



# MALDIVES MARINE RESEARCH BULLETIN

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### REPORT ON THE MALDIVIAN FISHING INDUSTRY - 1960

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Ministry of Fisheries, Agriculture and Marine Resources  
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**EDITORIAL**

This volume of the Maldives Marine Research Bulletin brings forth another historical manuscript on the Maldivian fisheries sector. The manuscript presented here is a report by Dr. R. S. Cole, based on observations and enquiries made during his field visit to the Maldives in 1960. Dr. Cole was assigned the task to investigate and make recommendations on the areas towards which funds could be allocated from the Government of the United Kingdom towards the improvement of the Maldivian fishing industry.

The recommendations made by Dr. R. S. Cole targeted towards triggering the Maldivian fishing industry to a state of full efficiency. The mechanization of the *dhoni*, improved water circulation system in the bait well by adding more inflowing pipes of larger diameter, a water spraying system to attract bait, and developing the bait fishery as a separate fishery are some of the recommendations made by Dr. Cole. The report presents a good review of the Maldivian tuna fishery at the time and hence, is a valuable reference document for fisheries regulators, planners and industry.

In preparing this reprint, attention has been given to retaining the format and pictures of the original document. However, certain illustrations have been retouched to ensure the quality of the report is retained. In this respect, Mr. Ibrahim Faizan deserves special mention for drawing all the diagrams in true depictions of the original, Miss Zeena Ali for word processing the document, and my colleagues for their kind assistance in proof reading the document.

This volume of the Maldives Marine Research Bulletin would not have been possible without the support and encouragement of the Minister of Fisheries, Agriculture and Marine Resources Honorable Abdul Rasheed Hussein. I thank the Honorable Minister for his untiring efforts in promoting marine research in the country. I further thank our Assistant Director-General Mr. Ahmed Hafiz for his guidance in bringing this volume to fruition.

Zaha Waheed  
Editor

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# REPORT ON THE MALDIVIAN FISHING INDUSTRY - 1960

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# THE FISHING INDUSTRY OF THE MALDIVES

## 1. BACKGROUND

This report is based on observations and enquiries made during a visit to the Maldivian Islands and Ceylon between 25<sup>th</sup> September and 13<sup>th</sup> December 1960.

My instructions were to investigate in consultation with the appropriate Maldivian Authorities and report to the Secretary of Commonwealth Relations, on the Maldivian Fishing Industry, and to make recommendations on how the United Kingdom Government might allocate funds from the Maldivian Aid Vote towards improvement of the Maldivian fishing industry.

The islands of the Maldivian chain of atolls stretch from 7° North to 1° South, a distance of some 500 miles. Malé, the capital is 400 miles from Ceylon. All the islands are low lying and all are small; Malé is three-quarters of a mile long and half-a-mile wide, few islands are larger than this and most are appreciably smaller. From the figures I was given, it would appear that only 250 of the 2000 islands are inhabited. Since the total land surface has been estimated to be less than 120 square miles it will be appreciated that many of the islands, which are inhabited, are crowded since the total population is in excess of 100,000. Some 11,000 people live in Malé.

Communications between the islands is by sailing boat, since the atolls lie north and south while the two monsoons bring south westerly or north easterly winds, travel in one direction is usually easy and in the other difficult.

Trade with Ceylon and India has until relatively recently also been by sailing vessels, few of these are now in use and there is somewhat irregular communication by motor vessels.

With so small a land surface, there can be a few natural resources, most islands are covered with coconut palms but there are few other trees. Houses are built of either coral or palm thatch and boats of such timber as is available; all metal, and such essentials as sail cloth, clay pots and crockery as well as food stuffs and tobacco must be imported.

The twin factors of isolation and lack of resources colour all aspects of life in the Maldives.

There remains the sea, which is the source of almost all income. The sea surrounding the atolls is more than 1,000 fathoms deep; between the atolls the depth varies from 100 to 500 fathoms and in the lagoons, the average depth is between 20 and 30 fathoms.

The bottom of the lagoons is covered with coral sand, which provides neither food nor shelter for fish; all fishing therefore takes place either in the open sea or on the coral reefs, which surround each atoll and each island.

Two distinct groups of fish are recognised, the reef fish and the open sea fish and it is on the latter that the major fishery and the only one of any importance is based. I have not attempted to produce a list of fish species found in the Maldives since such a list would have no value either from a scientific or from a fishery viewpoint, as it would be so incomplete due to the briefness of my visit and the fact that I spent virtually all my time in Malé.

While in Ceylon I had brief meetings and discussions with a number of officials of the Ceylon Government and with the local representatives of some commercial firms.

I visited the boatyard and workshops operated by Harrisons Lister Engineering and discussed the building of fishing boats and engine fitting with Mr. Paterson and Mr. Ballingal. I also visited the TAOS boatyard and was shown round by the manager, Mr. De Silva.

The Ceylon Fisheries department showed me the Canadian project at Mutwal and I discussed various aspects of fisheries development very fully with the Director of Fisheries, Mr. D. T. G. A. de Fonseka and his deputy, Mr. L. F. Tisseveraghe.

Mr. K. K. S. Alvis the Assistant Food Controller (Control) explained the present quota system for the import of Maldivian fish and expressed the view that a market exists in Ceylon for much larger quantities. I also discussed the import of Maldivian fish with Mr. Ali Maniku of the Maldivian National Trading Corporation.

I had a lengthy discussion with Mr. Eric Estlander who was one of the members of the FAO Mission, which visited Malé in December 1959.

On my return from the Maldives, I met Mr. D.V. Mortenstyn of Mortenstyn & Co. in order to discuss Ceylon prices of fishing gears and materials. I also obtained figures for Ceylon fish imports from Mr. H.W. Sturdy of the United Kingdom Trade Commission.

While in Malé I obtained figures for fish landings in 1959 from the Hon. Mr. Ibrahim Rasheed, President of the Fisheries Board with whom I discussed the fishing generally on a number of occasions. Records of the landings by a number of fishing boats during my stay were recorded for me by the President of Municipal Council, Mr. Abdul Majeed Mahir.

A list of Maldivian Government Officials who held office at the time of my visit is at Appendix I.

