be a free for all, closer examination reveals that there is a definite packing order. Usually the catch has already been sorted by the fishermen during their return from the fishing grounds. Small amounts will have been placed aside for crew members;

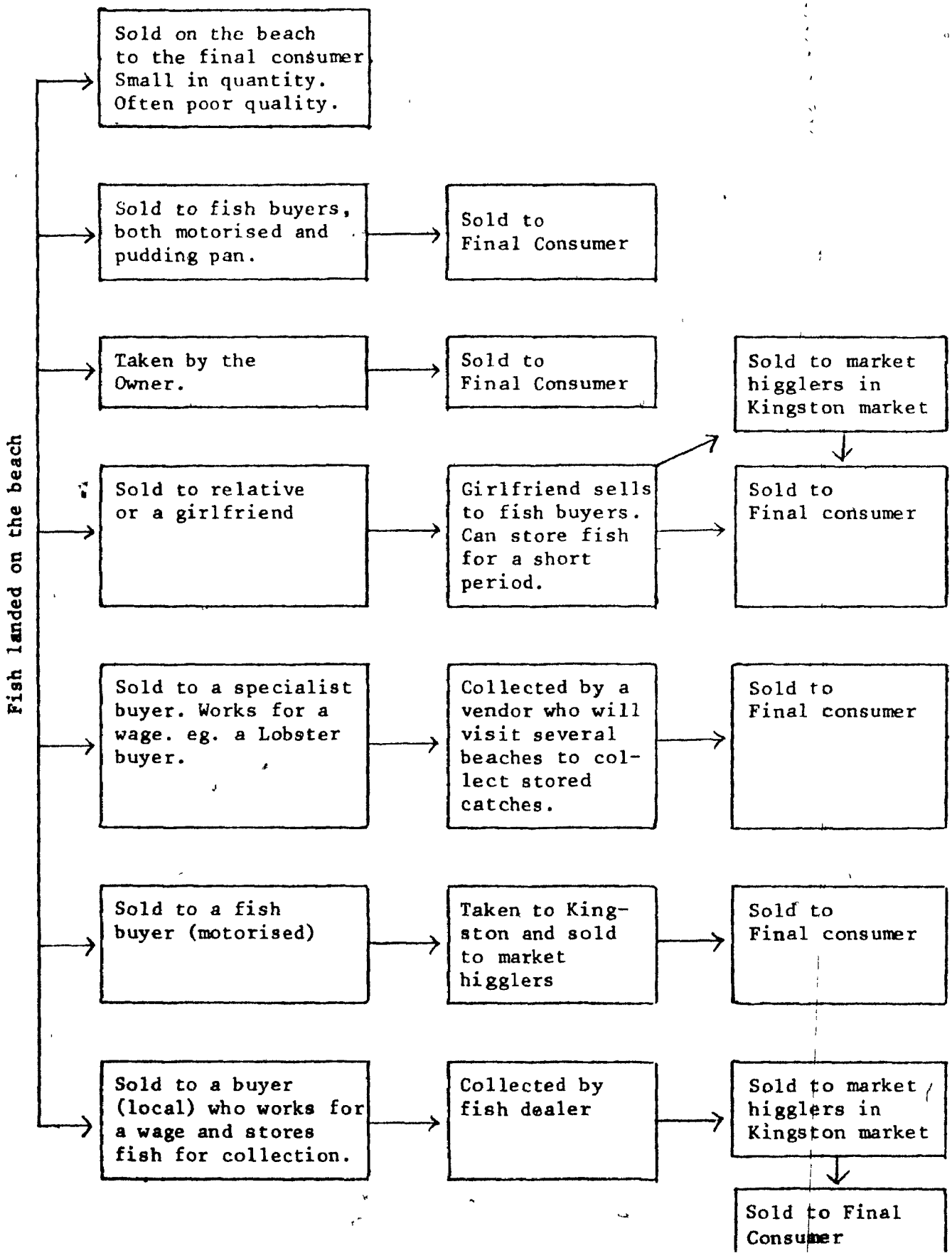
lobsters being placed separately, and fish sorted according to quality and apportioned among the one or more regular buyers or kept for the owner.

Large fish buyers, that is those who buy fish in quantities greater than thirty pounds, have verbal agreements with certain captains and they will purchase the best fish from those boats. On some beaches e.g. Calabash Bay these large buyers will wait by their vans and the fish is brought to them for weighing by the fishermen. Fish not put aside for any of these purposes are bought by the fish higglers or "pudding pan" women. Finally, women who are interested in buying only very small amounts at the lowest prices remain at the boat when the other buyers have left to meet the next incoming boat. It is not usual practice for buyers and higglers to visit every boat but only those captains with whom they have verbal agreements.

Fish sold on the beach may go directly to the final consumer or pass through several intermediaries. On many beaches fishermen sell their catch largely to a female relative or girlfriend, but on other beaches fish are sold directly to buyers who come from outside the village. The importance of any method varies from beach to beach and every beach has several co-existing methods. For example, at Alligator Pond the majority of the buyers come by bus, and all the fish are landed between 8 a.m. and 1 p.m., after which the buyers leave. However, on other beaches such as Whitehouse, Old Harbour Bay and Calabash, boats may arrive at any time of the day or night, so fish is bought by women who store the fish in insulated boxes kept on the beach and resell to motorised vendors when they call. At Calabash Bay the motorised vendors live next to the beach and have small freezers for storing the catch. Hence the marketing system is strongly influenced by the landing times of the canoes.

Figure Two

Systems Analysis Chart of Marketing Systems



Within the marketing systems mentioned it is possible to identify several different types of fish buyer, the relative importance of each type varying from beach to beach. They can be identified in terms of the quantity purchased, the mode of transport used, the method of sale, and the capital involved. The following is a list and a brief explanation of each

Local Higglers ("Pudding Pan" Women)

Local higglers are usually women who buy a large pan of fish varying in value from thirty shillings to ninety shillings and weighing between ten to thirty pounds. They do not ice their fish and rely on selling by the same evening to neighbours within walking distance of their own home. They travel by bus if it is available, or by truck or hired mini-van.

Market Higglers

Market higglers are both men and women, they may spend ten to fifteen pounds on a single visit. They travel by bus or truck, and visit the beach on regular days and sell the fish on the same day and the following day at a market. For example, market higglers from Mandeville market buy fish at Alligator pond in the morning and can return to sell fish in the market the same day, the fish being washed and packed in chipped ice. The unsold portion is stored in barrels in the market overnight.

A typical schedule might be:-

Alligator Pond	Tuesday
Mandeville Market	Wednesday
Mandeville Market	Thursday
Alligator Pond	Friday
Mandeville Market	Saturday
Sunday & Monday	No business

Market Higgler (Stationary)

The market higgler (stationary) does not leave the market to buy fish.

The fish is bought for him by a relation or business associate at the beach and the fish is sent by truck, van or bus to the market.

In Kingston, van owners sell fish they bought in Old Harbour Bay and Rocky Point to market higglers, much of this is sold in the streets rather than in the market. However, some thirty women can be seen in Coronation market selling fish they have obtained both from these sources and the Kingston beaches.

The Fish Buyer (Wage earning)

The fish buyer is frequently a local resident who buys fish for a dealer. The fish are washed and stored with chipped ice in an insulated box. The dealer arranges for the collection of the fish, brings fresh ice and pays the fish buyer.

Specialist Buyers

Similar to the fish buyer above, the specialist buyer is usually a local resident who buys lobsters and stores them alive to be collected by a dealer who will visit many beaches. These people usually work on a commission basis.

There is one "pudding pan" lady at Alligator Pond, who specialises in salting lobsters. She takes the bus to Mandeville and sells them by visiting homes in the middle class housing areas.

Motor Bike Vendors

Motor bike vendors are men travelling on small motor bikes from village to village with a small box strapped over the rear wheel carrying fish. These boxes are capable of holding up to a hundred pounds of fresh fish, but they rarely carry more than twenty to thirty pounds. The bikes are mostly 50 c.c. Hondas, which can be bought on hire purchase. Their

singular advantage is their very low running costs. The amount of cash involved in day to day transactions is very small and profits which are also small, depend on the ability of the vendor to obtain fish. Most vendors questioned complained of the difficulties of obtaining sufficient fish and felt that they could earn a good living if more fish were available. Like other vendors, the motor bike vendors have definite routes. That is they may not follow the same route every day, but will choose between two or three routes depending on the time of their last visit; how much fish they have to sell; and their estimation of the probable demand along that route on that particular day. The average distance they travel is lower than that of the vendors who travel by van, but as with van vendors, frequency of visit varies inversely with increasing average distance travelled - see below.

Table Four

Frequency of Visit, Distance Travelled and Range of Motorised (Motor Bike) Vendors

Frequency of Visit	Average Distance Travelled	Range
3 times a week or more often	19.8 m.	3 - 42 m.
Twice a week	23.5 m.	3 - 53 m.
Once a week	37.1 m.	23 - 47 m.
Infrequent	27.3 m.	13 - 59 m.

Only in the last case, that of infrequent visits i.e. once very fortnight or more rarely, does this relationship fail to hold. In the case of infrequent visits, the distance factor is of less importance in explaining variation in

the frequency of visit. This may reflect experiment on the part of the vendor to find new markets close by.

Motor Van Vendors

Motor van vendors carry their fish in small pick-up vans in an insulated box, using chipped ice to preserve the fish. They are the most important buyers on all the major south coast beaches, with the exception of Alligator Pond. The level of initial capital expenditure is higher than any other method and the day to day running costs are higher; also the amount of cash involved in day to day transactions is greater. Van vendors travel further, generally obtain the better quality fish, and enjoy higher returns than other distributors. Expenses are high due to the short life of the vans caused by the large annual mileage and the bad condition of many Jamaican roads.

The most common organisational unit is 'one man - one van', though some operators own more than one van and some own their own boats. Van vendors supply villages many miles from the south coast beaches, sometimes even supplying towns on the north coast, as at Montego Bay and Ocho Rios. Like the motor bike vendors, they have definite routes and, once again, the frequency of visit varies inversely with the average distance travelled.

Table Five

Frequency of Visit, average Distance Travelled and Range of Motorised (Van) Vendors

Frequency of Visit	Average Distance Travelled	Range
Three times a week or more	27 m.	7 - 43 m.
Twice a week	41.4 m.	21 - 61 m.
Once a week	44.9 m.	37 - 59 m.
Infrequent	31.6 m.	6 - 60 m.

Again the relationship fails to hold in the final class possibly for similar reasons. The full importance of the van vendor will further emerge when the distribution network is discussed in the next chapter.

Bicycle Vendors

These are men travelling on bicycles carrying fish in a small box strapped on the back. They usually carry some ice but not always, as buyers sometime express a preference for 'fresh fish', that is fish that has not been iced. They maintain that they (the consumer) then can be sure that the fish has been landed that morning or otherwise it would be bad. Most bicycle vendors could probably carry as much as fifty to sixty pounds of fish, but it is rare that they carry more than twenty pounds owing to the difficulty of obtaining any more. Interviews with bicycle vendors revealed that van vendors offered better prices on most beaches, so bicycle vendors are more commonly found on the smaller beaches which the vans rarely visit. Although it was not possible to survey the number of people who find employment in this way, it seems that only very small amounts of fish are distributed in this manner. Distances involved are necessarily small, partly because the small quantity carried is quickly sold and partly due to the exhausting nature of this method of travel. Jamaica is a very hilly country away from the coastal roads and most areas are not well suited to travel by bicycle. The average distance travelled is 8.6 m. and the distance ranges from 5 - 12 m. Vendors travelling every day so that they can get fish.

Runners

Runners are rarely seen today, but before the widespread availability of motor transport, fish was transported on foot. The distances involved were staggering. A local resident of Spaldings remembers that early in this century fish was carried by runners overnight from Alligator Pond, without ice, in a

basket carried on the head. This is a distance of thirty-five miles, much of it uphill. Donkeys were not used for this trip as they were too slow. This system has only just disappeared, the last regular runner stopping only two to three years ago. Fish is still occasionally carried on foot but the distances involved are small.

The Fish Fryer

The fish fryer is usually a woman, who buys fish, fries it overnight and sells it the following day often with bami bread at a market or on the street.

The Individual Consumer

In addition to casual callers many beaches on fishing days have a market on the foreshore and individuals often bring farm produce which they sell and then buy fish to take home.

It is possible to distinguish between two major systems of distributing the catch.

The Local System

The local system is characterised by low income consumers and a dispersed market. By this system, fish is supplied to small farm units by women higglers, who reach the beach by bus or hired transport, which they catch by walking to a point along the transport route. They often carry a small amount of farm produce which they sell at the market held on the beach. They purchase fish from the canoes as they land spending between twenty shillings to eighty shillings in the course of the day. They return with the truck or bus in the afternoon carrying their purchases in aluminium bowls or hand woven baskets and sell on the same day by visiting on foot, their customers who live near them. They usually visit the beach on certain fixed days. If the catches are poor or bad weather prevents the boats from putting

to sea the higglers may be forced to return without any fish. The system although time consuming does have certain advantages.

1. It provides a small cash income to people who have few other ways of earning money.
2. It provides a source of protein to people who are unable to purchase meat regularly because of low incomes and/or lack of an accessible meat market. When fried with peppers fish can last several days.
3. It serves scattered and remote areas where regular transport services do not exist or are expensive, and where motorised vendors are not attracted because of low population densities, the time consuming nature of the travel, and difficult roads.

The Regional System

The regional system may be divided into two parts depending on whether the market is nodal or dispersed:

1. The nodal market:- is served by both pickup van and motor bike. Fish is transported to a point market such as a market place, supermarket, or hotel and the complete stock sold in one or a few transactions.
2. The dispersed market:- is served by both pick-up van and motor bike. It is of great importance as most settlements outside Kingston and Montego Bay rely upon travelling vendors for any fish they receive.

