

PART II—FISHING METHODS

1. INTRODUCTION

CEYLON seas in common with other tropical waters are characterized by a large number of species of fish with varied habits and consequently many different types of craft and gear are in use.

The fishermen of the country are very skilful in their manipulative techniques. They know what type of gear, within the range at their disposal, to use under given circumstances ; but their knowledge of fish, fishing grounds and fishing seasons is somewhat limited. The major disadvantage that they suffer is through the inadequacy of the means they adopt to make use of their knowledge and skill.

The gear they use is, for the most part, satisfactory in design but the cotton and other vegetable fibres used in their nets and lines require a great deal of attention to maintain them in good condition. Nylon nets and lines, though gaining in popularity, are still unfamiliar to most fishermen. In the hauling and drawing of nets there is a heavy dependence on man-power. Certain types of gear such as trawls, purse-seines and drift long lines cannot be used advantageously from the craft at their disposal.

The fishermen's greatest handicap lies in the nature of their craft. These have remained unchanged in design for over a hundred years. They are extremely seaworthy, but are severely limited in range as they depend on winds and currents supplemented by muscle-power harnessed to oars for propulsion. The main difficulty in improving craft by adding mechanical power or building mechanically propelled boats is the lack of capital. Even a simple crude boat represents a considerable investment to the average fisherman and development of craft is slow, although a start has been made with Government assistance.

The small working range of all the craft used makes for overcrowding in the coastal waters and an ignorance of conditions further out at sea. Fishing operations have to wait for shoals of fish to enter coastal waters. Detection of shoals is not always easy though birds often help to reveal surface shoals by flying above them to dive for fish. An entire shoal does not always come into the coastal area and considerable numbers may stay out of reach of the fishermen. Mechanization of craft is slowly being introduced to widen the area fished. Large powered boats will also enable fishermen to reach comparatively distant and rich grounds such as the Pedro and Wadge banks which are now exploited only by Government-owned trawlers.

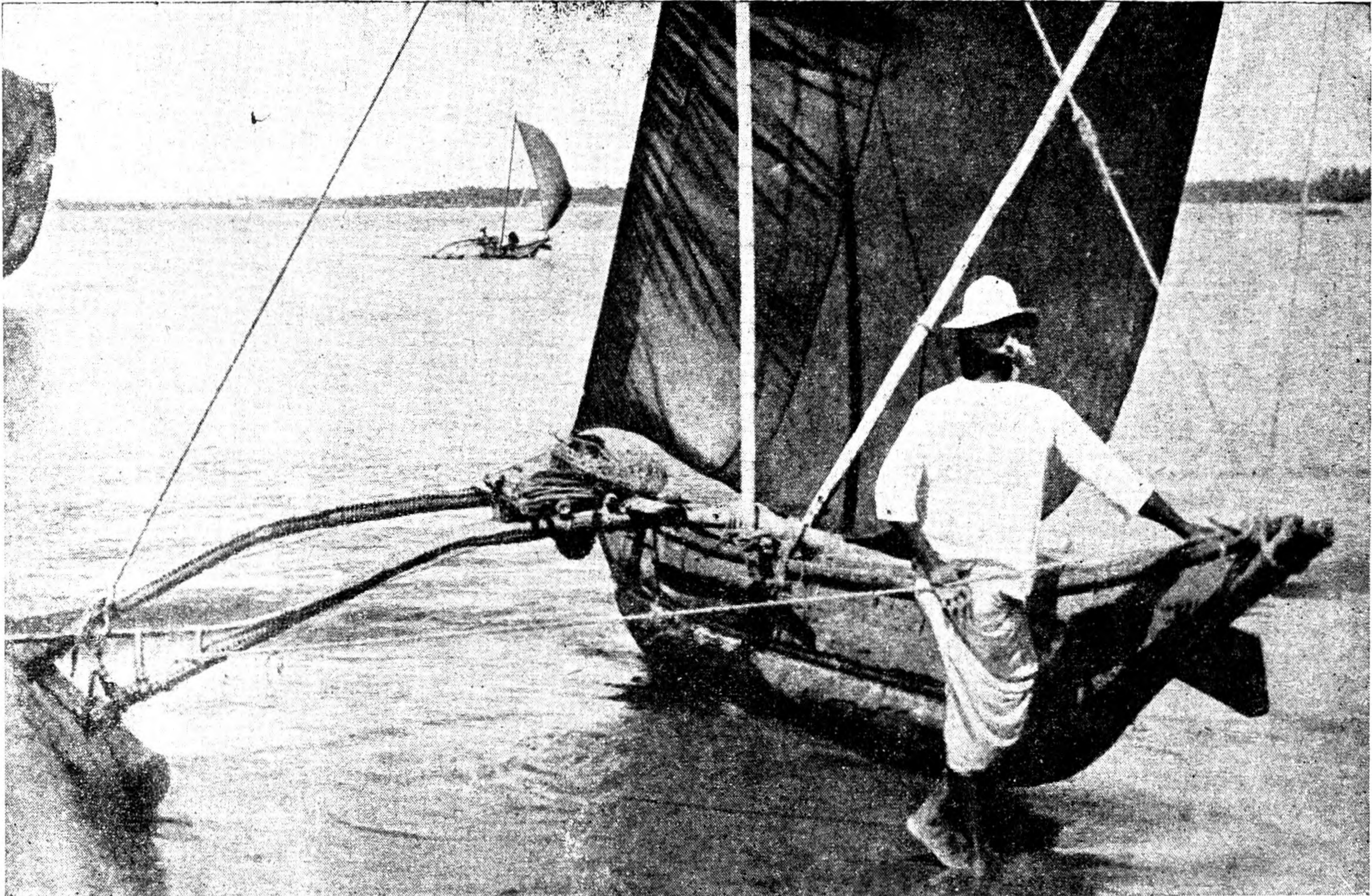
Fishermen in brackish and fresh waters use several of the techniques of coastal sea fishermen and are similarly handicapped by the lack of mechanical power for hauling and setting of nets, though this affects them to a lesser degree as their working areas are more limited. The brackish water fishermen specialize in traps of all types which are mostly used to intercept fish and crustaceans moving between these waters and the sea. The fresh water fisherman is being acquainted with methods of fish culture where either young fish are introduced into a confined stretch of water to be raised for the market or good quality fish are established in previously unproductive waters to form a continuous source of edible fish.