I made a number of fishing trips with pole fishing boats and other fishing boats from Malé, examined the fishing gear and watched boats building and under repair.

Through the courtesy of the Prime Minister I was able to visit the Atoll of Faadhippolhu briefly where I studied the method of preparing Maldivian fish, had discussions with the local leaders and watched live bait being obtained by the coral diving methods.

## 2. FISHING METHODS IN CURRENT USE

### 2.1 The Pole Fishery

This is the fishery on which the livelihood of the Maldivians depends. The major export of the Maldivian Islands is Maldivian fish; this is made almost entirely from bonito caught in the pole fishery.

The bonito or skipjack (*Katsuwonus pelamis*) is one of the smaller tunas and ranges widely throughout the tropic seas. It is an oceanic fish which does not normally enter shallow water; its availability in the waters surrounding the Maldives therefore depends on migrations which have been little studied in the Indian Ocean.

From the returns of fish caught in 1959, (Appendix 3) it would appear that bonito are available in most atolls for most of the year but there are peak seasons at the height of the North East monsoon from November to January and again in the period when the South West monsoon is strongest from June through August. Since we have figures available for one year only it would be dangerous to draw detailed conclusions.

The bonito rarely enters the lagoons in any numbers and fishing therefore takes place from the outer reef to a distance of fifteen miles to seaward. My experience is limited almost entirely to Malé and my impression is that the Malé boats rarely sought fish more than eight miles off the coast. I was told that fishermen of the Northern atolls do travel further a field and may spend the night at sea. The Malé boats generally sail early in the morning and return in the late afternoon. The catch is sold fresh at Malé and boats do not spend so long at sea as in the outlying Atolls where the bulk of the catch is processed because there is an advantage in marketing the catch early and a boat which has taken a reasonable catch therefore leaves the fishing grounds at once.

All the fishing for bonito is by the pole or live bait method. This is an ancient method but is none the less an effective way of taking bonito which is still practised by American and Japanese boats with only slight variations of the basic method used in the Maldives. The variations are due to the scale in which American and Japanese operations are carried out, i.e., with larger boats fishing further from their bases.

The boats employed in the fishery vary from 28 feet to 45 feet in length and from 7½ feet to 11 feet in beam. In Malé, most of the 29 boats in use are between 32 feet and 36 feet in length. A typical deck layout is shown in Appendix 5. Details of construction are given in the section of this report, which deals with boat building.

These boats are undecked with the exception of the fish well and the area by the mast. They are designed primarily as sailing boats but move well under oars, a 32 feet usually pulls 4 oars a side although there is provision for 5.

In Malé the boats fish under sail, in the Southern atolls the boats are rowed while on the fishing grounds but sail to and from the grounds if the wind is favourable.

All the Malé boats are lateen rigged; this rig enables the boats to point fairly high and makes it possible for them to carry a good sail area on a short mast. Long straight spars are in short supply and this second point is almost as important as the first. Owing to their relatively shallow draft (a 32 foot boat draws about 2 feet three inches light and 3 feet flooded) they make a lot of leeway. The rig and general design are a good compromise well suited to local conditions.

There is no way of overcoming the two principal difficulties, which the lateen rig imposes. Firstly the boats cannot be tacked, they always have to wear round, this causes quite a loss of distance made good to windward and is especially important when trying to work to the windward to reach a school of fish. The second difficulty is that the sails cannot be reefed and three sails are therefore carried by each boat. In the 32-foot boat, these are about 450 square feet, 360 square feet or 120 square feet in area. There is no difficulty about changing the sail, the rig is planned for it and a change is effected in about five minutes; the point is that the sails deteriorate whether they are in use or not and the owners therefore have the expense of providing and maintaining three sails for each boat.

So far as I could judge the boats are balanced for the medium sail and under this rig they are well balanced, when the large sail is being carried in anything more than a light breeze they carry a heavy weather helm and sailing then is a feat of strength as much as skill. This is because the sails are cut with vertical cloths and the additional cloths in the large sail are all aft.

The theoretical speed for non planking hull of this type is probably just under seven knots and my impression was that this speed is reached under good conditions.

The fisherman's working day begins when he boards his boat between 4am and 7am, the selected sail is bent and hoisted and the boat with its crew of 8 to 14 men proceeds to the bait fishing grounds. It may take anything from fifteen minutes to six or seven hours to obtain enough bait; bait is sometimes to be found in the harbour reef at Malé or at Dhoonidhoo a mile away, sometimes the boats have to travel six miles or more to the bait grounds.

Live baitfish with which the bonito is chummed is the key to this type of fishing, without an adequate supply of bait; no fishing is possible.

Fishes of two families are used for live bait, the Clupeids Rehi and Hondeli, which I identify as *Spratelloides japonicus* and *Dussumeria hasseltii* respectively, and the Pomacentrid Nilamehi, which is *Chromis caerulea*. The latter is used principally as live bait for drift line fishing or whiffing in Malé but is used elsewhere for pole fishing. Other Pomacentrids are said to be used also in other atolls at certain seasons.

Fishes suitable for use as live bait in the Maldives are found over or near the coral reefs, all have the desirable characteristic of diving into the shadow of the hull when used as chum and not swimming away from the boat.

In South Malé lagoon bait is found near coral outcrops or 'Giri', in North Malé lagoon the fishermen look for bait on the reefs fringing the islands. In either case, the method of obtaining bait is the same. The boat is moored head to wind using two or three anchors (1 iron grapnel and two mushroom shaped coral anchors are normally carried) over a spot where baitfish can be seen swimming. All boats carry a supply of shark liver or coconut oil, usually in a bottle hung on the mast and a bamboo wand with which the oil is flicked onto the water where the resultant slick smoothes the surface and improves under water viewing. Only when baitfish can be seen in numbers is the boat moored in position when the actual attempts to catch bait can begin.

During the trip to the bait grounds one of the crew will have prepared a fish paste to be used in attracting bait. This is made by filleting a fish from the previous days' catch and scraping the fillet with a knife; if bonito are not available any other fish, even shark, may be used.