On all the large beaches it is possible to find examples of all types of distributing agents. A casual observation of most fishing beaches gives the impression of a large number of women engaged in the buying of fish. But their numbers are not in proportion to their importance in the distribution of the catch. Many of the women seen on the beach will be buying for themselves and their families (a family may have over a dozen members, and

fried fish will keep for several days, hence amounts purchased may be quite large). Many of the women in this category live within a short distance of the beach or make the trip once a week, if the distance is greater than five to six miles. Some women will be buying for subsequent resale to dealers. They are thus engaged in the marketing of fish, not its distribution. Many beaches function as markets so that many of the women are not there solely to trade in fish.

The role of the fish higgler woman appears to have declined rapidly over a short period of time. Only five to six years ago many inland centres were supplied by local women who travelled weekly to purchase fish, returning home the same day to sell a small load. Many areas are still served in this way but increasingly they are giving way to the motor bike and van vendors. They travel more quickly and carry ice so that their fish is in better condition. They can carry more; visit more frequently; offer better prices on the beach; and if there is a shortage of fish on one beach, their greater mobility enables them to try another beach. Although fewer do this than might be expected. Due to the network of personal agreements, it is unlikely that much fish will be available for sale to a "stranger" except in the unusual event of a surplus. Van vendors rarely visit beaches in the hope that a canoe has recently returned outside the normal landing times. In which case, beach women will have bought the fish and stored it in insulated boxes on the beach. Bike vendors travelling shorter distances are often able to return to a beach in the afternoon in the hope of obtaining fish for the following day.

To date no "pudding pan" women have invested in vans probably because of the lack of capital. Interviews with van vendors often revealed that their initial capital came from outside the fishing industry. Many had worked abroad for several years and on return to their home village with its lack of

employment opportunities had invested their saved up capital in starting a small fish selling business and have subsequently developed their present routes. At the present time in spite of a shortage of fish throughout most of the year, new people are entering the business.

No general store ever sells fresh fish or buys fish to cook and resell (two exceptions in two hundred and sixty-two interviews), although some buy for their own consumption. As the vendor stays only as long as he is selling fish distribution is limited to people who are on the spot at the time. Those who live away from the stopping places may only rarely see fresh fish. Most stores stock salted fish, and nearly always canned fish imported from overseas. Canned fish and canned meat together with cheese probably supply a large amount of the protein intake in these areas.

Chapter Five

Relationships Between the Fishing Effort and the Distribution Pattern

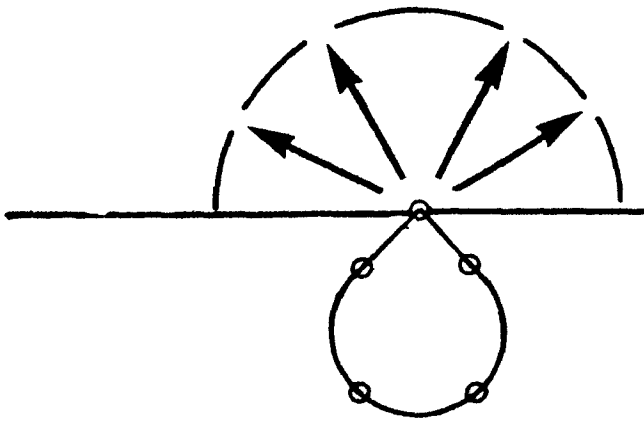
The organisation of the fishing effort and the organisation of distribution are closely linked together through the fishing beach. The level of fishing activity, and hence the size of the catch, affects the nature of the distribution network. The quantity landed is a function of the fishing effort, i.e. the number of boats and their equipment and the distance travelled. Canoes fishing within thirty miles of the shore, that is largely on the island shelf have smaller catches than canoes and boats travelling further to the long range fishing grounds. Canoes travelling short distances return within a narrow time band and are met on the beach by fish buyers and the catch is sold immediately, the shorter the distance travelled the lower is the investment in canoes and equipment, and the smaller is the distribution area. In the case of the smaller beaches this is largely within walking distance of the beach.

Canoes exploiting long range waters, and boats fishing distant waters do not return at a definite time, so that on those beaches it is sometimes necessary to store the catch. These beaches have greater investment in canoes and equipment. Owing to their higher level of investment and greater commitment, motorised vendors are attracted to beaches having larger catches, that is those beaches fishing at least partly long range. The pattern of arrangements on any one beach, is sometimes complex but it is possible to construct a number of models to illustrate the nature of the distribution systems and their relation to the fishing pattern. The models fit into a hierarchy and 'build up' on each other, up to the most complex where all possible patterns both on the landward and seaward sides can be found.

For a complete key to symbols used See Appendix E p.88

Model I

LAND



SEA

Characteristics of the Distribution Pattern

Fish is consumed locally by fishermen and families or sold to women who resell often reaching their market on foot.

Fish is rarely distributed more than a few miles from the landing point.

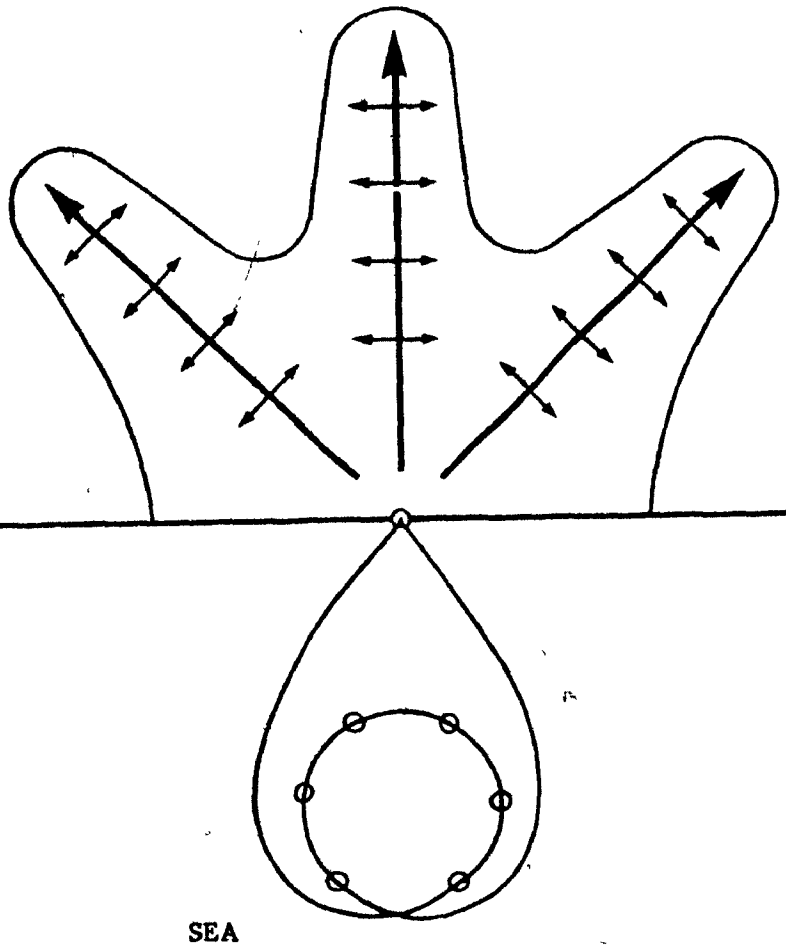
There is no investment in transport or storage.

Characteristics of the Fishing Effort

Short range, less than 5 miles.
Canoes largely powered by sail and paddle.
Canoes return to the beach in 3/4 hours.
A variety of fishing methods are used.
Catches are very small (10-30 lbs.)
Canoes in poor condition.
Investment in equipment is low.
Crews receive a share of the catch.

Model II

LAND



SEA

Characteristics of the Distribution Pattern

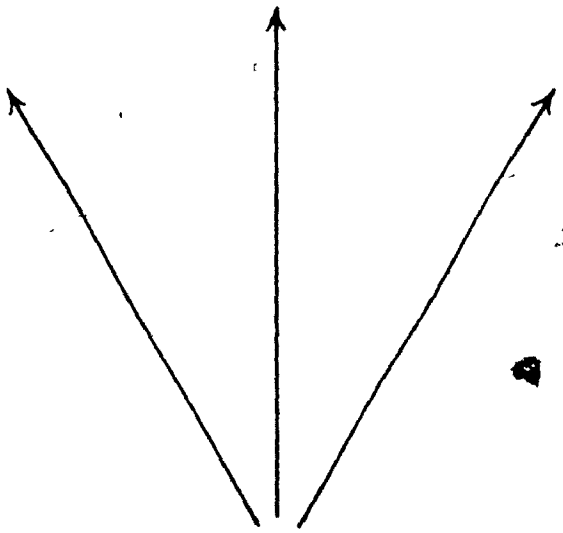
The catch is distributed by women higglers who carry up to 30 lbs. of fish in baskets, walking from stopping places along the bus route and selling to farmers. They rarely carry ice and the only investment is in the purchase

Characteristics of the Fishing Effort

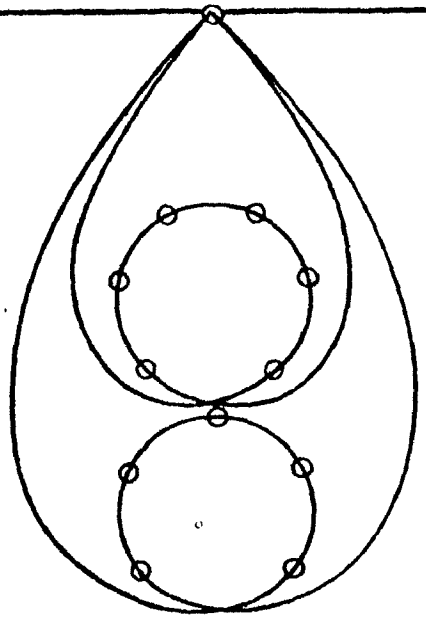
Fishing range is 5-30 miles.
Many of the canoes are powered by outboard motor.
Canoes return to the beach in 4-9 hours.
Mostly pot fishing, but lines may be used on the way to the main fishing grounds, and at certain seasons nets are used.
Catches are small, 30-100 lbs.
Canoes are in good condition.
Crews receive a share of the catch.

Model III

LAND



SEA



Characteristics of the Distribution Pattern

The catch is distributed by motorised vendors over a large area.
The catch is sometimes stored and ice is carried.
The operation is characterised by a higher level of investment than in models I and II and by the full time commitment of the vendors.
Large quantities are carried (100 lbs or more)

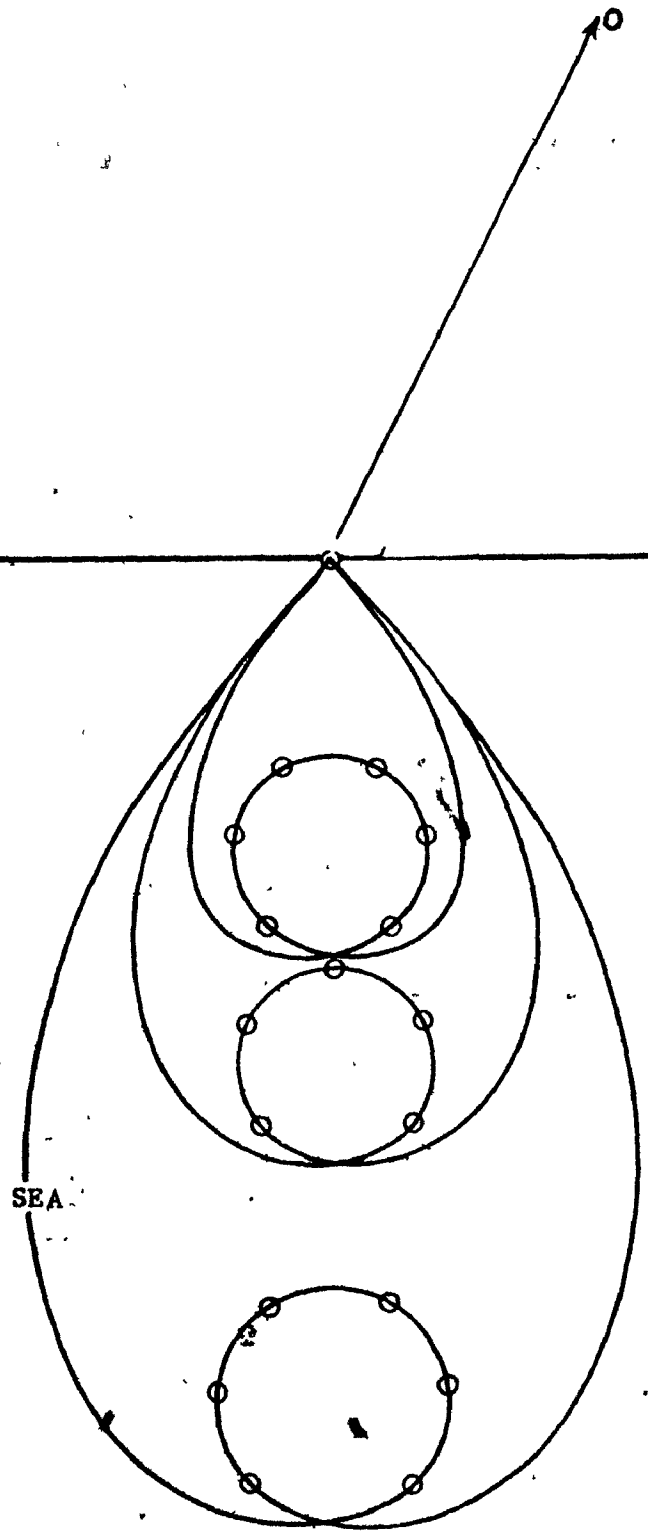
Characteristics of the Fishing Effort

Fishing range is 15-60 miles.
Canoes are powered by outboard motor.
Canoes may make trips of more than 24 hours.
Mostly pot fishing
Catches are larger over 100 lbs.
Canoes are in good condition, the more successful fishermen have bought fibre glass canoes.