2. MARINE FISHERIES

Deep Sea fishing. The motor-vessel "Meegamu Maru" owned by a joint Japanese-Ceylonese company is engaged in tuna fishing over a wide area of the Indian Ocean. Drift lines are used which consist of large numbers of hooks on a long floating line. The hooks are baited for tuna, and

catches include marlin and sailfish. Losses of hooked fish occur through attacks by marauding sharks that roam these seas. The "Meegamu Maru" brought in over 112,000 lbs. of fish in 1957.

Large sharks and other big fish such as marlin and sailfish are taken from deep waters near the edge of the continental shelf, especially off the south coast, by local fishermen. The method used is trolling, that is the trailing of baited hooks from lines connected to detachable poles or projecting points of a fast moving outrigger canoe. The depth of fishing can be adjusted with lead weights attached to the lines. The line is separated from the hook by a metal wire lead of German silver to prevent the line being bitten off by the big voracious fast-swimming fish caught by trolling. Artificial baits are also used along with lures made of both natural and synthetic fibres.



An outrigger canoe ("oru")

The outrigger canoe ("oru") is a fast, stable boat, about 15 to 25 feet long, which is largely used both for deep sea fishing and off the unprotected south coast which is often exposed to rough weather. The boat itself is a hollowed log, the sides of which are built up with planks. It is provided with a mast and boom for supporting a sail. This craft can reach 8 to 10 knots in moderate winds for distances not exceeding 25 miles from shore. It is stable on the surf and can be easily launched and beached. The boat has very limited working space so that the fisherman has to wedge himself in a half-seated position between the planked sides while its holding capacity for fish is also restricted. The deep seas off the continental shelf can be reached by outrigger canoes with strong favourable winds. The introduction of mechanized fishing boats is gradually extending our fishing grounds from the overcrowded coastal belt into the deeper waters where there is every indication of good fishing possibilities.

Trawling. Although trawling has been carried out on both the Wadge and Pedro banks, the Wadge bank is preferred for commercial operations when boats are based at Colombo. The Pedro bank is off the north coast of Ceylon but has to be reached from Colombo by a route going round the south coast and up the entire east coast. This is because the depth of water at Pamban Pass between India and Ceylon in the north is insufficient for trawlers and obstructs the direct passage from west to north. Trawlers based at Trincomalee will find it convenient to use the Pedro bank for commercial fishing as trials on this bank have proved it to be a good fishing area. The bank has not been explored thoroughly and many obstructions exist which can cause damage to fishing gear but most of the obstructions are such as will be cleared by continuous trawling.