Handfuls of this paste are scattered into the water and the bait fish gather and feed on the particles, when enough bait fish have gathered near and under the boat the bait net is spread. This net is of very fine mesh (less than ¼" stretched mesh in some nets) and is square or rectangular varying from 12 feet to 18 feet in length and width. These nets have always been made by hand commencing with cotton yarns, which are spun and then braided. One net takes one man three months to make and costs Rf. Maldivian 450 - 500. Ready-made nylon webbing has recently been introduced and from this a net can be made in a few days at a cost of about Rf. Maldivian 100.

The net is tied to a wooden pole at each corner, one man handles each of the inner poles, and the outer poles, which are longer, are handled by two men each. The net is thrust vertically down into the water and then spread

horizontally under the bait, more paste is thrown in to keep the bait fish occupied and the net is raised smartly with appropriate blessing and the bait is flicked into the bottom of the boat.

As soon as bait is found the plugs are removed from the bottom of the boat so that it floods. There are four flooding ports per frame between frames 3 and 5. Since the bait can only be kept alive by a constant change of fresh water the bailers start to earn their extra shares money as soon as the hull is flooded by bailing water over the side with wooden scoops aft of frame 6 where the bait grid is situated. This bailing is continued at intervals from the time the first bait is taken and the hull flooded until the bait is used up or the boat returns except when the boat is actually manoeuvring to fish a school when the ports are plugged.

The chummer is responsible for attracting bait by spreading the paste and is responsible for looking after the bait once it is in the boat.

Bait catching is continued until several thousand small fish have been caught. It is absolutely essential that vast quantities of bait be obtained as these are used to attract the bonito within fishing range - a process known as 'chumming'. If bait fish are found near to Malé in dense shoals it may take as little as a quarter of an hour to obtain enough for a days fishing, if on the other hand a long journey is necessary and the bait is then found in small scattered shoals it may be seven hours before the boat is ready to start fishing.

When sufficient bait has been obtained the boat is unmoored, the anchors being recovered by diving if necessary, the boat sails out through a gap in the reef to the open sea and the search for bonito commences.

During the bait catching operation the sail is lowered to deck level, at other times when the sail is lowered either for a sail change or because there is no wind the yard is lowered into the yard crutch. The tiller is also unshipped while bait fishing.

Once the boat clears the reef the search for fish starts, fish may be seen breaking surface and 'boiling' the water or leaping high out of the water; in the distance the only sign of a fishing school may be sea birds diving and taking the small fish driven to the surface by the hungry bonito. A close watch is also kept on any other boats, which are visible, if another boat is

fishing or obviously manoeuvring to fish a move may be made in that direction.

Soon after clearing the reef, one of the crew may perform a ceremony of blessing the rods. A bailer is dipped into the sea and water poured along the length of the rods commencing at the tip and ending at the butt, this is repeated three times; one of the rods is then taken and hurled butt first into the sea three times from the bow, three times from amidships and three times from the fishing platform, appropriate prayers are recited the while. The rod is recovered after each throw by hauling in on the line, which is retained in the hand.

When a school of bonito is sighted near enough to make pursuit practical the boat is sailed up to and slowly past the school and the chummer throws live bait out to the fish. The idea is to keep the boat moving slowly and to get the school to follow, bait is scooped up with a net scoop and thrown out by hand, another member of the crew may be kept busy supplying scoops full of bait to the chummer.

If the chumming is successful events take place in rapid succession, when the apparent confusion has died down the skipper has handed the tiller to a relief helmsman and he and two other men have rods in their hands and are on the fishing platform, two men are squatting on the after end of the platform making a spray with the water splashes and the flooding ports have been plugged so that bailing becomes unnecessary. One of the bailers will be stationed in the bailing compartment to help unhook fish.

The chummer continues to throw out bait as the school follows, the water spray serves several purposes, for one thing, it gives the appearance of a large school of bait fish and it also covers the hooks and conceals the boat from the quarry.

The fishing rods or poles from which the method derives its name are simple bamboo poles having a butt diameter of about 2 inches and fining almost to a point at the tip. Three lengths are carried, 15 feet, 12 feet and 9 feet. The longer rods are used when the fish are 'shy' and cannot be chummed close to the boat, the shorter ones are used when the fish are feeding hungrily and will close the boat. About six feet of locally spun cotton line is attached to the tip of each rod, usually this line continues to the middle of the rod so that if the rod breaks the fish and line are not lost. Either nylon monofilament or wire of sufficient length to make the line the

same length as the pole is attached to the cotton and this terminates in a locally made tinned barbless hook.

These unbaited hooks are swung into the spray and moved so that they look like a frightened small fish, when a bonito strikes at the hook the pole bends under its weight and as it does so it is raised in a carefully controlled move and swung towards the boat, if the swing is perfectly controlled the fish hits the bulkhead at frame 7 and falls off the hook. This operation is repeated at great speed and there may be two or three fish in the air at once when the fish are feeding vigorously.

When the fish are shy, smaller hooks are used and the fisherman may put a live bait on the hook, three 'long type' hook sizes are carried and one small round bent barbless hook, the photograph shows the shape of these, the larger hooks are 2.3 inches long.

Fishing from any one shoal may last for a few minutes only or up to half an hour, as soon as the fish sound or stop feeding the crew look for a new shoal or watch for the same one to reappear. While looking for fish the plugs in the flooding parts are removed and bailing starts so that the water fouled by the catch is changed as soon as possible; the fish are removed from the bailing compartments and stored in the fish well.

During fishing one crew member remains in the bailing compartment to assist in clearing lines, unhooking fish if necessary and preventing the escape of landed fish. Another man is stationed forward near the mast ready to replace lost hooks or affect other repairs to the fishing gear.

The catch is never counted until the fishing ceases for the day as it is considered unlucky to do so.

When the bait is exhausted or no more fish can be seen the boat returns to Malé. If a good catch is made early in the day the boat may return early in order to get the best market, elsewhere the boats stay out as long as possible. On arriving at Malé the boat will be met by the owners' representative who takes the owners' share of 25% of the catch, the remainder is taken by the crew to the fish market where it is sold by a trusted crew member. Elsewhere these fish would be taken home where the women and boys start the preserving process.

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If any bait remains alive, it is stored in a live box against the next day's use. When a boat returns early the crew may decide to catch and store bait so that an early start can be made in fishing the next day.