Fishing range is more than 60 miles.
Decked vessels staying at sea for 3-10 days carrying ice for storage
Characterised by substantial investment in the boat and equipment. Crews are paid a wage
Catches are very large (1000-5000 lbs.)

Model IV

LAND



Characteristics of the Distribution Pattern

Fish is transported by van to a nodal market.

Characteristics of the Fishing Effort

Fishing range is 15-60 miles.
Canoes are powered by outboard motor.
Canoes may make trips of more than 24 hours.
Mostly pot fishing
Catches are larger over 100 lbs.
Canoes are in good condition, the more successful fishermen have bought fibre glass canoes.

Fishing range is more than 60 miles.
Decked vessels staying at sea for 3-10 days carrying ice for storage
Characterised by substantial investment in the boat and equipment. Crews are paid a wage
Catches are very large (1000-5000 lbs.)

TABLE SIX : SUMMARY OF FISHING & DISTRIBUTION CHARACTERISTICS

	CHARACTERISTICS OF THE DISTRIBUTION PATTERN					CHARACTERISTICS OF THE FISHING EFFORT							
	METHOD OF DIST-RIBUTION	DISTANCE CARRIED FROM THE BEACH	STOR-AGE FACIL-ITIES	AVERAGE QUANTITY CARRIED	TYPE OF MARKET	RANGE	OPER-ATING UNIT	POWER UNIT	TRIP TIME	METHOD OF FISHING	AVERAGE QUANTITY CAUGHT	SYSTEM OF CREW REWARD	STOR-AGE FACIL-ITIES
MODEL I	ON FOOT	1-5 MILES	NONE	1-3 lbs	LOCAL	<5 MILES	CANOE	SAIL & PADDLE	3-4 hrs.	POT LINE NET	10-30 lbs	SHARE OF CATCH	NONE
MODEL II	BY BUS AND ON FOOT BY WOMEN HIGGLERS	1-25 MILES	NONE	1-30 lbs	DISP-ERSED	5-30 MILES	CANOE	OUT-BOARD ENGINE	4-9 hrs.	POT	30-100 lbs	SHARE OF CATCH	NONE
MODEL III	VAN	1-30 MILES	OCC. FREE-ZER	100 lbs	DISP-ERSED	15-60m. / >60 m.	CANOE / DECKED VESSELS	OUT-BOARD / IN-BOARD ENGINE	24 hr / 3-10 days	POT / POT	100-200 lbs / 1000-5000 lbs	VAR-IABLE / WAGE	NONE / ICE
MODEL IV	VAN	1-30 MILES	OCC. FREE-ZER	100 lbs	NODAL			AS	FOR	MODEL	III		

As most of the north coast beaches fit Model I and have only a local impact upon the island distribution pattern attention is focused on the south coast beaches. Fourteen beaches appear to dominate the distribution pattern, twelve of these have distinct market areas, although they overlap with those of other beaches. Two beaches, Farquhars and Belmont have market areas within the market of Rocky Point and Whitehouse respectively. Each of the fourteen beaches serves a market area the size of which, whether measured by area, total population or population density, bears a strong positive relationship to the catch. The greater the catch the greater the extent of the market.

Figures for catch per beach have been estimated in preparation for a new Sample Survey of the Fishing Industry by the Ministry of Agriculture and Lands. These figures are open to revision but they can be used to rank the beaches. The areal extent of the markets have been mapped from the results of the village questionnaire and population figures for the districts concerned were obtained from Kingston Town Planning Department.

Using the data from Table Seven (overleaf), Spearman's coefficient of rank correlation value (r_s) was .745, r_s is significantly greater than zero at the one per cent level ($r_{s\ 0.01}$ = .645 for n = 14).

For catch and total population of the districts served the Spearman's coefficient of rank correlation value (r_s) was .745, r_s is significantly greater than zero at the one per cent level ($r_{s\ 0.01}$ = .645 for n = 14).

For catch and the average population density the Spearman's coefficient of rank correlation value (r_s) was .812, r_s is significantly greater than zero at one per cent level ($r_{s\ 0.01}$ = .645 for n= 14).

Table Seven

Area, Population and Average Population

Density of Areas served by the Principal Beaches

	Principal Beaches Ranked by Catch.	Total area of Principal Districts Visited in sq. mls	Rank	Total Population of Principal Districts Visited	Rank	Average Population Density of Principal Districts Visited	Rank
GROUP 1	1. Kingston	655.9	2	585,558	1	849.	1
	2. Old Harbour Bay	1048.3	1	359,729	2	394.28	3
	3. Alligator Pond	342.8	6	132,788	6	406.91	2
	4. Rocky Point	639.5	3	198,040	3	339.5	4
	5. Whitehouse	423.4	5	143,972	5	334.6	5
	6. Treasure	599.3	4	164,096	4	291.5	6
GROUP 2	7. Yallahs	101.	13	21,814	13	205.6	11
	8. Negril	137.4	11	38,080	11	292.4	9
	9. Parotee	203.6	8	37,175	8	180.25	13
	10. Belmont	199.6	9	62,929	9	333.25	8
	11. Hope Wharfe	65.8	14	18,991	14	291.5	10
	12. Scots Cove	156.4	10	27,997	10	175.6	14
	13. Farquhar	296.2	7	99,413	7	388.8	7
	14. Morant Bay	131.7	12	32,070	12	269.3	12

See Appendix D for further detail

Hence we may conclude that the size of the markets, whether measured by total area, population, or population density, bears a strong positive relationship to the size of the catch.

Examination of Table Seven shows that the first six beaches (or groups of beaches) have large markets in terms of area, total population, and population density. The last eight beaches have much smaller markets, serve fewer people, and have generally much lower population densities. The biggest of this second group Belmont and Farquhar, as has already been pointed out, could be included with Whitehouse and Rocky Point. The first six beaches which make up Group 1 are examined separately, the eight minor beaches which make up Group 2 can be considered together.

Group 3 beaches include the rest of the island's fishing beaches which have only a local impact on the distribution pattern.

Table Eight

Number of Boats with/without Engines

	Beaches	No. Boats with Engines	No. Boats without Engines	Total No. of Boats
GROUP ONE	Kingston	250	340	590
	Old Harbour	126	38	164
	Alligator Pond	87	8	95
	Rocky Point	68	19	87
	Whitehouse	66	-	66
	Treasure Beach	44	2	46
GROUP TWO	Yallahs	19	18	37
	Negril	16	43	59
	Parotee	8	35	43
	Belmont	8	41	49
	Hope Wharf	6	41	47
	Scots Cove	6	25	33
	Farquhar	19	4	23
	Morant Bay	2	14	16

Table eight shows that the Group 2 beaches have smaller fishing fleets and have proportionally fewer boats with engines.

Group One Beaches

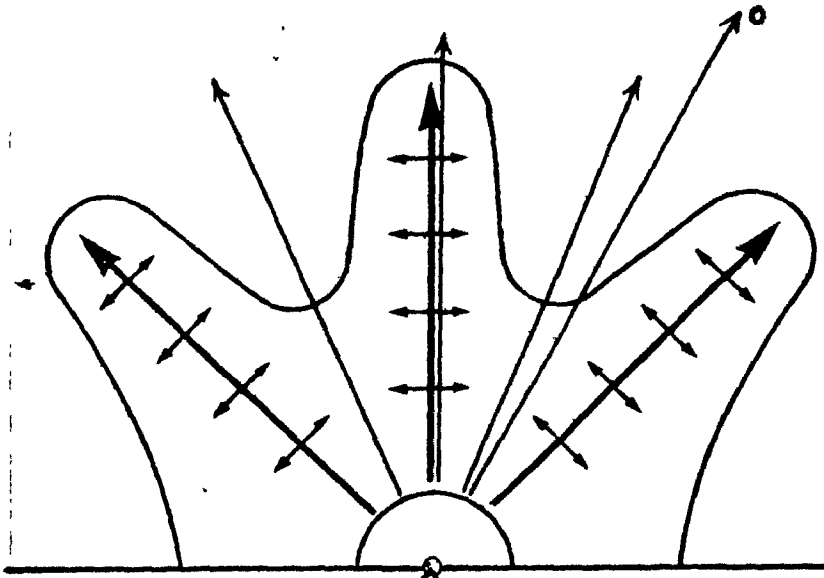
Kingston

The model shows that Kingston beaches have three distinct levels of fishing effort. The first level is short range using both motorised and unmotorised canoes landing the catch at Greenwich, Hunts Bay and Port Royal. The second level is long range, the catch being ferried from the Pedro Cays by carrier boats. The third level is characterised by decked vessels travelling in excess of a 400 mile trip.

More fish are landed at Kingston than anywhere else on the island, this is because the carrier boats from the Pedro Cays and the boats fishing in distant waters all land their catch at Kingston. The amount landed by carrier and distant water boats is difficult to assess. The 1962 Survey estimated five million pounds of fish valued at £375,000. Conversations with leading fishermen put catches at around 50,000 - 60,000 pounds per week that is 2.3 million to 3 million pounds of fish a year.

Kingston itself is the major market for the catch. Fish is marketed by higglers in Coronation market and on the streets particularly along Luke Lane and Barry street. The other major Kingston outlet is through a chain of shops owned by a successful fisherman. Fish is sent daily by truck to Montego Bay. Outside Kingston fish is distributed partly by women higglers but mostly be motorised vendors over an area enclosed by the A3 road and the A1 road as far as Moneague.

Kingston Beaches



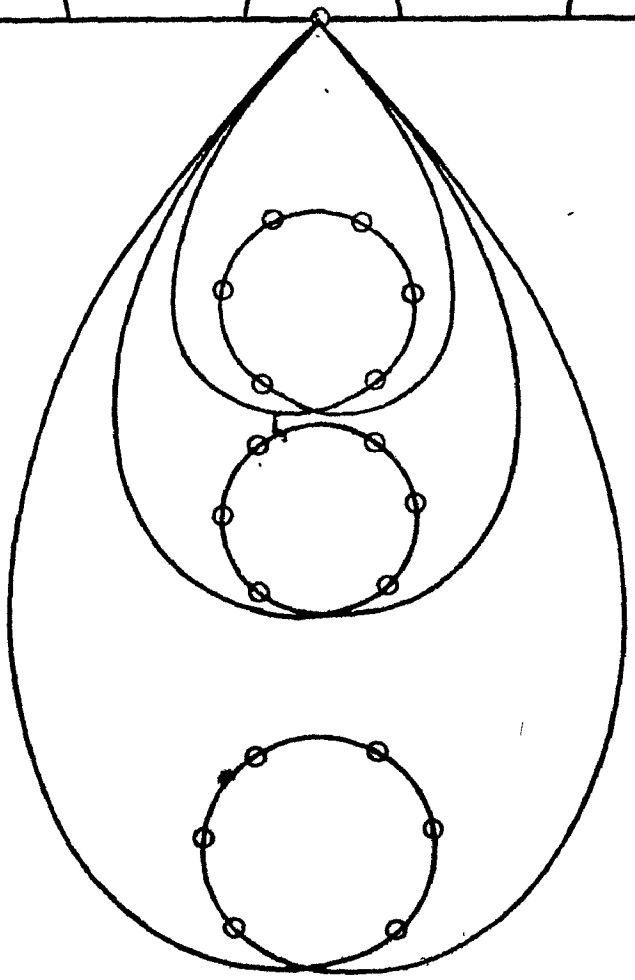
Characteristics of the Distribution Pattern

Nodal Market - Montego Bay

Distributed by motorised vendors

Distributed by women higglers

Kingston market and shops

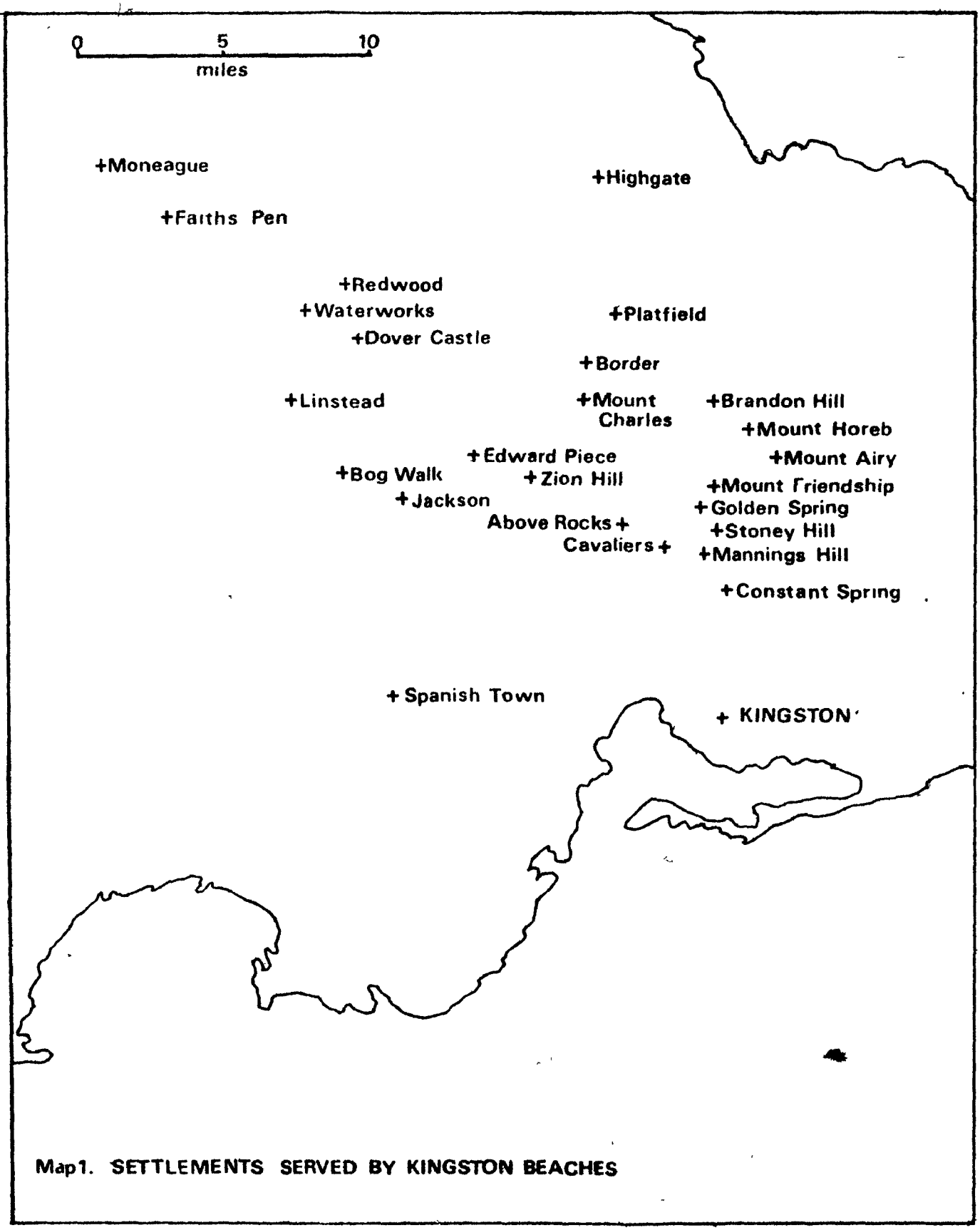


Characteristics of the Fishing Effort

Short range, under 20-25 miles. One out of two boats have engines. Canoes return to the beach in 4-9 hours. Mostly pot fishing

Long range - catch made by canoes based on Pedro Cays, and ferried to Kingston by carrier boats.