The first few trawler operations on the Wadge bank were surveys carried out by the "Violet" in 1907, by the "Lilla" in 1920-23 and the "Lady Goschan" in 1928-30. While the third boat was carrying out its survey, the first commercial trawling operation was started by a Ceylon company using two trawlers the "Tongkol" and the "Bulbul" on both the Wadge and Pedro banks. There was no trawling from 1936 to 1945 after which the Government of Ceylon put the "Raglan Castle" into operation. This ship continued trawling till 1951. In 1947-48, a private company operated the trawler "Aringa" on the Wadge bank. The Ceylon Government purchased the trawler "Braconglen" which commenced fishing in 1951 and was joined in 1953 by the trawler "Maple Leaf" presented to Ceylon by the Canadian Government. These last two are both 325-ton (gross weight) oil-fired steam trawlers with mechanically refrigerated holds and are the only fishing craft now operating on the Wadge bank. There is no fishing done on the Pedro bank by trawlers.

A single trawling operation (or haul) is of 3 to 4 hours duration during which a large wide net is towed along by the ship with the lower edge of the net scraping the bottom of the sea bed. An average of 40 hauls are made per trip which lasts about 10 days and the time taken to reach the fishing grounds is less than a day. About 2 trips are made every month by each ship for 9 months of the year, the balance 3 months being taken up for repairs and overhauls.

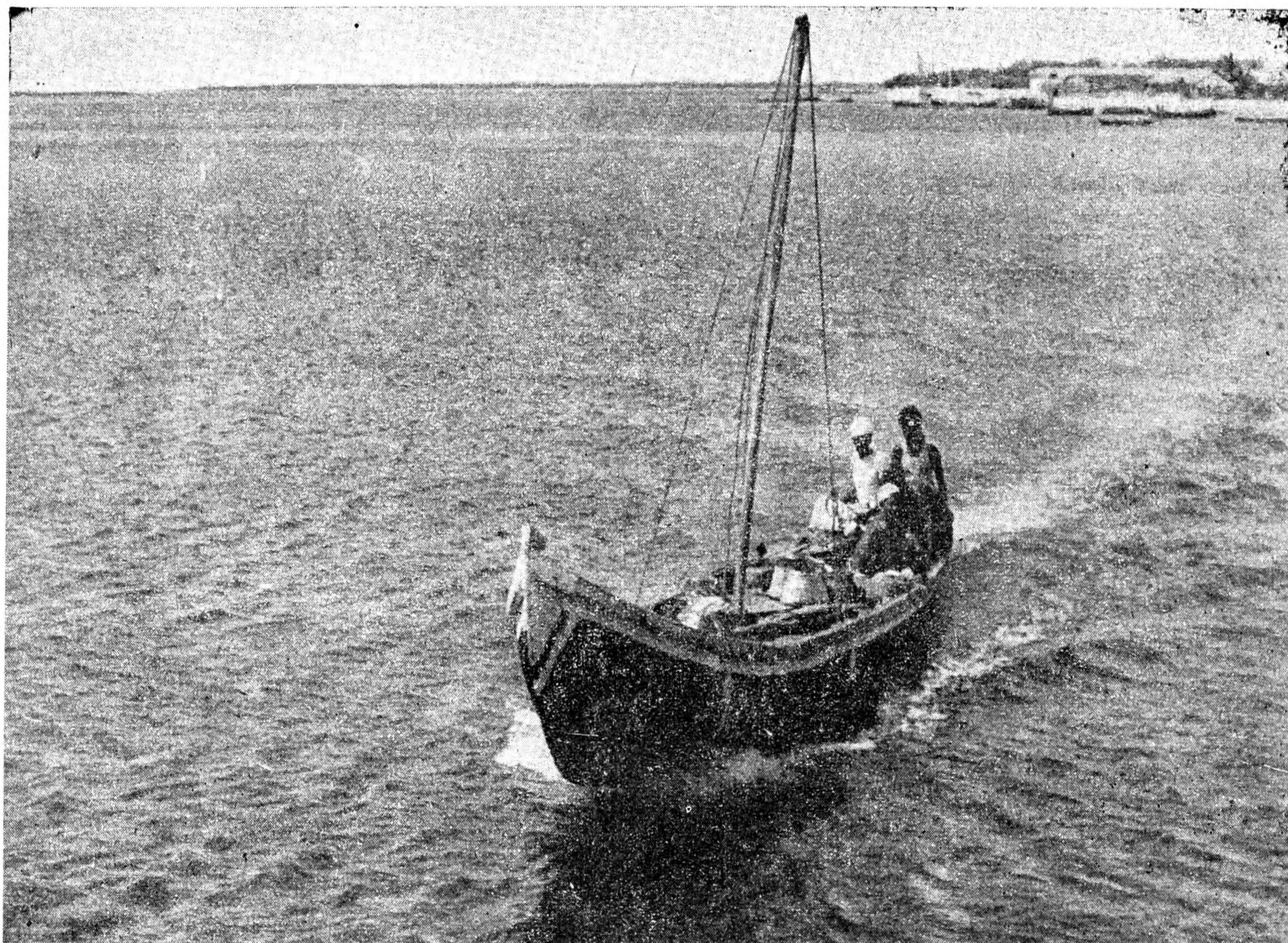
The fish fauna on the Wadge bank show no sign of depletion and records indicate that fishing here can be increased without affecting stocks. Average catches amount to about 500 lbs. of fish per hour of trawling and during 1957, the two trawlers brought in over 3,200,000 lbs. of fish. This constitutes 5 per cent of the nation's total catch of fish and about 65 per cent of trawler catches consist of marketable varieties.