Bait fishes between 2 and 3 inches long are preferred as these are hardier than smaller fishes, the important feature is that the bait must be of a species which will prefer to dive towards the apparent shelter of the boat when used as chum and not a species which will swim away as the whole object of chumming is to bring the fish as close to the boat as possible, this is why bait is sought along the reef from the species which normally shelter in the coral rather than in the open lagoon.

Apart from the bonito the mackerel tuna *Euthynnus affinis*, the frigate mackerel *Auxis thazard*, small yellowfin tuna *Neothunnus macropterus* and the rainbow runner, were being taken by this method when I was in Malé. I was told that the barred Spanish mackerel *Cybium commersoni*, the wahoo *Acanthocybium solandri*, the bluefin tuna *Kishinoella tonggol* and *Chorinemus* Spp. are also sometimes taken in quantity.

The following list gives the equipment carried by a pole fishing boat: -

- One or two five pronged iron grapnels of 15 to 25lb weight
- Cables for mooring
- One or more mushroom shaped coral anchors
- Ten oars
- Three sails and a sail bag
- Six or eight wooden poles for use as net poles and quants
- About 20 bamboo poles complete with lines, leaders and hooks
- A bait net
- Two wooden bailers
- Two netting bait scoops
- An iron gaff or spear or both
- A knife
- Stopping twine
- Water cask
- Two water splashes
- Spare leaders and hooks

Traditionally all these items have been made locally, the only material imported being iron, sailcloth and cotton and bamboo poles. Nowadays nylon monofilament and wire are imported and nylon netting for bait nets is added to the list.

There are only two specialist posts in the crew, the skipper makes all decisions and normally sails the boat, the chummer is responsible for looking after the bait and for chumming the shoal alongside. Two different members of the crew bail each day, the work is hard and earns an extra share, both excellent reasons for rotating the task. Acting as relief helmsman, water splashing, fishing and bait net handling are shared tasks, which earn no extra shares and may be undertaken by anyone. Anyone, except the skipper, rows when necessary.

An almost exactly similar method is used close to the reef at Malé for catching rainbow runners and garfish, the boats employed in this fishery are smaller and a crew of 5 - 7 is usual. Bait is obtained in the same way but is usually the Pomacentrid *Nilamehi* having obtained bait these boats move to the outer reef and the skipper looks for the deep swimming fish on which the fishery is based, a few bait fish are occasionally thrown over and the skipper watches to see if these are taken by bigger fish; as soon as fish can be seen more bait is thrown in an attempt to bring the shoal up to the stern. Only one rod is used and only the skipper normally fishes.

## 2.2 Trolling

Trolling is not popular as the pole boat skippers say that it spoils the pole fishing. While I was at Malé about a dozen boats varying in length from 20 to 24 feet in length were trolling, each boat having a crew of three or four.

No outriggers are used and therefore only two lines can be used, these are of varying lengths, 40 - 50 yards seemed usual, and are made locally. They are preserved by a tanning process. A wire leader, made from wire obtained by unravelling steel cable, about 4 feet long is attached to the line and a short round bent hook is tied to the wire. Eyed hooks were not being imported and indeed seemed to be unknown, all the hooks I saw in use had flattened shanks but the users drilled the floats employing a gramophone needle as a drill bit.

The only artificial bait in use was a feathered jig made by binding white or brown and white chicken feathers to a wooden disc, which is drilled and mounted on the wire leader. No weight is employed either in the bait or on the line, as the local theory is that the bait should be right on the surface for best results.

The best fishing is found along the outer edge of the fringing reef, the boats usually concentrate in the area near the gaps in the reef, which offer a passage into the lagoon.

These boats take a mixed bag of bonito, frigate mackerel, mackerel tuna, barred Spanish mackerel, wahoo, yellowfin tuna, garfish and dolphin. The larger bluefin tuna, sail fish, spearfish, marlin and swordfish are also occasionally taken. For the larger fish, a longer and heavier line is used with a longer, stronger leader.

Mounted dead fish are used as bait for these bigger fish, flying fish being the preferred bait.

### 2.3 Handlining

Handlining for reef fish is a part-time occupation, very few people specialise in it.

Simple cotton handlines are used with wire and nylon monofilament traces, the hook size depends on the size of fish expected and only a single hook is used by each man.

Any fish may be cut as bait and the art of ground baiting with fish offal is well understood.

The best fishing is at spring tides on the outer reef and only night fishing is worthwhile.

Fishing takes place from anchored boats, if fish are not found quickly in one place a move is made to another until a shoal is located. The bulk of the catch is red snapper but golden snapper, groupers, ganter, surgeon fish, brems and wrasses are also taken and small sharks may be caught.

Whiffing or drift line fishing with handlines is used seasonally for pelagic fish such as Spanish mackerel when suitable baitfish are available and spanish mackerel are present in any quantity. Pomacentrid fish of 3" - 4" in length are used alive; the preferred hook is the locally made barbless hook shown as 5 in my photograph No. 2. I did not see this method as it was not in use during my visit.

I was also told that there is a seasonal fishery for flying fish using bamboo poles and tight lines with small hooks and fish baits, the flying fish are attracted by ground baiting with fish paste and the boat is drifted. The method is only used during very calm periods in the northeast monsoon.

### 2.4 Spearing Fish

Most bonito boats carry a spear with which sword fish, marlin, sharks and big rays can be taken when these are found on the surface. Rays are taken in the shallow lagoons while on the bottom.

Rock haunting fish are speared by divers, the spear used is made from three or four feet of 1/4" iron rod and has a single barb.

There is one exception to this; there is a spear fishery for seer (spanish mackerel and wahoo), which is used by full time fishermen. Seer fish are not always present and the method is used only when they appear.

Small boats are used, manned by two men. A flying fish is obtained for use as a lure and this is attached to a short line on a bamboo pole. One man rows the boat from the bow while the other uses the pole to keep the flying fish skipping along the surface in the wake of the boat; when a seer fish sees the flying fish lure and attacks it the seer is either speared or gaffed.

I saw this method being attempted but saw no fish caught; I was told that wooden models of flying fish are used if it is not possible to obtain a fish for use as a lure.