Distant waters - decked vessels involved in trips in excess of 400 miles and 7-10 days.



Map1. SETTLEMENTS SERVED BY KINGSTON BEACHES

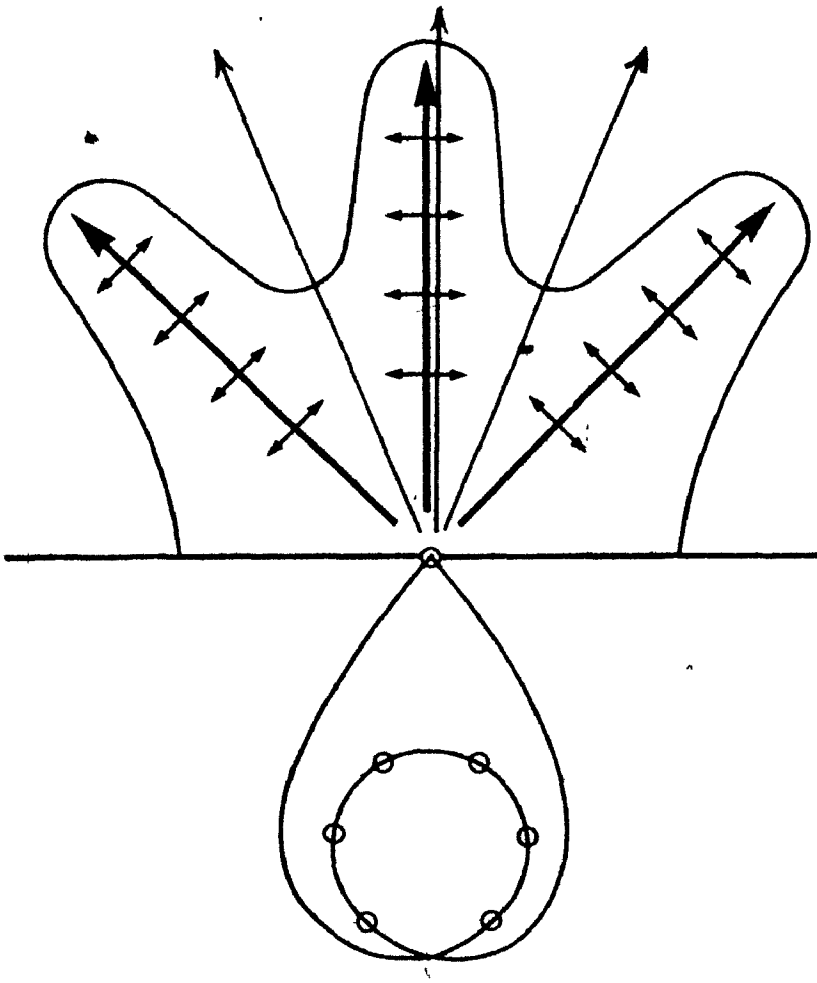
Old Harbour Bay

The model shows that Old Harbour Bay has only one level of fishing effort, that is short range. It has however a large fishing fleet and lands a greater catch than any other single beach dependent on canoes.

Some of Old Harbour Bay's catch goes by truck and van to Kingston and is sold to market higglers. The rest of the catch is marketed by van and higgler over an area of greater than a thousand square miles, which by area is the biggest market of any beach in Jamaica. The area extends to Madeville and Wait-a-Bit in the west, to the northern coast between St. Anns Bay and Hotel Casa Maria and as far east the A3 road from Kingston to Annotto Bay.

Old Harbour Bay

LAND



SEA

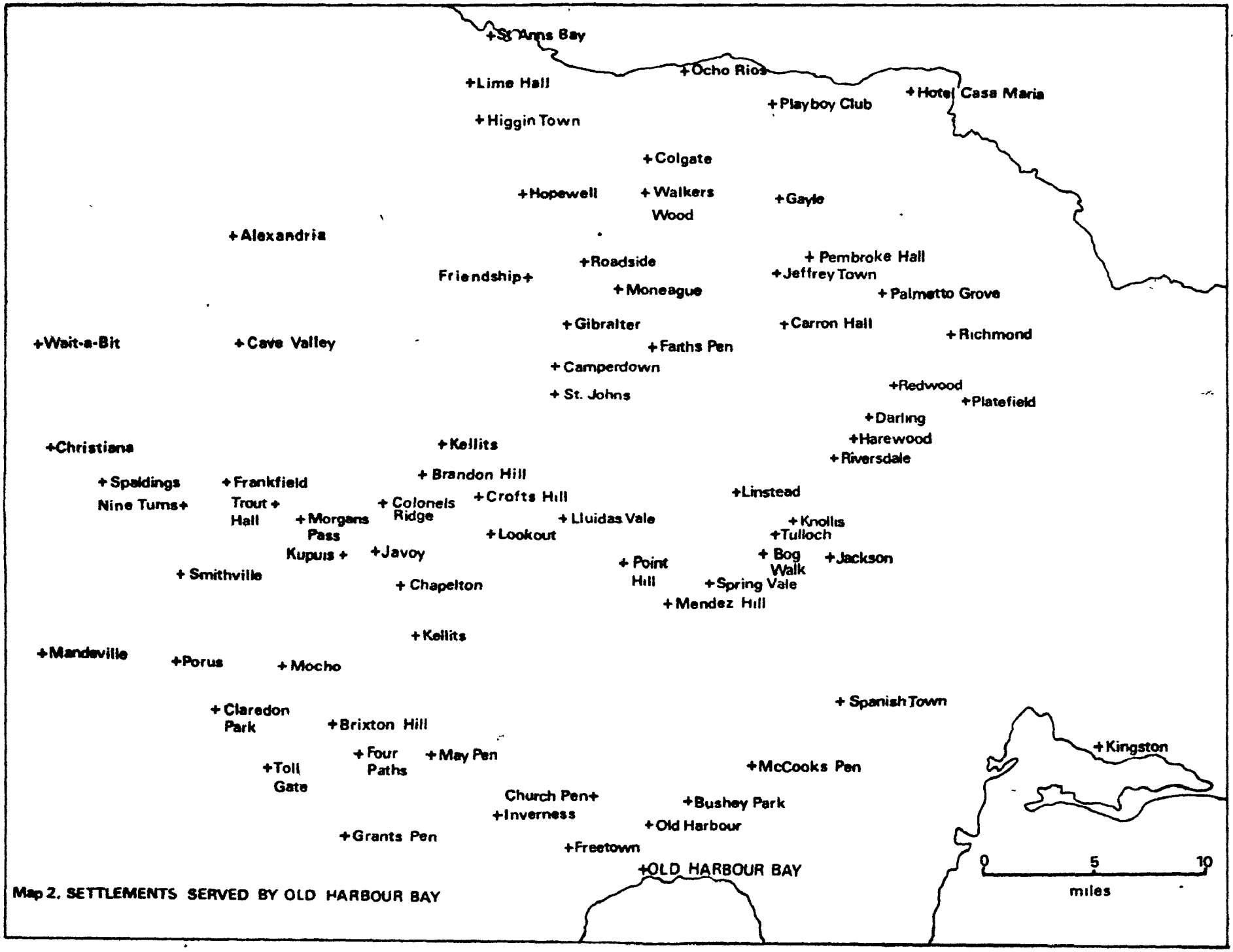
Characteristics of the Distribution Pattern

Fish is distributed over a wide area reaching as far as the north coast by between 25-30 vans and a similar number of motor bikes.

A substantial proportion of the catch is distributed by 250-300 pudding pan women.

Characteristics of the Fishing Effort

164 cottonwood canoes of which 126 have engines. Threequarters are engaged in pot fishing and the rest in net fishing and lining. Two-thirds fish within 10-15 miles of the shore and the rest no further than 30 miles. Catches are small 30-100 lbs. Condition of the canoes is mixed. Canoes return to the beach within 4-9 hours.



Map 2. SETTLEMENTS SERVED BY OLD HARBOUR BAY

Alligator Pond

The model shows that Alligator Pond has only one level of fishing effort, that is short range. On the landward side distribution is dominated by the women higglers. Although the area served is the smallest market area of any of the Group One beaches the population density is higher than any except Kingston and even higher than that figure if the capital is left out of the calculation.

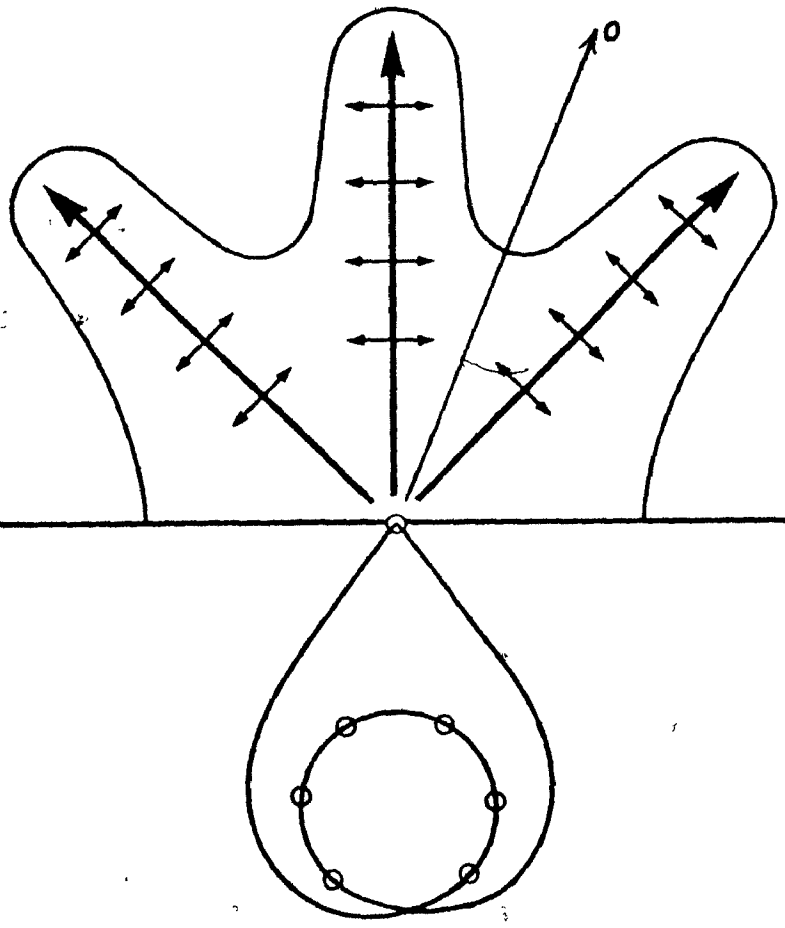
The area served by Alligator Pond can be divided into three parts.

1. An area roughly triangular in shape lying south of the main road joining Santa Crux to Mandeville, the apex of the triangle being Alligator Pond. This area is served by pudding pan women who three to four times a week catch the bus to Alligator Pond and return to their village to 'walk and sell'.

2. Mandeville market - is served by market higglers. The middle class housing areas of Mandeville are visited by higglers, but none of the supermarkets take any fish from Alligator Pond.

3. The Mandeville- Christiana area. This area is served by vans and motor bikes (apart from Christiana market which is served by higglers).