The regular operation of the trawlers is sometimes held up due to absence of key personnel as it is not possible to employ standby staff for only two trawlers. As an incentive to good attendance and work, a system of sharing profits of a catch among the crew was started in 1957. Repairs and difficulties in obtaining spare parts also interfere with operations especially as only one heavily booked dry dock is available in the Colombo Port premises. Finally there has always been difficulties regarding the technical staff of trawlers as the salaries paid by Government are lower than those offered by the private sector.

Coastal line fishing. Trolling lines are worked by outrigger canoes over a broad area of coastal waters, extending as far as 15 or 20 miles from shore. Fishermen seek the large-sized species some of which are prime fish to our consumers, such as sizer and yellow-fin tuna. It is common practice for fishermen in canoes to troll these lines to and from their fishing grounds.

In the shallow waters off the northern coast long lines carrying 1,000 to 2,000 hooks are laid along the bottom of the sea bed from north-east canoes. These "bottom set lines" are chiefly for bottom-feeding fish and are preferably set during full moon periods when net fishing brings poor catches. In other regions shorter bottom lines with about 500 hooks are sometimes set down from canoes. The limited use of bottom lines may be attributed to shortage of bait for attaching to the series of hooks. The irregularity of the sea bed with coral formations and other obstructions also detract from the popularity of this type of gear.

The north coast canoe ("vallam") is operated in bays and sheltered waters mostly in areas along the north coast. It is constructed either as a dug-out canoe from a log or with planks on a frame. A detachable outrigger and sail are used when fishing outside shallow waters. Its length ranges from 20 to 35 feet and its breadth (beam) $2\frac{1}{2}$ to 5 feet. Though it has considerably greater working space it is not regarded as being as safe at sea as the outrigger canoe ("oru") nor can it be beached as easily.



A mechanized north-coast canoe ("vallam")

Hand lines are extensively used for fishing bottom-living species especially fish frequenting submerged rocks or reefs. The fishermen travel to suitable localities at sea in all types of craft and anchor at the fishing grounds. The lines are lowered with the bait attached to the hook as well as sent alive in a small cage on the same or another line. This cage is cone-shaped with a lead ring round its open circular base. The live bait is trapped in the descending cone till it reaches the sea bed where the cone tilts over and the bait, usually small prawns, escape and attract any passing fish. The fish attack the live prawns and then follow up by biting the prawns on hooks.

Fishing with rod and line is the cheapest and most widespread of fishing methods. Activities are usually confined to bays and inlets within wading distance of the shore, but sometimes the fishermen go by boat or raft to a suitable fishing point a short distance from shore. At a few places along the coast, fishermen stand perched on vertical wooden stakes driven into firm coral reefs and angle from this vantage point for fish feeding on the reefs.