### 2.5 Shark Fishing

Shark liver oil is used to waterproof the coconut planked boats and therefore large quantities of liver oil are needed annually.

Shark are caught by drift lining using a locally made iron hook on locally made chain, the hooks I saw were round bend with a six inch shank and three inch gape, the chain was relatively short being only 4 - 6 feet long.

When a boat goes on a shark hunt it may be away for a week or ten days, shark are caught mostly at night; the boat drifts with one or two lines down baited with dolphin or turtle meat. When a shark is caught it is lashed alongside the boat alive and is butchered only when the boat returns to base.

## 2.6 Drift Net

Short lengths of drift net having a mesh of from 1" to 1½" (stretched) are used occasionally in the lagoons for the 'mushimas' and scad. The nets have wooden floats on the handline and are weighted at the foot with leads or shells. Very few of these nets exist and the method is of no commercial importance at present in Malé.

## 2.7 Seine "Nets"

A coir rope bearing palm fronds at short intervals is occasionally used as a sweep in bays in the lagoons; these sweeps are used to herd fish together in shallow water where they are caught by hand or with whatever netting is available. I did not have an opportunity to see this done and gained the impression that the method is little used. Suitable beaches are certainly not common in Malé atoll.

## 2.8 Cast Nets

A few cast nets exist; they are simple circular nets with no drawstring and are used to obtain fish for personal consumption or bait.

## 2.9 Scad Traps

I was told that a large kraal type trap exists in Nilandhe Atoll; the leads being made by building coral walls. This trap is said to catch a large proportion of the scad, which are exported dried.

## 3. THE SHARE SYSTEM - INCOME TO FISHERMEN AND BOAT OWNER

This account is based on conditions at Malé where the catch is sold fresh. The price realised for a catch is therefore higher in Malé than elsewhere, living and boat building expenses are also higher in Malé than in some outlying atolls, there is therefore probably little difference in the profit in running a boat or working as a fisherman in Malé or elsewhere.

Fishing is a joint enterprise in which the crew and owner share the profits between them. The financial risk is the owner's. In Malé the boats are all owned by businessmen, Government Servants or retired Government

Servants, there are no owner skippers. I was told that elsewhere most boats are owned by fishermen or ex-fishermen but cannot confirm this.

The system of sharing the catch varies slightly from place to place. The basis appears to be that the boat owner is entitled to 25% of the catch; shares are then given to the owner of various pieces of essential equipment and to the crew with extra shares for the specialists in the crew. Normally the boat owner will also own all the equipment.

If 100 fish are caught in a day's fishing from Malé they would be shared as follows:-

The owner takes 25 fish in kind as the boat share. A trusted crewmember sells the remaining 75 fish and the cash is divided on the following basis:

1 crew share for each man, i.e., for crew of 8	8 shares
1 extra share for skipper	1 share
1 extra share for chummer	1 share
1 extra share for each of two bailers	2 shares
1 share for sail owner	1 share
1 share for net owner	1 share
1 share for fishing gear owner (given to skipper in Malé)	1 share
Total	15 shares

In this case, each share would be worth the cash value of five fish. The value will depend not only on size and on species of the fish but also on the quantity of fish available on the market and also on the time of day. During my stay at Malé, the price paid for one fish varied between Rf. 1.50 and Rf. 10.00. If we take a value of Rf. 3.00 per fish the profit distribution for 100 fish sold would be: -

	Rufiyaa
Boat owner	75.00
Net owner	15.00
Sail owner	15.00
Gear share (Captain)	15.00
8 crew shares at Rf. 15.00	120.00
Captain's extra share	15.00
Chummer's extra share	15.00
Bailers 2 extra shares	30.00
Total	300.00

In practice the boat owner normally owns the sail, bait net and fishing gear, the gear share is given to the Captain who replaces lost or damaged hooks and leaders (but not poles) and the chummer is expected to replace bait scoops.

There are two permanent specialist posts, those of skipper and chummer, the bailers change daily as the work is hard and also because this gives all the crew a chance to earn the extra share in turn; the skipper and chummer do not bail.

With an eight-man crew (including the specialists) a boat owner, owning all the gear, therefore takes 35% of the gross, the skipper 15%, the chummer 10%, the two bailers 10% each and the remaining four-crew member 5% each. With a smaller crew all the shares will obviously be larger, with a larger crew all the shares smaller.

In addition to his shares, the skipper, in Malé island only is paid a monthly bonus varying from Rf. 1500 to Rf. 30.00 per months as a retainer and is given two sets of clothes a year worth between Rf. 40.00 and Rf. 50.00 at controlled prices. This practise has arisen as a result of the shortage of good skippers in Malé.

Two boats from Raa Atoll were operating out of Malé at the time of my visit. In Raa the fish will not normally be sold fresh, it will be processed to Maldivian fish. A different share system was operating in these two boats, I was told that the system was basically the usual one in Raa atoll but that the food share was given because the crew were away from home.

If 100 fish are caught, the boat owner receives 29, 25 of these are the boats share and four the sails share. The remaining 71 fish are divided on the following basis: -

Crew of 8 - one share each	8 shares
Skipper ½ share extra	½ share
Chummer ½ share extra	½ share
Bait net 1 share	1 share
Gear share (skipper)	½ share
2 bailers ½ share extra each	1 share
To provide food for crew	1 share
	<hr/>
	12½ shares

On this sharing system the crew benefit slightly at the expense of the owner, if 100 fish were sold in Malé at Rf. 3.00 each, each crew member would receive Rf. 17.00 and the food share is also Rf. 17.00 while the owner receives Rf. 87.00.

#### 4. PROFITABILITY IN THE POLE FISHERY—INCOME TO BOAT OWNERS AND FISHERMEN

During my stay at Malé, I arranged for the collection of statistics from ten of the twenty-nine pole fishing boats operating. The boats were selected at random.

The statistics were collected on daily forms by the staff of the Municipal Office in Maldivian and Mr. Ahmed Ali Didi translated the entries for me.

These forms show how long each boat spent at sea, how long it took to obtain bait, how many fish were caught and the value of the catch. I have complete records for nine boats over a five-week period; from these the income of a fisherman who stayed with the boat over this period and that of the skipper and owner can be calculated. Since the crew member varies from day to day, each day's share has to work up individually for each boat.