Alligator Pond



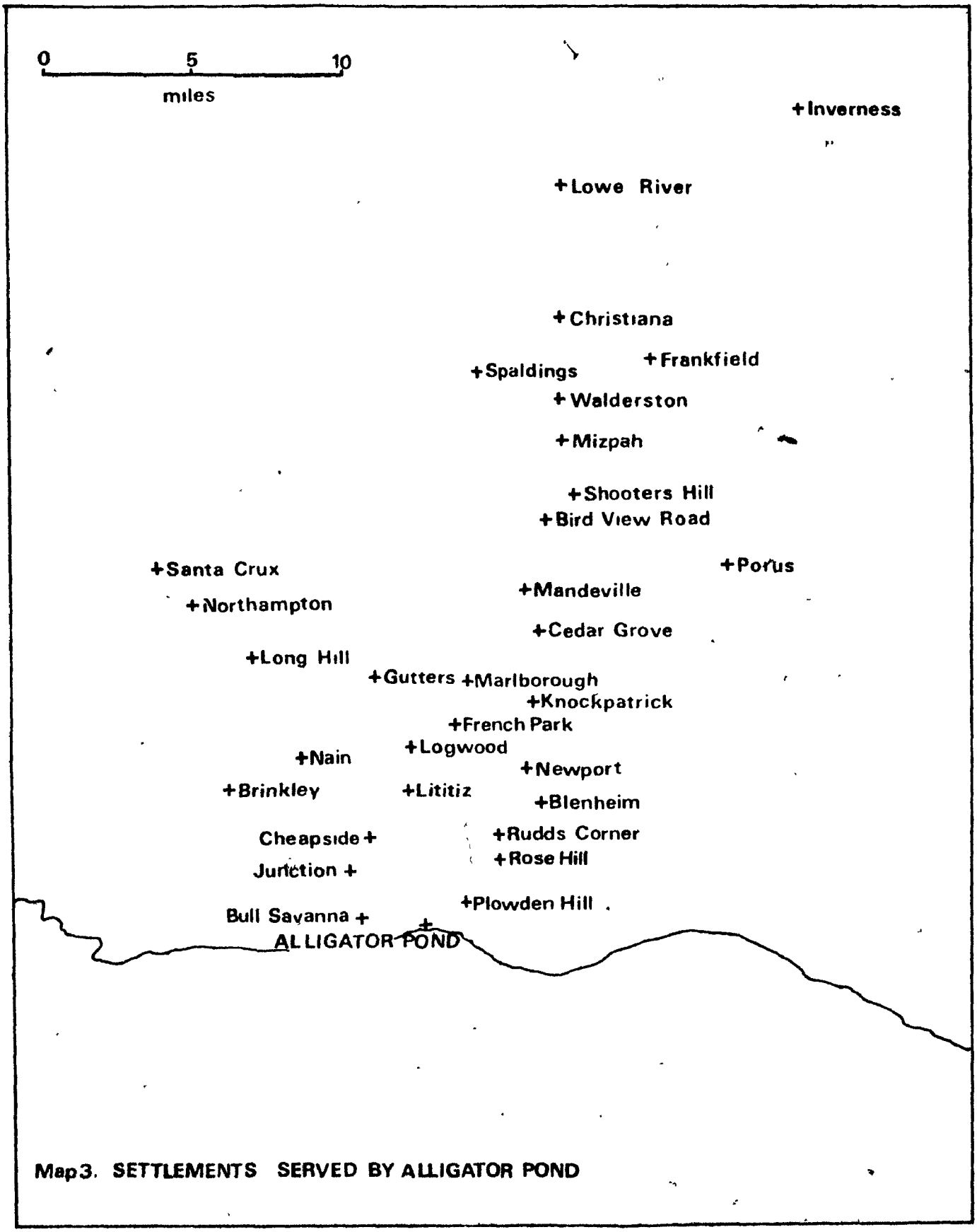
Characteristics of the Distribution Pattern

Mandeville market and an area around Spaldings is served by three vans and three motor bikes

The bulk of the catch is distributed by women higglers who travel by bus - 120 women

Characteristics of the Fishing Effort

Fishing range is up to 30 miles.
100 cottonwood canoes and 15 fibre glass.
Between 70-80 canoes have outboard motors.
Catches are small 30-100 lbs.
Canoes are in good condition.
Crews receive a share of the catch.
Mostly pot fishing, but lines may be used on the way to the main fishing grounds, and at certain seasons nets are used.
Canoes return to the beach in 4-9 hrs



Map3. SETTLEMENTS SERVED BY ALLIGATOR POND

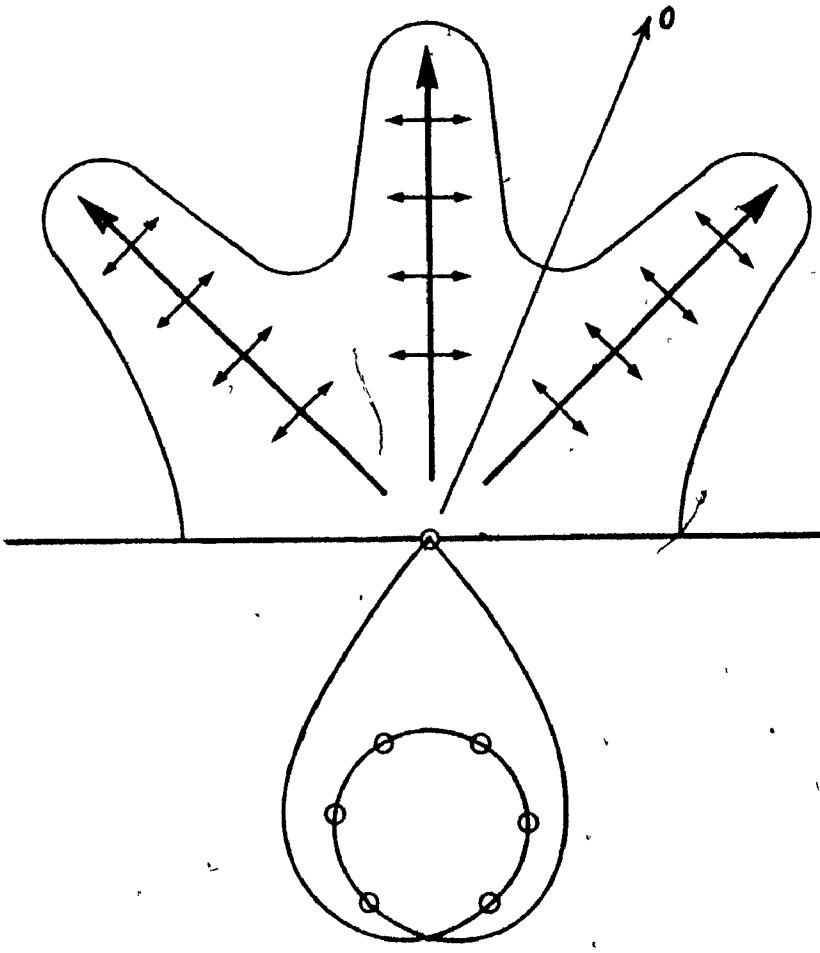
Rocky Point

The model shows that like Old Harbour Bay and Alligator Pond, Rocky Point's level of fishing is short range. The market area is nearly 640 sq. miles but there is an area of overlap with the area served by Old Harbour Bay and some settlements receive fish from both beaches.

Some of Rocky Point's catch goes by truck and van to Kingston and Linstead markets, and then is sold to market higglers or direct to the consumer. The rest of the catch is marketed by higglers as far as Frankfield to the north and Spanish Town to the east.

Rocky Point

LAND



SEA

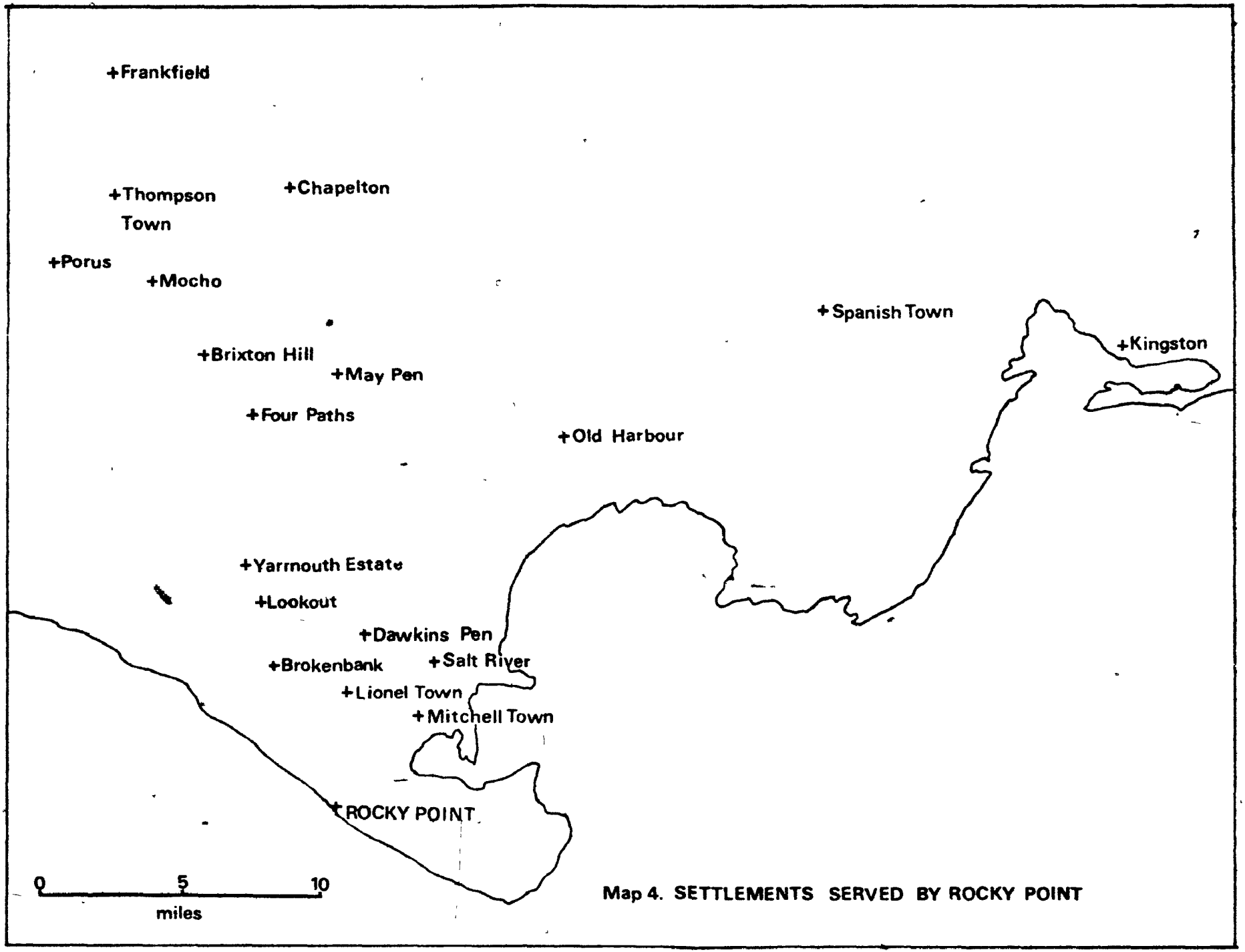
Characteristics of the Distribution Pattern

Nodal markets - Linstead
Kingston
these markets are served by 10 motorised dealers

Fish are distributed by between 60-100 women higglers the number varying from day to day.

Characteristics of the Fishing Effort

Fishing range is up to 20 miles
115 cottonwood canoes, mostly with engines.
75 canoes are engaged in pot fishing
25 net fishing and line fishing
Canoes are in good condition
Crews receive a share of the catch
Canoes return to the beach in 4-9 hours.



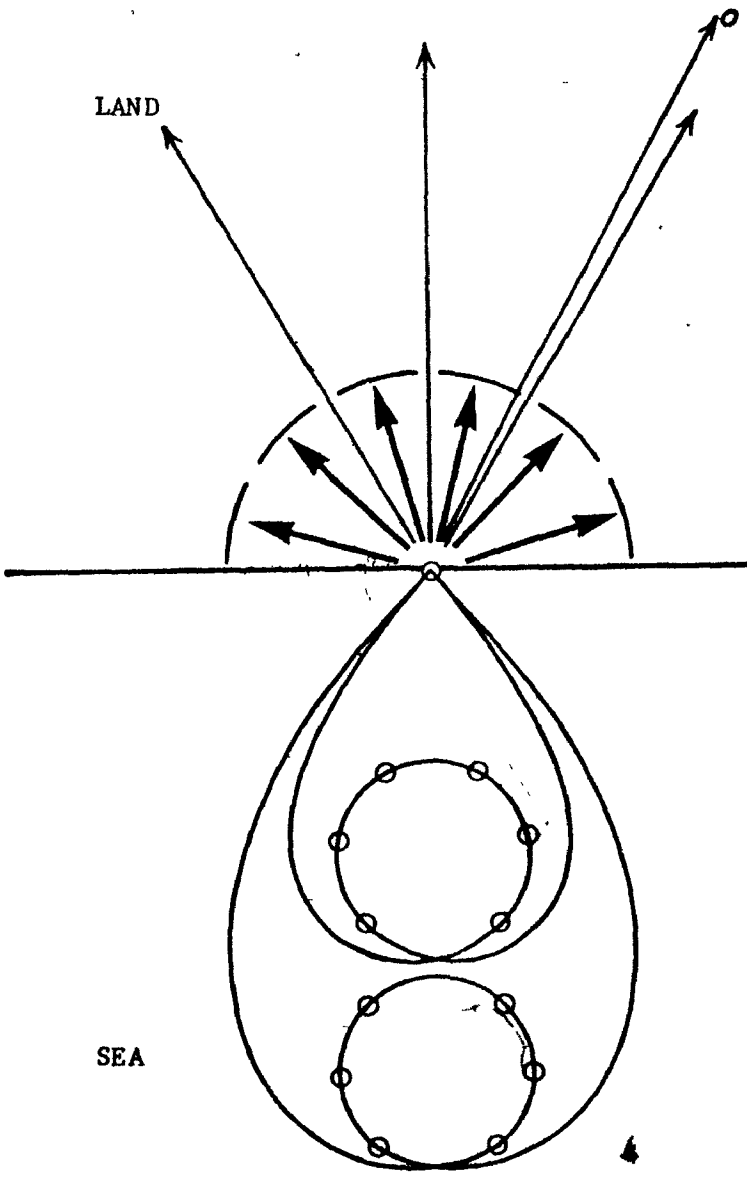
Map 4. SETTLEMENTS SERVED BY ROCKY POINT

Whitehouse

The model shows that Whitehouse has two distinct levels of fishing effort. One is short range using motorised canoes, returning to the beach after four to eight hours. This catch is sold to motorised vendors and higgler women. The second level is long range, the majority of this catch being sold to motorised dealers.