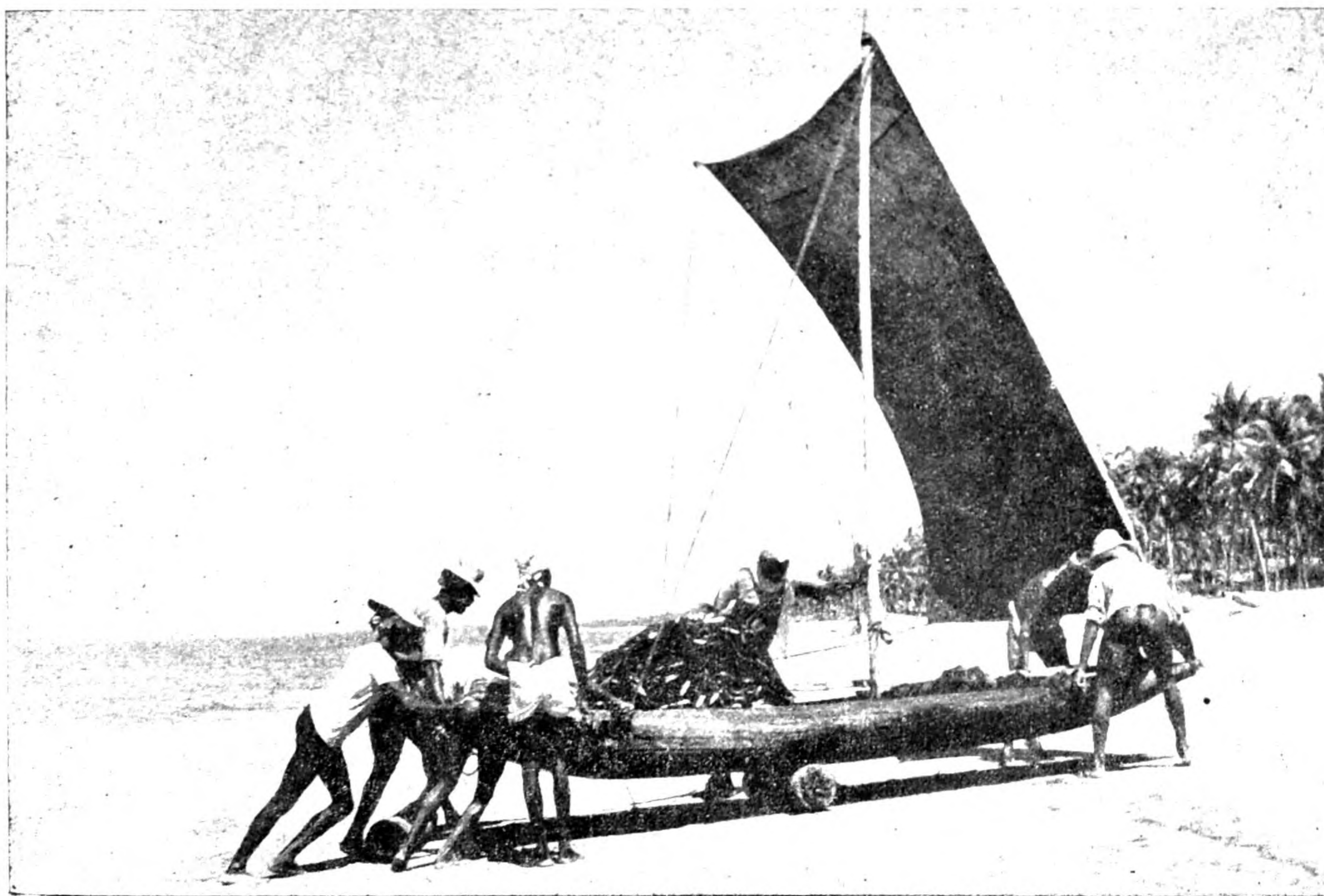
A special form of rod and line fishing is carried out from boats for the large schools of skipjack which approach the coastal waters, and give rise to a seasonal fishery off the south and south-west coasts. The fishermen first obtain the bait from shallow banks using dip nets for small-sized fish. This bait fish is kept alive by being trailed behind the canoe in a wicker basket submerged in the water. The canoes then go in search of skipjack. When a school is sighted the canoe is taken into their midst and the live bait is thrown at them in handfuls. To increase the excitement among the feeding skipjack, the fishermen splash the surface of the sea with their hands and oars. Each man then lowers into the water a barbless unbaited hook attached to a string line and bamboo pole, for which reason this operation is also known as "pole fishing". As an excited fish bites the shiny hook, it is quickly lifted into the boat and the hook being barbless is easily flicked free and can go back into the water to repeat at high speed the operation of hoisting fish from the sea into the boat. Great care is taken to prevent a hooked fish jumping overboard as fishermen state that the presence of a hurt and disturbed fish can panic the whole school into flight. When a school of fish is found it is not unusual to catch a full boatload of fish by this method. This fishery will be more profitable with the use of mechanized craft which can cruise over a wider area and therefore have a better chance of finding fish shoals.

Coastal gill net fishing. Gill nets are walls of netting set across the path of moving fish. Drift gill nets hang from surface buoys or floats with weights along the lower edge to stretch the net. The entire net can drift along with the current. Bottom set gill nets have their lower edge heavily weighted down with either stones or small concrete slabs so that it lies more or less immovable on the sea bed. The top edge has wooden floats strung along it to keep the whole net up.