The average catch per boat (number of fish caught) during this 5 week period was 971, reduced to a 4 week month this gives an average of 728 fish, inspection of the table at Appendix 3 which gives the average catch per boat per month in 1959 suggests that we are dealing with a period of 'normal' or 'average' fishing.

The table reproduced below shows the gross income to the owners' skippers and a crewmember of each of the nine boats for which records are complete.

Since each fisherman gets a chance to bail and earn an extra share in turn; and since the crew number varies from day to day; it is not possible to assess income accurately. It is fair to assume that each man will bail twice in five days and I have therefore inserted a column allowing a 40% increase in the basic share to allow for this.

Table 1. The gross income to the owners', skippers and crew of nine boats sampled.

Boat No:	Days at sea	Gross value of catch	Owners share	Skippers share	Chummer's share	Basic crew share	Basic crew share Plus 40%
1	27	3261.50	1254.01	497.29		165.93	232.30
2	18	625.25	201.40	79.26		26.42	36.99
3	14	485.00	181.46	75.30		25.10	35.14
4	28	2725.00	936.11	415.26		138.32	193.65
5	16	396.00	133.03	73.55		28.02	39.23
6	28	3108.06	1059.92	392.37		130.79	183.106
7	16	630.00	215.86	102.60		34.20	47.68
8	28	2782.00	937.83	369.48		123.16	172.42
9	27	3430.75	1152.51	446.85		148.95	204.53

These nine boats thus fall into two groups, an active successful one and a less active much less successful one.

No fishing takes place on Fridays the Muslim day of rest, five of these boats therefore fished on almost everyday. The reasons given for not sailing are shown in the following table.

Table 2. Reasons for not sailing for pole and line fishing.

Boat Number	Illness	Days lost		
		Repairing gear or careening	Bad weather	Other reasons
1	0	2	1	0
2	10	2	0	0
3	9	6	1	0
4	0	0	2	0
5	10	0	3	1
6	1	0	1	0
7	8	4	2	0
8	0	0	1	1
9	0	1	1	0
Total Days Lost	38	15	12	2

Illness is therefore given as the main reason for loss of fishing time. However, the less successful boats also spent a greater part of their time

ashore for cleaning and the crew of these boats showed less weather hardiness than the others which suggests that illness may be a term which covers the reluctance of less successful crews to turn out. As in most other fisheries, the skipper is the key man and in my view the success or failure of a boat engaged in pole fishing depends to a very large extent on the skill of the skipper. The successful boats careen for oiling on a Friday thus avoiding loss of fishing time. There are certain holidays during the year; the fishing year is therefore roughly 50 weeks or ten times the period for which figures are available. It appears therefore that if we assume this to have been a period of average fishing; i.e. neither particularly good nor particularly bad, we can also assume that in Malé a particularly successful skipper can earn up to Rf. 5000 a year; a member of his crew would earn Rf. 2300, his chummer Rf. 3300 while the owners gross income would be Rf. 12,500

At the other end of the scale, if a boat continues to fish through a year of successive misfortunes the skipper might earn as little as Rf. 750, his chummer Rf. 500 and a crew member only Rf. 350. The owner's share would in this case be only Rf. 1800. These are the extremes however and it is unlikely that many boats are near to earning sums such as these. A boat, which grossed Rf. 20,000 worth of fish and earned Rs 7,646 for its owner, Rf. 2,646 for its skipper, Rf. 1,764 for its chummer and Rf. 1,240 for a crewmember, would be near the normal.

Unfortunately, I have no figures for the value or weight of catches outside Malé as the figures collected by the Fisheries Board show numbers of fish caught. It is therefore not possible to estimate income to fishermen from other places in the same way. There were 1,348 boats registered in 1959 outside Malé Atoll, Kolhumadulu and Hadhdhunmathi. We do not know what proportion of the catch is consumed locally but 67,146 cwts. of Maldivian fish was exported to Ceylon in that year, at the Malé price of Rf. 156 per cwt. this was worth Rf. 10,474,776. If an "average" boat existed it would have grossed Rf. 7,771 from sales to Malé. Of this, the skipper would get Rf. 1,032, the chummer Rf. 688, a crewmember Rf. 482; the owners' share would be Rf. 2611.

There is no way of calculating what proportion of a boat's earnings is represented by this sale to Malé, there is little other fishing however and quite a proportion of the catch must be consumed locally. If we assume a total of 1500 pole boats to exist (including the atolls for which 1959 figures were not recorded) these could provide employment for 15,000 men. In a population of 100,000, there will be roughly 50,000 men and boys; of these,

at least 25,000 – 30,000 would be of working age. In the past, it has been suggested that there are insufficient boats fishing and that many boats are laid up. I do not believe that a substantial number of boats are laid up and out of use at present; I saw none in either Malé or Faadhippolhu. It does seem to be true, that there are not enough boats to provide full employment for all the men who might fish, there are few other occupations and most of these, like fishing, are seasonal. It is certainly true that in 1959 some boats were not used effectively, Appendix 2 shows that in some places some boats were not at sea when fish were most plentiful on the fishing grounds.

Maldivian fishermen follow the teachings of Islam and therefore do not fish on Fridays. The obligation is actually to attend Friday prayers at the Mosque, fishing is allowed after this religious obligation has been performed but in practice bonito fishing by the pole method cannot be undertaken on a Friday as there would not be time to collect bait and then go fishing in the afternoon. There are also a number of public holidays, some religious, during the year, the days on which no fishing takes place are: -

Fridays	52 days
2 Eids (religious festivals)	4 days
Birthday of the Prophet	1 day
Anniversary defeat of Portuguese	1 day
Conversion to Islam	1 day
9 <sup>th</sup> and 10 <sup>th</sup> Muharram	2 days
Muslim New Year	1 day
Pilgrimage Day	1 day
	<hr/>
	63 days

There are therefore about 300 days on which fishing can take place if the weather allows. Unless a boat is damaged the only other times when fishing is not possible is when it is hauled out for cleaning and oiling, a keen crew will do this largely on Fridays and festival days so there are about 290 days in a year when only the weather can prevent fishing. In 1959 some boats came very close to this figure while other boats fished on only a few occasions. Of the 1,348 boats registered a maximum of 182 were laid up for the entire year, this would assume that the same boats are shown as not fishing in each month.