From the map it can be seen that most of the distribution area of Whitehouse is in Westmoreland and St. James parishes, north of Whitehouse. The five major vendors who travel by van sell their load in Montego Bay, reaching it by following the coast road to Ferris Cross and then north to Montego Bay. Other motorised vendors sell along this route and follow side roads to Darliston, which is also served by Treasure Beach, motorised vendors also reach Cambridge and Bethel Town. The area south of Darliston to Whitehouse is very hilly, with very poor roads and is served largely by women higglers. Darliston and the area to the north of Darliston is served regularly by vendors on motor bikes. Both van and motor bikes follow the easterly road to Maggotty. Apart from Montego Bay, Whitehouse's market is very dispersed with very low population densities, around 270 - 430 persons per square mile.

Whitehouse Beach



Characteristics of the Distribution Pattern

Nodal market - Montego Bay

The catch is distributed by motorised vendors, 12-14 owning vans, and 10-15 motor bikes.

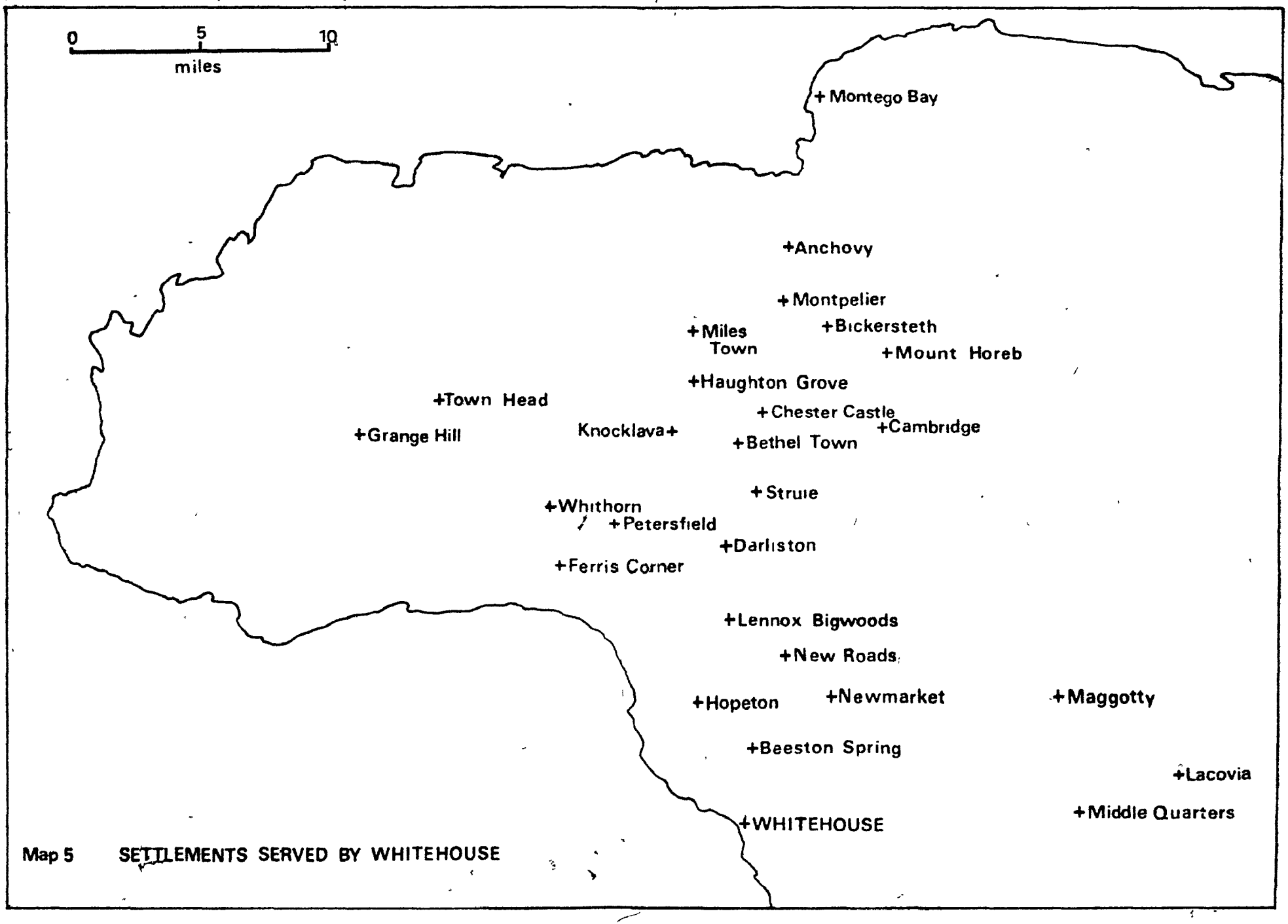
Fish are stored on the beach if canoes return outside the market hours.
Fish are distributed locally by women higglers

Characteristics of the Fishing Effort

Some 56 canoes, all with engines fish within 30 miles of the shore

Some 10 canoes fish 60 miles out to sea returning the following day.

There are two decked boats, one makes regular three day trips, the other stays 6 days at sea.



Map 5 SETTLEMENTS SERVED BY WHITEHOUSE

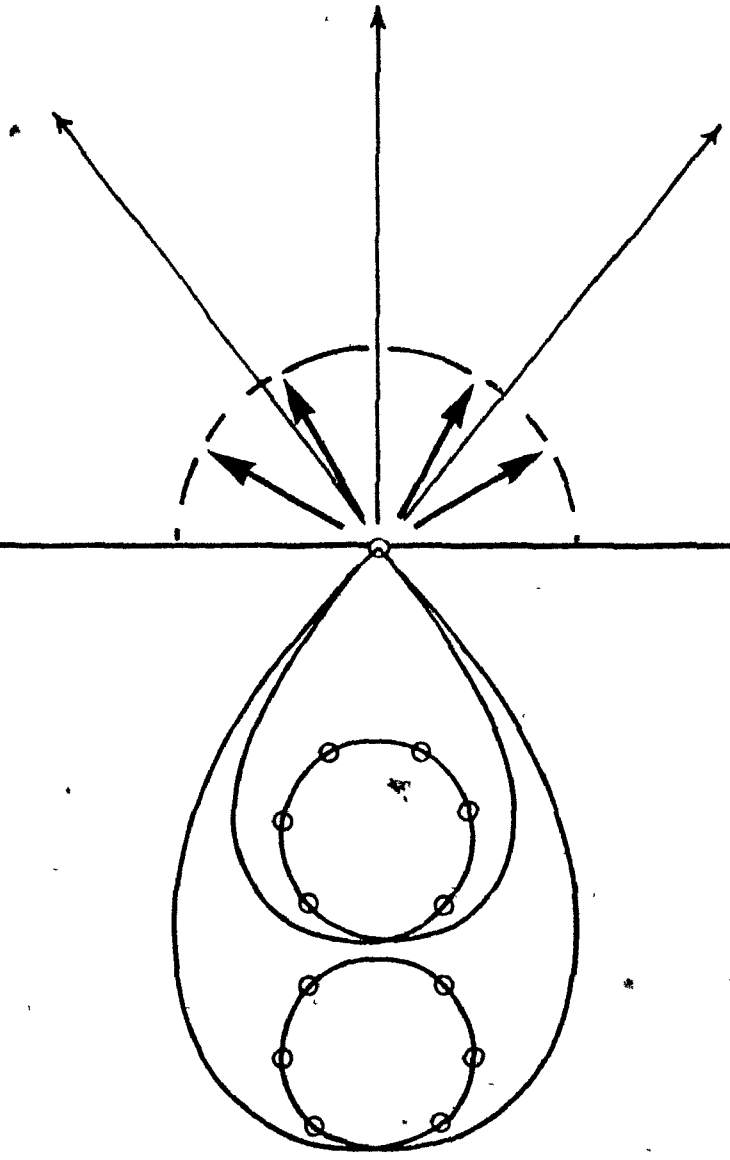
Treasure Beach

The model shows that Treasure Beach like Whitehouse has two distinct levels of fishing effort, one short range and one long range.

Fish from "Treasure Beach" actually come from Calabash Bay, Great Bay, Fisherman's Bay and Billy Bay, all of which are in close proximity. Fishermen from Fisherman's Bay and Billy Bay land their catch at Calabash Bay and Great Bay and motorised vendors visit both beaches. Hence it is not possible to distinguish the separate impacts of the two beaches on the distribution pattern.

The Treasure Beach market is shaped like an inverted letter 'A', the two blank spaces being filled by the Santa Crux mountains and the Smith and Black River swamps, and the southern edge of the Cockpit country. Both of these areas, due to their physical nature, are difficult to traverse and are regions of low population density. They are divided by a zone of higher density along the Balaclava to Maggotty axis, where sugar estates, rum refining and bauxite extraction provide employment. One axis of the market area extends through Malvern, Lacovia, Maggotty and Cambridge to Montego Bay on the north coast. The other axis extends through Main (Alpart) Gutters, Mandeville, Mile Gulley and Albert Town to Ulster Spring.

Treasure Beach



Characteristics of the Distribution Pattern

The catch is distributed by 10 motorised vendors

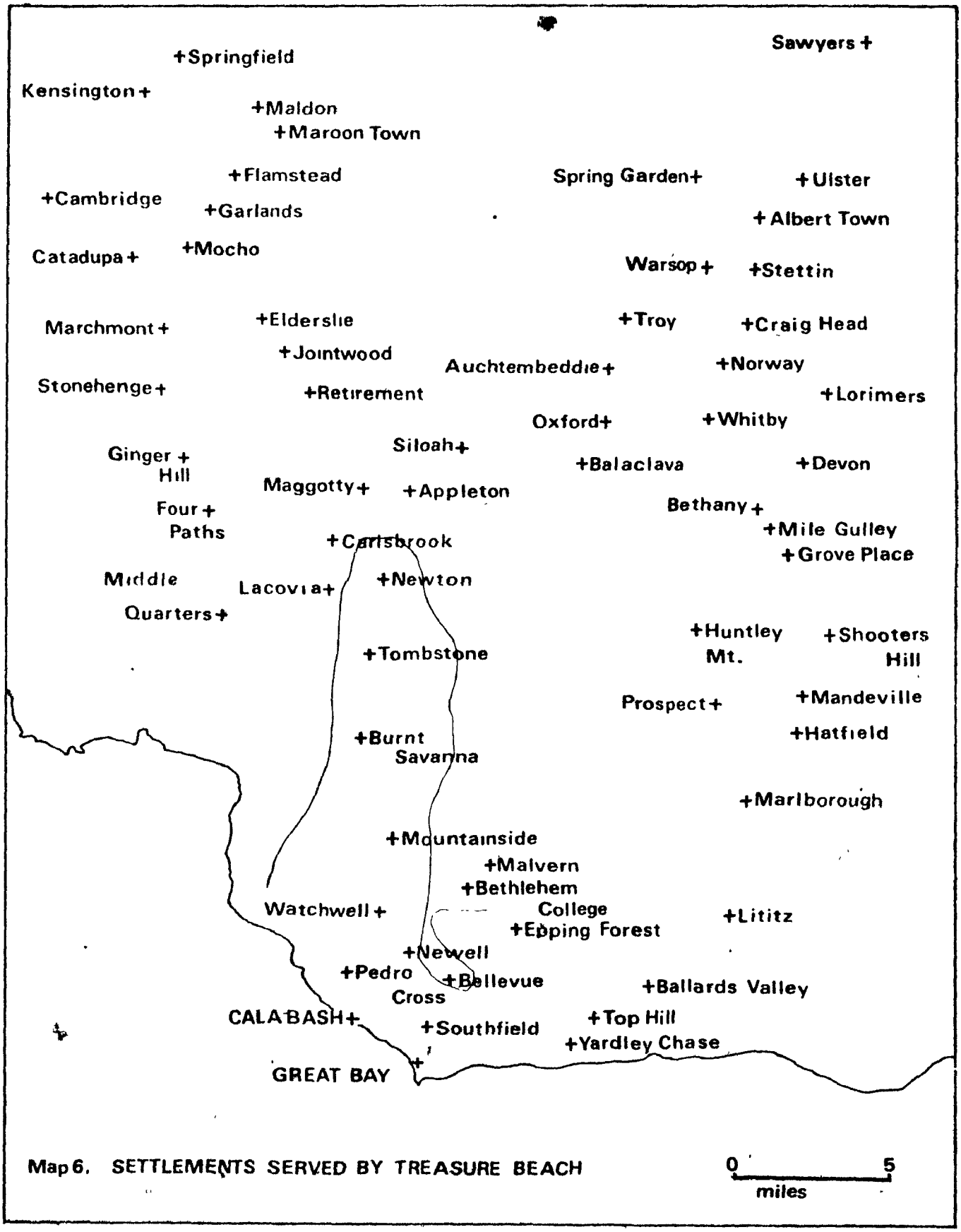
Fish are stored in freezers if canoes return outside the market hours.

Fish are distributed locally by 40 women higglers

Characteristics of the Fishing Effort

Some 56 canoes of which 40 have engines fish within 16 miles of the shore. Pot fishing.

Nine canoes usually carrying two engines and 60 gallons of petrol make 24 hour trips 80 miles from the shore pot fishing.