When a fish comes up to the net, it pushes its head through the mesh which then acts like a noose between its body and the expanded gill covers of its head. The size of the mesh ($\frac{1}{2}$ to 7 inches) determines the size of the fish which it can trap. The names given to nets such as sier net, mackerel net, or prawn net indicate the main species caught by them and thereby the mesh size.

The nets are made of vegetable fibres such as cotton and hemp but with the introduction of nylon netting, the fishermen are becoming increasingly aware of the advantages of synthetic fibres which are of greater durability and require less maintenance without the necessity of spreading them out to dry. The length of the nets used is variable and depends on the number of small nets strung together. The poor mobility of the fishing craft and lack of mechanical equipment for hauling limit the lengths of netting used. Mechanized boats will permit the operation of longer nets and extend the areas where nets can be placed.

The drift net is widely used round the coast whilst the bottom set net is operated almost entirely in the shallow seas of Palk Bay and other areas off the north coast. Rafts are extensively used for gill net fishing.

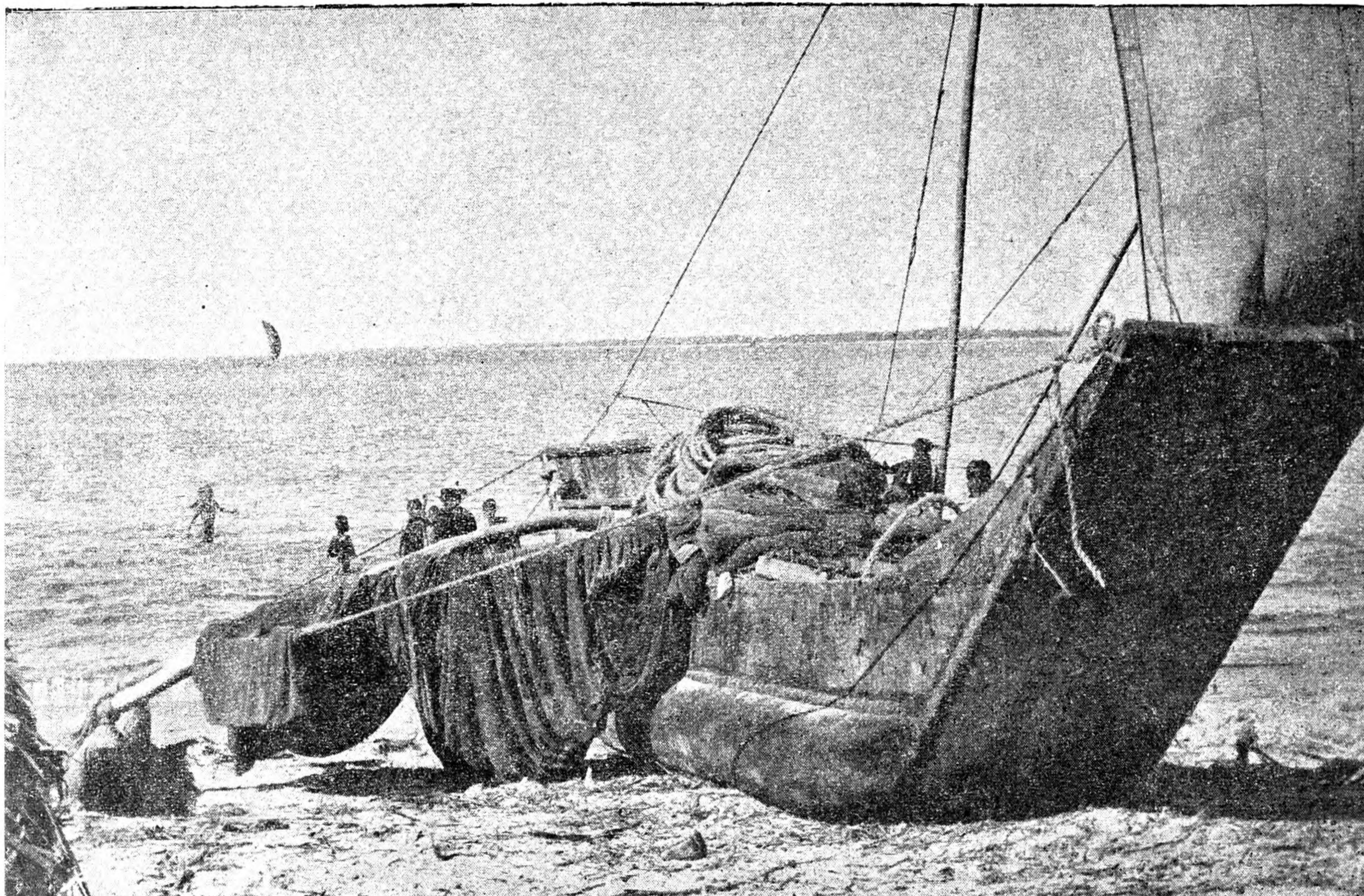


A raft ("teppam") being brought ashore

Rafts are made of shaped logs lashed together by ropes and pegs. They tend to become water logged after prolonged use at sea and have therefore to be sun-dried on shore. The larger type of raft (the "kattamaram") with lengths reaching 30 feet is not beached intact but is dismantled into separate logs which are carried ashore. The smaller type (the "teppam") is 9 to 15 feet in length and has a more permanent construction with the use of wooden pegs. It is brought ashore on rollers, which are often short lengths of coconut tree trunks.

The rafts are rowed out with oars and then use a sail for riding light winds. The raft is half-submerged and the crew of 2 or 3 men are continuously drenched by the sea. No loose cargo can be carried without danger of being washed overboard and even the separation of the catch of

fish from the meshes of a gill net is delayed until the return to land. With the sail down, a raft can remain close to a set gill net without drifting far and this advantage combined with easy beach landing even on rock-strewn shores have given the raft a continued popularity for fishing in comparatively calm waters. Rafts do not go more than 3 to 4 miles out and often seem to compete with the beach seine fishery for the same shoal of fish.



A beach seine boat ("paru"),



A late stage in the hauling of a beach seine net

Beach seining. The beach seine fishery is the most important of Ceylon's fisheries because it contributes the greatest share (40 per cent.) to the total fish landings.

The average beach seine net consists of a 10 to 15 feet long bag of small meshed netting called the cod end, which can hold $1\frac{1}{2}$ to 2 tons of fish. This is attached to the body of the net which is a 40 ft. long cone with sections of different sized meshes, small near the cod end and bigger towards the free end. Two wide-meshed wings are attached to the body which narrow down to mere strips of netting which is finally attached to hauling ropes. The wings are 25 to 40 feet long and the ropes about 1,500 feet each. The overall dimensions and the mesh size of the cod end are varied slightly according to operating conditions and nature of fish shoals to be encircled. Coir is used for making the final part of the wings and hauling rope while the netting of the cod end, body and fore-part of the wings is generally made from cotton or hemp twine. When completely set out the seine may measure more than 3 miles in length and when wet it may weigh upwards of 2 tons. The net is operated by 20 to 70 men.