No one expects any boat to go out on every possible fishing day. In any fishery there are times when fish are plentiful and easy to catch and other

times when fish are absent or difficult to catch. In this particular fishery, availability and ease of catching do not necessarily coincide as hungry fish are easy to catch and the larger schools may appear when food is most readily available to them.

Possible reasons for not going fishing are: -

1. Illness of a key man. In Malé during my stay, this was the principal cause of lost time.
2. Bait is not available or is difficult to obtain.
3. Fish are either not there to be caught or are shy and difficult to catch.  
(2) and (3) are seasonal difficulties, nothing can be done about them unless fishermen are willing and able to migrate when fish or bait are unavailable at home.
4. Shortage of essential items of boat or fishing gear. This has certainly operated in the past and certain items were in short supply during my stay at Malé.
5. Stress of weather. The sea may be too rough for fishing or surf conditions may make launching an impossibly hazardous process.

Of all these reasons, only 4 could have operated to prevent some boats putting to sea for long periods in 1959. The only other possibility is a shortage of skilled crewmembers. There is a shortage of good skippers in Malé. It was suggested to me that past vexatious regulations and shortages had made fishing an unattractive occupation, the present Government is encouraging fishing and new boats are being built and this difficulty will disappear.

A fisherman in Malé has to find about Rf. 65.00 a month for household expenses, if he is earning the average wage or share of Rf. 100 per month he has little to spare. Boat ownership can be profitable if the crew work well and the boat has normal luck. I have estimated the average boat owners share at Rf. 7,646, his initial expenditure to buy a boat and put it to sea is of the order Rf. 5,000, if this is depreciated to write off over 10 years the owners expenses during the year can be assumed to be: -

	Rufiyaa
Depreciation of hull	500
Sail replacement	140
Repairing and oiling hull	600
Repairs and depreciation	120
Skippers retainer	240
Representative who meets boat etc.	1,320
Replacement boats gear	200
	<hr/>
	3,120

This gives a net income to the owner of about Rf. 4,400. It would appear therefore that the owners' share of the profits is an unduly large one. I do not think I have underestimated the expenses of running a boat, the major items of depreciation of hull, repairing and oiling and wages and bonuses are if anything over estimated.

## 5. SEASONAL FLUCTUATIONS IN LANDINGS

With only one year's landing figures available it is not possible to come to any definite conclusions as to which seasons provide the best fishing. Appendix 2 shows the average catch per boat in each of the administrative districts in 1959. These figures suggest that in most places the best fishing is experienced in the North East monsoon and that good fishing can also be expected at the height of the South West monsoon, generally speaking the inter monsoon periods did not provide such good results. There is a surprising difference in the level of catches between the adjacent atolls of Felidhe and Mulaku; there were a number of months in which catches were excellent in one atoll and poor in another. It would seem that the use of powered boats, which will make travel easier, may help to reduce these differences.

There does seem to be distinct variations in catch levels at different times of the month. Spring tides occur at full and change of the moon, and that the strongest tidal currents occur about three days after full and change. From Appendix 13 it would seem that the best fishing coincides with the stronger currents, the histogram is based on only five weeks fishing however and is therefore not a completely reliable indicator.

An inspection of Appendices 2 and 3 shows quite clearly that in 1959 some boats were not at sea during the months when most fish were available. It is

most important that every effort should be made to ensure that there is no shortage of equipment which might prevent boats getting to sea when fish is most plentiful, it also appears to be worthwhile to concentrate effort on the days following a new or full moon.

## 6. FISH PRESERVATION – PREPARATION OF MALDIVE FISH AND MARKETING

Although the preparation of Maldivian fish is an important factor in the Maldivian economy, I had very limited opportunity for studying this since no Maldivian fish was made at Malé during my stay there. The following account of the preparation of Maldivian fish is based on a demonstration arranged for me at Faadhippolhu on the occasion of my brief visit and on the answers to questions asked and answered through an interpreter.

When the fish (bonito etc.) is landed it is turned over to the women and boys, the fish has been washed in the boat, it is now beheaded and filleted moving the knife from tail to head and holding the fish by the tail. The fillets are washed in seawater to remove some blood.

While the fillets are being prepared a fire of small branches, coconut frond, mid ribs or other small firewood will have been lit and a flat round tinned copper pan of seawater is being heated. Some salt is always added to this water if available; if the fish is intended for local use only a handful or so is added, if the fish is intended for export several handfuls are added. I could not get any accurate measurement for this, the best answer being "the more salt the better".

The fillets are cooked for about 20 – 30 minutes; the water is not allowed to boil vigorously as it is most important that the fillets should remain whole. If the fillets are from large fish each will be split in two prior to cooking.

When the fish has simmered long enough to be considered cooked it is removed from the pot with a flat wooden paddle on which it is drained of water, it is then laid carefully on a rack made roughly of wooden poles above the fire.

The cooking process takes place in crude huts, the fires produce a great deal of smoke and after cooking the fire is kept burning for at least 24 hours. In



practice, the fish put in one night will be removed when preparing the fire for the next day's catch.

After this smoking process the fish is stored for three or four days, during this time the fillets become glossy – a pellicle forms. The fillets are then piled and stored under a gunnysack for 24 hours or more. I was told that this increases the weight. There is little doubt that this process encourages the growth of moulds, which ferment the protein thus producing the special flavour of Maldive fish.

Thereafter the processing depends largely on the weather, if there is good bright sun three days sun drying will be sufficient to make the fish dry enough for storage, if there is only partial sun a longer time is needed, if the weather is wet the drying takes place over fires. If it become necessary to dry over a fire coconut husk may be used as fuel – this produces more smoke than other available fuels.

If it is necessary to store the dried fish for a long period it may be buried in sand, which has been partially sterilised by sun drying; the object of this is to prevent insect attack.

Before shipment each piece of fish is rubbed thoroughly with salt, the salt used is pounded to produce a fairly fine grain before use. By the time it is shipped, the Maldive fish is as dry and hard as a piece of brown soft wood.