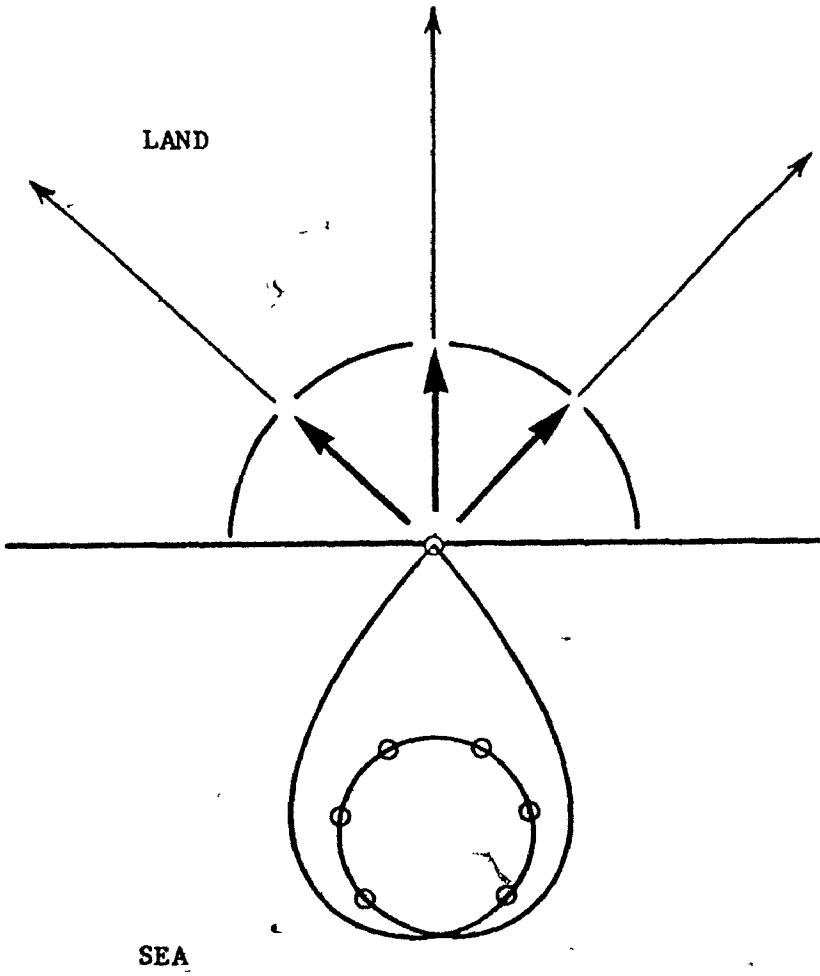
Map 6. SETTLEMENTS SERVED BY TREASURE BEACH

Group Two Beaches

Group Two beaches are separated from Group One beaches by important differences both on the fishing side and on the distribution side.

On the fishing side Group Two beaches have fewer boats with engines, the average trip to sea is usually under 15 miles, and catches are smaller. On the distribution side the areal extent of the market, the total population and the average density of the principal districts visited, are all significantly smaller than for Group One beaches. On Group One beaches fish are moved by vans and higglers, whereas on Group Two beaches they are moved largely by higglers, motor bikes and bicycles.

Group Two Beaches



Characteristics of the Distribution Pattern

Fish is distributed over a small area not usually over 200 sq.ml. with a low population density.

The bulk of the catch is distributed by women higglers and men riding motor bikes and bicycles.

Characteristics of the Fishing Effort

Fishing range under 20-25 miles.
Cottonwood canoes.
Apart from Yallahs and Farquhar less than one in four canoes have engines.
Catches are small.
Variety of fishing methods, seine netting more popular than in Group One.
Crews receive a share of the catch.
Canoes in good condition.
Canoes return to the beach in 4-9 hours.

Group Three Beaches

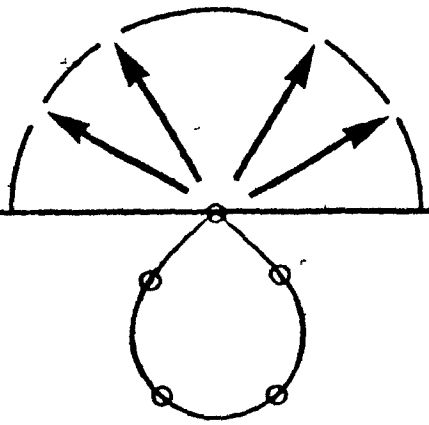
The distinguishing criteria between Group Two and Group Three beaches is that Group Three beaches have only a local impact upon the island distribution pattern nearly all of the catch being distributed within 5 miles of the beach. This group contains by far the majority of the beaches.

Group Three Beaches

Characteristics of the Distribution Pattern

Fish is consumed locally by fishermen and families or sold to women higglers who handle small quantities (a few lbs). Fish is rarely distributed more than a few miles from the landing point, there is no investment in transport or storage.

LAND



SEA

Characteristics of the Fishing effort

Short range, less than 5 miles, canoes largely powered by sail and paddle. Canoes return to the beach in 3/4 hours; a variety of fishing methods are used - pot, line, net etc. Catches are very small, (10-30 lbs.) Canoes are generally in poor condition. Investment in equipment is low. Crews receive a share of the catch.

The majority of beaches to be found on the northern coast fit this model. Investment levels are very low, but so are rewards, indeed it is difficult to understand how such fishermen can afford to replace a canoe once it has become impossible to repair it further.

Conclusion

Apart from areas within five miles of a fishing beach most of Jamaica's fresh fish comes from catches landed at one of fourteen beaches (or beach groupings). Of these fourteen, six dominate the distribution pattern serving large markets, whether measured by area, population, or population density. Both the size of the market area and the organisation of distribution are strongly related to the level of fishing activity.

All parts of the market are not equally served, for frequency of visit varies inversely with distance from the fishing beach. The extent of the market is therefore variable over time, and depends on the supply available and spatial variations in demand. In the short run supply is inflexible and if quantity demanded is high close to the beach, areas further away may receive no fish. Further exploitation of the Jamaican island shelf is unlikely to increase supply and may even cause catches to fall further. Jamaican fishermen have shown that at quite low levels of investment they can reach the Pedro Banks where larger catches can be made. However, by canoe this is a hazardous voyage and the time that can be spent on the fishing grounds is short. Larger decked vessels are needed for more efficient exploitation and these require greater investment and a trained crew. The problem of financing the purchase of a suitable boat and equipment and of training a crew have been tackled by a combination of government, fishermen and cooperative at Manchioneal. If this venture succeeds it may well point the way for the future development of a distant water Jamaican fishing fleet.

Appendix A

Information gathered on the beach

1. The number of boats, their type and quality
2. The number of boats with engines
3. The types of fishing e.g. pot fishing, seining, lining
4. The distances travelled to sea, the fishing areas visited, the number of boats involved at the different locations
5. The sources of equipment, spares and petrol
6. The existence of a cooperative and its impact on the fishermen
7. The type of storage facilities available
8. The number of higgler women visiting the beach
9. The method of transport used by higgler women
10. The existence of public transport
11. The number of motorised vendors and others
12. What markets or market areas did the above serve
13. On what days are fish landed for sale
14. What approximate quantities are involved.

Village Questionnaire

1. Does anyone ever sell fresh fish here?
2. Where do they come from (which beach)?
3. How do they travel?
4. How often do they come i.e. on which days and when did they last come?
5. How many people come here to sell fish, do any of them live here?
6. How much do you pay?

Appendix B

The Credit Facilities Scheme

The scheme provides funds for the purchase of engines by fishermen on a credit basis.

> "The funds allocated for mechanisation are administered by a three man statutory board the Fisheries Loan Board ..... The qualifications for and the procedure in obtaining a loan are ..... A borrower must be a professional fisherman who depends largely or wholly upon fishing for a livelihood. He must own a boat, free of encumbrances and in a reasonably good condition. His general character especially in relation to his operations at sea and his health must be good. His estimated monthly earnings must be stated ..... The "loan" granted to the fisherman is not made in cash. He obtains an engine from the Fisheries Division." Thomas (1960).

Associated with the Credit Facilities Scheme are three others.

1. The sale of duty free gasoline/oil to fishermen. Pre-mixed fuel is sold to fishermen from a number of specially constructed depots now to be found on most major beaches.

2. The Fisheries Division has imported improved gear which has been available at lower than commercial prices to fishermen.

3. Service and Training Schemes. Fishermen owning engines can receive instruction in it's operation and maintenance, and there is a repair shop at the Fisheries Division H.Q.

"By the 31st October, 1967 a total of 1,852 engines had been issued since the inception of the scheme in 1956."

Handbook of Jamaica 1967.

Appendix C

The Cottonwood Canoe

The canoe is made from the cottonwood tree Cieba Pentranda which grows on the island. The cost of a new cottonwood varies with quality and size, ranging between £125 - £180, though sometimes costing over £200 for very large canoes (over 30 feet). When a new boat is required a suitable tree must first be found and purchased. Then a cutter is employed to cut the tree down and 'rough it out' to the shape and size desired and if necessary drag it out of the woods. It is then transported to a canoe builder who will shape the canoe and widen the hull by using large stones or sticks to stretch the wood. The final finishing including painting and putting in seat boards may be done either by the canoe builder or the owner depending on the individual arrangement. The cost of the canoe can be broken down as follows:-

Purchase of cottonwood tree	£10-£15
Cutting, roughing out, etc.	£45-£60
Transport	£15-£20
Canoe builder	£45-£60
Cedar boards, paint etc.	£10-£15
	£125-£180

Some successful fishermen have bought fibre glass canoes which are far more expensive. They have the advantages of longer life, less maintenance and are not attacked by marine worms. Their disadvantages, apart from cost, are that they crack easily and although built with a small flotation chamber sink quickly if holed. Cottonwood canoes even if broken in two do not sink, their disadvantages are the need for constant maintenance and their short life.

Appendix D

The Districts Served by Group One and Group Two Beaches : Their Area, Population and Population Density

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Kingston	Montego Bay	53.7	37,344	692
	Spanish Town	181.2	48,748	269
	Bog Walk	29.1	10,275	353
	Red Hills.	12.5	3,053	244
	Stony Hill	25.4	9,860	388
	Glengoffe	13.5	9,083	673
	Riversdale	24.2	9,994	413
	Richmond	23.5	11,560	492
	Highgate	21.0	8,119	387
	Castleton	21.3	6,883	321
	Belfield	18.6	5,987	322
	Guys Hill	32.0	15,835	495
	Spring Hill	29.1	4,403	151
	Moneague	71.7	6,669	93
	Linstead	51.4	20,687	391
	Kingston	47.7	377,058	7905
	Total -	655.9	Total- 585,558	Ave. Density 849.3

Average Density
Not Including Kingston
= 378.9

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Old Harbour Bay	Christiana	12.9	8,297	643
	Spalding	22.1	12,857	582
	Mandeville	33.5	19,004	571
	Porus	31.7	10,843	342
	Frankfield	33.3	18,987	570
	Mocho	29.9	9,426	315
	May Pen	125.0	33,517	268
	Chapelton	47.4	21,259	449
	Kellits	47.7	16,641	349
	Moneague	71.7	6,669	93
	Ocho Rios	35.7	12,136	340
	Lluidas Vale	26.4	5,507	209
	Linstead	51.4	20,087	391
	Point Hill	15.1	8,275	548
	Ewarton	19.8	5,270	266
	Old Harbour	57.3	16,302	285
	Spanish Town	181.2	48,740	269
	Bog Walk	29.1	10,275	353
	Riversdale	24.2	9,994	413
	Richmond	23.5	11,560	492
	Guys Hill	32.0	15,835	495
	Gayle	40.6	14,881	369
	Highgate	21.0	8,119	387
	Belfield	18.6	5,987	322
	Thompson Town	17.2	9,253	538
	Total-	1048.2	Total- 359,729	Ave. Density 394.28

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Alligator Pond	Junction	38.7	16,910	437
	Main	27.5	5,820	212
	Santa Crux	60.1	11,357	189
	Christiana	28.3	18,070	639
	Spur Tree	16.3	4,563	280
	Mandeville	33.3	19,004	571
	Williamsfield	19.3	10,090	523
	Newport	32.2	8,970	279
	Cross keys	31.7	6,158	194
	Spaldings	22.1	12,857	582
	Frankfield	33.3	18,987	570
	Total -	342.8	Total - 132,788	Ave. Density/406.91

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Rocky Point	Spanish Town	181.2	48,748	269
	Old Harbour	57.3	16,302	285
	Hayes	14.6	4,700	322
	Race Course	41.4	13,057	315
	Lionel Town	27.8	6,624	238
	Rocky Point	32.7	5,324	163
	May Pen	125.00	33,517	268
	Mochos	29.9	9,426	315
	Porus	31.7	10,843	342
	Thompson Town	17.2	9,253	538
	Frankfield	33.3	18,987	570
	Chapelton	47.4	21,259	449
	Total -	639.5	Total- 198,040	Ave. Density 339.5

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Whitehouse	Montego Bay	53.7	37,344	692
	Anchovy	27.3	7,253	266
	Cambridge	17.8	4,189	235
	Newmarket	21.7	8,837	407
	Middle Quarters	23.1	6,776	293
	Maggofty	23.1	7,148	309
	Lacovia	38.9	5,881	151
	Whitehouse	18.1	6,043	334
	Darliston	30.6	10,603	347
	Lambs River	18.6	8,012	430
	Bethel Town	13.9	3,763	271
	Withorn	18.2	6,577	361
	Grange Hill	30.9	10,445	338
	Gopse	39.9	6,293	174
	Frome	28.8	10,870	377
	Petersfield	18.8	6,938	369
	Total -	423.4	Total - 143.972	Ave. Density/ 334.625

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Treasure Beach	John's Hall	25.6	9,425	368
	Cambridge	17.8	4,189	235
	Maroon Town	32.9	8,182	249
	Catadupa	34.3	6,559	191
	Albert Town	41.2	11,633	282
	Coleyville	12.9	8,297	643
	Mile Gulley	45.4	12,902	284
	Spur Tree	16.3	4,563	280
	Mandeville	33.3	19,004	571
	Merrywood	24.9	7,206	289
	Jointwood	25.3	5,192	205
	Middle Quarters	23.1	6,776	293
	Maggotty	23.1	7,148	309
	Siloah	49.6	9,516	192
	Balaclava	51.5	13,357	259
	Lacovia	38.9	5,881	151
	Mountainside	47.2	9,178	194
	Malvern	25.8	7,843	304
	Southfield	30.2	7,245	240
	Total -	599.3	Total- 164,096	Ave. Density/ 291.526