A beach seine boat is used to set out the net. One type (the "padavu") is a larger version of the north-coast canoe ("vallam") and has a beam of 8 feet and a length of 45 feet and has no outrigger. It can traverse rough seas, using a sail, but it requires facilities for anchorage as it is difficult to draw up on a beach. The other beach seine boat (the "paru") is a large (18 to 35 feet) flat-bottomed boat with a square-type of base on twin keels made of logs. The ends of the boat slope at an angle of 45 degrees to the water. Oars are used for propulsion and it has great buoyancy, riding the surf extremely well.

To set a beach seine, the end of one hauling rope is fixed on shore and the boat goes out with the net, paying it out along an arched course till the free end of the second rope is brought to the beach at a point over 100 yards from the first end. Then it is a matter of hauling in the net which takes a tremendous effort and sometimes requires 40 to 50 men on each rope when the current and wind are against the course of the net.

A proportion of the enclosed fish shoals is known to escape before the cod end is pulled ashore. To secure these escaping fish, one or two gill nets are set outside the seine net and a few instances are reported where bigger catches were made by the gill nets than the seine.

Beach seine landings include a great many species of fish, almost all of which are known to form dense schools when moving in coastal waters. The small-sized fish such as sardines, sprats, small horse mackerel and silverbellies, are the mainstay of the fishery. The larger fish obtained include wolf herring, mackerel tuna, frigate mackerel and sier.

The seine nets are set out in some areas (e.g., Marawila) only when a shoal is sighted. In other areas the net is set "blind", that is, it is set and hauled a few times in the early morning, the results of which will determine the nature of further operations for that day.

The operations are confined to a narrow belt of shallow coastal waters about 3 miles wide. Beach seining can be carried out only in relatively calm water on coasts sheltered from the monsoon winds. The fishery is therefore seasonal on the east and west coasts although in some areas round Mannar Island and Kalpitiya fishing takes place throughout the year because there are two coasts one of which will form a lee coast to the monsoons.

The Government leases out defined stretches of the beach (called "padus") and each seine net is expected to operate in the water lying opposite a "padu". This stretch of beach is also used for the erection of temporary cottages and stores where the lessee and his labour force are migrants from other villages who have come over for the 3 to 6 months fishing season. In some regions a particular stretch of beach may be worked by a number of seine nets in rotation by agreement between the net-owners.

The profits earned by beach seines are generally taken by the net-owners who engage hired labour for the operations. These labourers are mostly unskilled but they must be led by an experienced fisherman who has skill in sighting fish shoals and in determining suitable types (i.e. mesh-sizes) of cod end to be used. A large number of people are engaged in beach seining but the returns in terms of effort expended are poor, the efficiency being estimated to be a little over two pounds per man-hour of actual fishing.

Pearl Oyster fishery. Pearl oyster fisheries take place at very irregular intervals as shown by the fact that only 61 fisheries were held over the past 280 years. In 1905 the pearl banks were leased to a private company but the supply of oysters apparently failed after 1907 and the company

went into liquidation in 1912. The apparent damage to the oyster population was ascribed to sand silting up the beds, attacks by predacious fish and other enemies, overfishing, overcrowding of beds by the oysters and disease. However no definite proof regarding any of these factors was obtained.

Inspections of the pearl banks are carried out almost every year during October and November to decide on the feasibility of holding a fishery between February and April, the season of calm weather on the banks.

The traditional method of fishing for oysters was by diving for them. Few of these divers were available in Ceylon, large numbers coming in to a fishery from India or countries round the Arabian sea. The divers worked off anchored boats and made use of sinking stones which were hung over the side of the boat. These stones aided the diver to sink to the sea bed where he worked at gathering oysters for as long as he could hold his breath.

A small experimental fishery was conducted in 1958 which did not employ any divers but used specially constructed dredges worked off two 45-foot Canadian fishing vessels. The dredge consisted of an iron frame, 6 feet by 1 foot to which was attached a bag made of iron mesh. The ship dragged the dredge along the sea bed for about 15 minutes at a time before hauling it up with the help of a winch. When fishing was good, a dredge could bring up as many as 5,000 oysters. The danger that a dredge would damage beds by scraping everything off it, including young oysters, becomes an insignificant one when it is realised that the 1957 survey covered only 3 square miles and the 1958 fishery less than one square mile while the total area of the banks is in the region of 300 square miles. Even in the area dredged, the bumping of the towed dredge would have left untouched spots which could contain sufficient stock for future colonization. The use of the dredge was so successfully demonstrated at the 1958 fishery that it is most unlikely that divers will ever be employed again at a Ceylon pearl oyster fishery.

Considering that only about 4½ million oysters were fished, the revenue obtained by their sale was high. Towards the end of the fishery there was a decline in both the demand and the prices obtained for the oysters. The main reason for this was the dearth of foreign buyers but it may also be that cultured and artificial pearls had captured the market. Thus it is apparent that although mature oysters may be present in the beds, it will not be possible to hold a fishery unless a demand is created for natural pearls. Marketing may emerge as a new factor contributing to the uncertainty of the Ceylon Pearl Fisheries.

Chank Fishery. This fishery dates back to early historical times and shells collected have almost always been exported to India where ornaments are manufactured from them by skilled craftsmen.

Chank shells are obtained by skin divers operating off large boats, each carrying about 30 persons. Depths of 1 to 3 fathoms are fished in Palk Bay and Gulf of Mannar by divers some of whom are in the 60 year age group. A day's collection by one diver varies from 35 to 45 chanks which he sells to a trader at the rate of about 85 cents per medium-sized shell (1957 price). The traders stack the chanks in heaps till the flesh rots away. The shells are then washed, dried and packed for export.

The Government controlled the fishery by specifying the fishable areas of the sea and imposed a royalty on the export trade. In addition the Chanks (Amendment) Act of 1948 and the Chank Fishery Act of 1953 authorized the Government to declare closed seasons for fishing and to set limits for the minimum and maximum number of chanks that may be fished from any area. The regulations defined "immature" chanks as those which could be passed through a ring of 2¾ in. diameter and totally prohibited their export and even stipulated that the collections must not contain more than 1 per cent. of immature chanks.

On an average about 2 million chanks were sent to India each year until, just after World War II, a ban on import of Ceylon chanks was placed by the Indian Government. This was to prevent small shells entering their market and contravening regulations in their country which aimed at preventing the fishing of small chanks to avoid stock depletion. The Ceylon export trade collapsed and no chank fishing was done until late 1954 when the ban was relaxed permitting 170,000 shells to be sold in 1955. The exports for 1956 rose to 500,000 shells and in 1957 over 640,000 chanks valued at about Rs. 700,000 were exported, paying a royalty to the Ceylon Government at the rate of Rs. 75 per 1,000 chanks.