BEACH	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Yallahs	Yallahs	40.0	6,487	162
	Trinity Vale	25.8	7,291	283
	Cedar Valley	35.2	6,056	172
	Total-	101.0	Total - 21,814	Ave. Density/ 205.6
Negril	Sheffield	31.3	5,475	175
	March Town	22.1	4,511	204
	Little London	34.9	8,546	245
	Grange Hill	30.9	10,445	338
	Dias	18.2	9,103	500
	Total-	137.4	Total - 38,080	Ave. Density/ 292.4
Parotee	Black River	57.4	10,757	187
	Mountainside	47.2	9,178	194
	Lacovia	38.9	5,881	151
	Santa Crux	60.1	11,359	189
	Total-	203.6	Total - 37.175	Ave. Density/ 180.25

BEACHES	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Belmont	Bluefields	21.9	8,518	389
	Petersfield	18.8	6,938	369
	Williamsfield	13.8	5,405	392
	Frome	28.8	10,870	377
	Grange Hill	30.9	10,445	338
	Withorn	18.2	6,577	361
	Copse	39.9	6,923	174
	Anchovy	27.3	7,253	266
	Total -	199.6	Total- 62,929	Ave. Density/333.25
Hope Wharf	Little London	34.9	8,546	245
	Grange Hill	30.9	10,445	338
	Total -	65.8	Total- 18,991	Ave. Density/291.5
Scots Cove	Black River	57.4	10,757	187
	Lacovia	38.9	5,881	151
	Santa Crux	60.1	11,359	189
	Total -	156.4	Total- 27,997	Ave. Density/175.6

BEACHES	PRINCIPAL DISTRICTS VISITED BY TRADERS	AREA IN SQ. MLS.	POPULATION	POPULATION DENSITY
Farquhar	Race Course	41.4	13,057	315
	May Pen	125.0	33,517	268
	Porus	31.7	10,843	342
	Mandeville	33.3	19,004	571
	Williamsfield	19.3	10,090	523
	Mile Gulley	45.5	12,902	284
	Total-	296.2 Total -	99,413	Ave. Density/383.8
Morant Bay	Morant Bay	26.6	10,097	380
	Seaforth	60.9	11,112	182
	Bath	44.2	10,861	246
	Total-	131.7 Total -	32,070	Ave. Density/269.3

Note 1

Both Rocky Point and Old Harbour Bay also serve Kingston town. Obviously they supply only a part of the market which is largely supplied by Kingston's beaches. To include the Kingston total population figures and densities in estimating Rocky Point and Old Harbour Bay markets would be to seriously exaggerate them at the expense of Kingston. To compare a weighted figure in proportion to their catch would be to assume what is being proved (i.e. that there is a strong positive relationship between catch and the size of the market) in order to prove it, which is not permissable. Any other allocation would be arbitary and therefore unjustifiable. The procedure adopted is to leave out Kingston town in calculating Rocky Point and Old Harbour Bay market densities and population totals, which means that their figures are lower than they should be, but it has the advantage that they preserve the relative rankings.

Note 2

Where smaller centres are served by more than one beach, population totals, areas and densities are included in both.

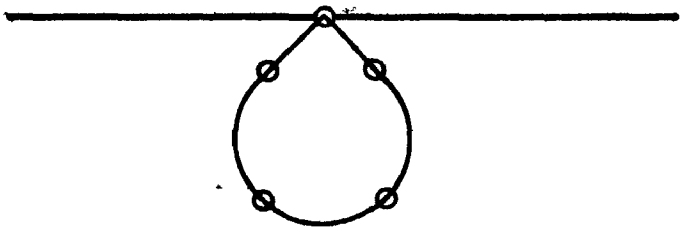
FISH CATCHES BY THE PRINCIPAL BEACHES

	lbs
Kingston	5,000,000
Old Harbour Bay	1,455,177
Alligator Pond	976,856
Rocky Point	456,172
Whitehouse	217,330
Treasure Beach	213,361
Yallahs	205,222
Negril	194,280
Parotee	190,285
Belmont	161,351
Hope Wharfe	154,765
Scots Cove	146,033
Farquhars	120,597
Morant Bay	88,745

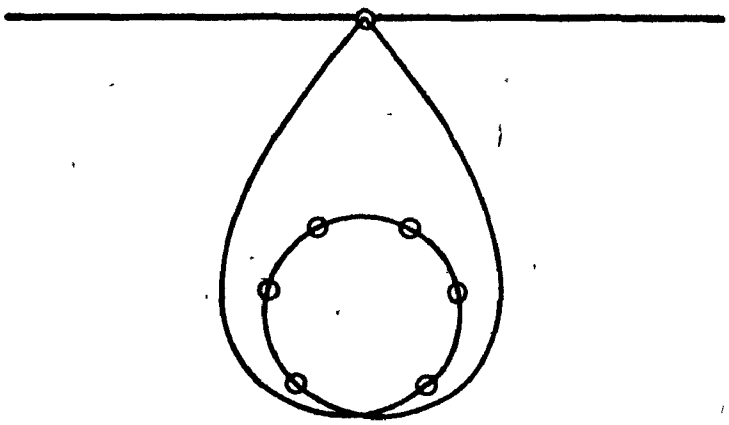
Appendix E

Key to Symbols

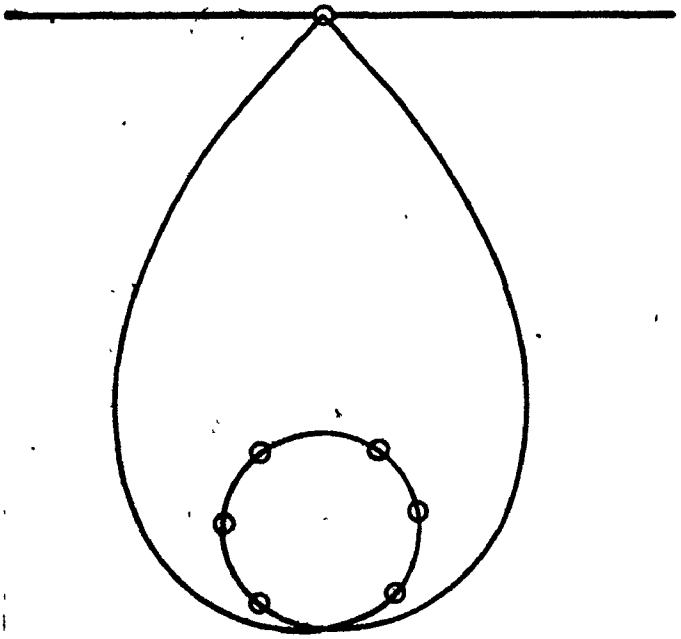
Characteristics of the Fishing Effort



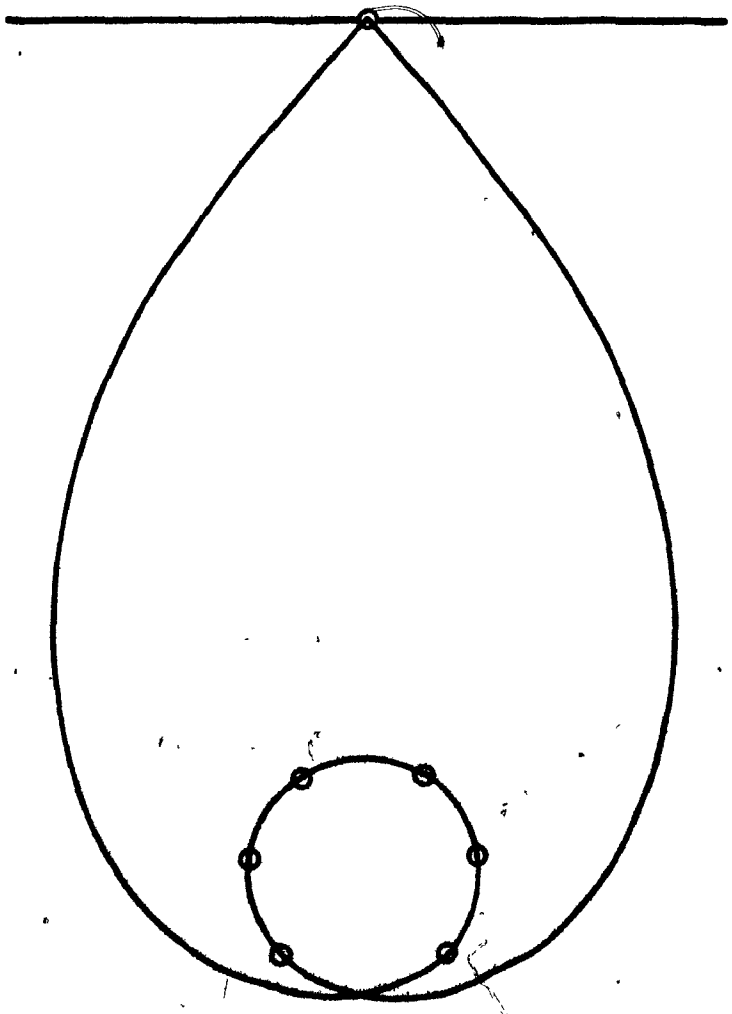
1. Short Range - under 5 miles



2. Short Range 5-30 miles

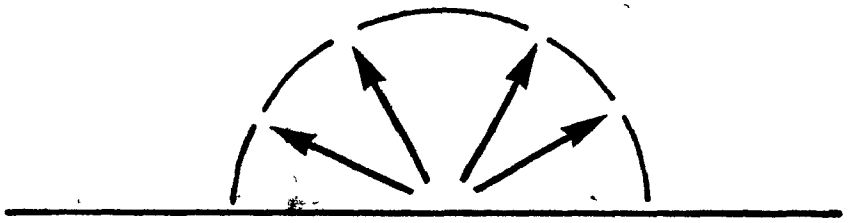


3. Long Range - 60 miles



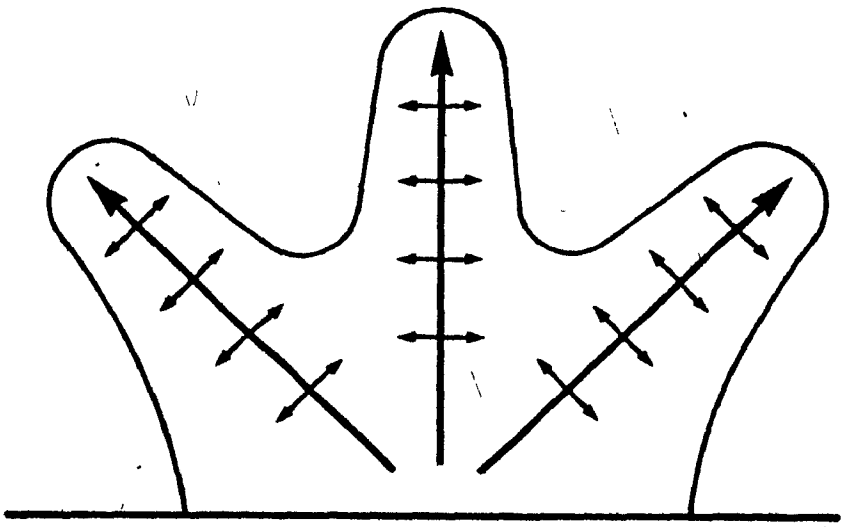
4. Distant Water 60-300 miles

Characteristics of the Distribution Pattern

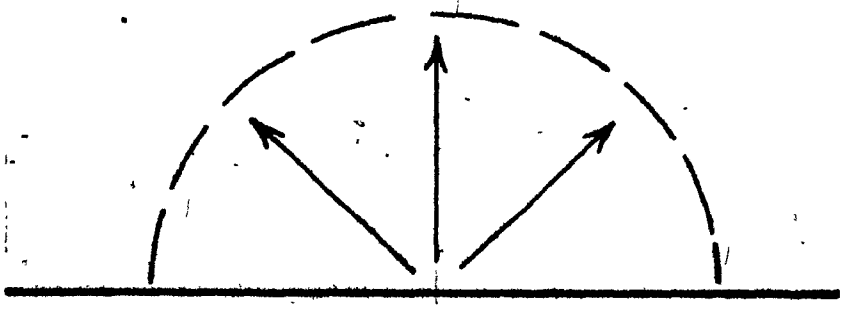


Local Distribution Net (within walking distance of the beach)

Kingston market

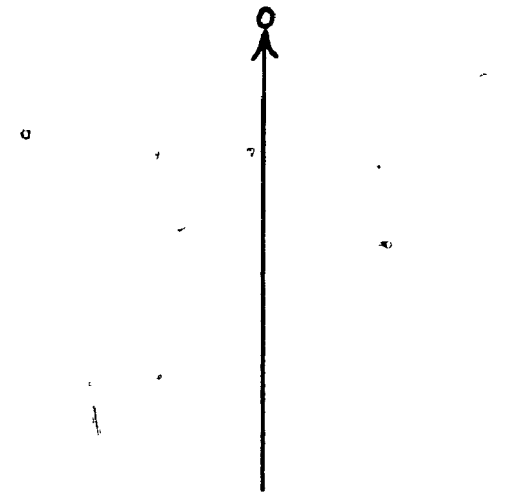


Distribution Net of women higglers

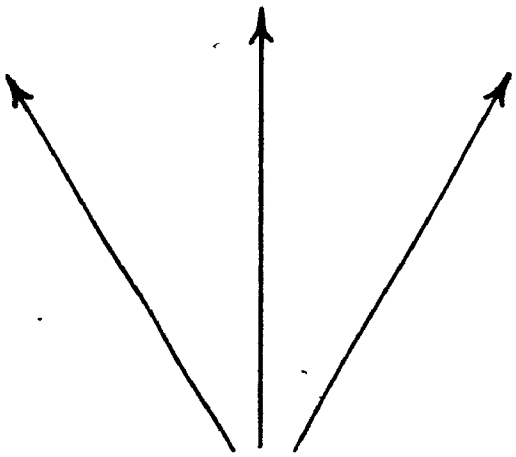


Distribution Area of a group two beach served by a mixture of women higglers and men riding motor bikes and bycycles

CHARACTERISTICS OF THE DISTRIBUTION PATTERN



FISH DELIVERED TO A NODAL MARKET



DISTRIBUTED BY MOTORISED VENDORS OVER A WIDE AREA

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