I had no opportunity to make quantitative study of the process but estimates that the conversion ratio is 5:1 or that five pounds of raw fish will produce one pound of Maldive fish.

The Maldive fish will keep for several months, some which I saw at Malé was said to be eight months old, apart from the fact that some of it had been attacked by insect larvae it appeared to still be in reasonably good condition.

When a quantity of Maldive fish has been accumulated, it is taken to Malé by sailing boat and is sold there.

The purchase is a Government monopoly and the fisherman receives Rf. 156 per cwt.

In Malé the fish is sorted and bagged in one hundred weight gunny sacks, it is stored until it can be sent to Colombo where it is sold by agreement to the Ceylon Government, the agreed prices are:-

Kundira (whole Maldive fish made from bonito) Rf. 190 per cwt.

Mixed (mixed bonito and other tunas) Rf. 2/- less than the rate for Kundira.

Mala (Maldive fish made from tunas) Rf. 2/- less than the rate for mixed.

Chips 3" and above Rf. 120/- per cwt.

Chips below 3" up to 4lbs in a bag of 1 cwt. is ignored, anything in excess of 4 lbs to be paid at 40% of the rate shown above.

Dust up to 2 lbs in a bag of 1 cwt. is ignored, dust in excess of 2 lbs is deducted from the total weight.

Tare – packing should be in sound single jute bags of approximately 1 cwt. each and tare not exceeding 2½ lbs per bag.

The quantities of Maldive fish exported to Ceylon in recent years are shown in the table at Appendix 4.

In 1959, 819 cwts. of dried bonito, similar to Maldive fish was imported into Ceylon from Japan, this was valued at Rf. 106,703 or roughly Rf. 118 per cwt; imports of "Maldive fish" from India, presumably produced in the Laccadive Islands, totalled 1648 cwts. valued at Rf. 306,510 or roughly Rf. 186 per cwt.

In the same year the 67,146 cwts. of Maldive fish imported was valued at Rf. 12,244,372 or Rf. 183 per cwt.

During the first ten months of 1960, 901 cwts. was imported from India valued at Rf. 166,060 or an average of Rf. 185 per cwt. Indian imports totalled 336 cwts. valued at Rf. 60,975 or an average of Rf. 181 per cwt.

A new exporter entered the market this year; imports from Britain North Borneo totalled 2,000 cwts. valued at Rf. 367,283 or an average of Rf. 184 per cwt.

In the first ten months of this year 50,833 cwts of Maldive fish was imported valued at Rf. 9,196,620 an average of Rf. 181 per cwt.

The Ceylon market for Maldivian fish is by no means satisfied and Maldivian fish is rationed there. Although the Maldives has the bulk of the market there is no ground for complacency, the 'substitutes' are generally speaking fetching as good a price at wholesale and are reported to be cleaner in appearance.

I would not at this stage recommend that any basic changes should be made in the curing process. I do however suggest that kerosene burning pressure stoves can be used instead of wood fires for cooking the fish in places where wood is difficult to obtain. Either wood or coconut husk fires would still be needed for the smoking and drying stages.

I suggest that the partly cured fish will dry more quickly if drying stages are constructed of thin wooden slats 1½ inches apart set on posts 2 to 3 feet high as this will enable a current of air to circulate round the pieces of fish and promote drying, in Faadhippolhu the fish is at present dried on mats or sacks on the ground.

I also suggest that the stores in which Maldivian fish is kept should be insect proofed using plastic fly screen mesh. Before the dried fish is stored, it should be brushed to remove dust and inspected for insect damage. It should be stored on low racks so that air can circulate round it.

I consider that substantially larger quantities of bonito can be handled in the traditional way and do not consider that it is necessary or desirable to consider the possibility of small factory scale production of Maldivian fish at present, especially as it may be possible to develop a market for frozen fish.

If, in a few years time it is proved that bonito can be caught with purse seines it may be necessary to consider factory production of Maldivian fish. I must emphasise however that there is always a danger in an operation of this sort in that unless the product is very much the same as the traditional one it may have a poor market value.

My tentative suggestions for such a factory are that it should embody the following features: -

Wooden tables at which the fish are filleted.

Iron or steel cooking vats 8 feet long, 2 feet wide and 1 foot six inches deep fitted with wooden covers and metal or wooden trays in which the fillets are placed for cooking. These vats would be heated with oil-fired burners.

The fish would be removed in the trays for draining and cooling.

Smoking and the initial drying would be done in controlled flow smoking/drying kilns of the Torry type.

When possible sun drying would follow since the use of fuel for drying will obviously be expensive.

Stacking in aluminium boxes would encourage mould growth and the drying process completed in the sun.

When fish cooking finishes for the night the liquid in which fish has been cooked is boiled and reduced to a pale brown thick fluid. This fish sauce is a popular article of diet in the Maldives but is not exported. It is said to taste like Marmite but I cannot substantiate this having lacked the courage to try it.

The only other exports of preserved fish products from the Maldives are bone dust (used as a fertilizer), dried scads and dried reef fish.

Bone dust is produced by a very crude drying process, the bones, with attached meat which remains after filleting the fish used for preparing Maldivian fish are thrown by the fire and dried. After drying, these are pounded. The heads are apparently discarded.

Other fish such as scads and reef fish are boiled in salt water and dried, small fish are boiled whole, the larger ones are filleted or cut into chunks.

There is no simple salting and drying as no salt is produced in the Maldives and salt is therefore relatively expensive.

## 7. BOAT BUILDING

Hard wood is in short supply and all boats are built from coconut palm planks on hardwood frames.

The boat builders use relatively crude tools but with the limited materials at their disposal these highly skilled men produce solid tough boats of excellent sea going quality. All the boats sail well and although they are heavy, they row well too.

All the boats used by fishermen are of similar construction and design; in the atolls where the passages from the lagoon to the open sea are shallow or where only shallow harbours exist, the boats are not so deep as in Malé where these difficulties do not exist.

The typical *masdhoni* or fishing boat is completely open; the length varies from some 28 feet overall to more than 45 feet. A boat, which I measured at Malé, had the following dimensions – length 32 feet 6 inches, maximum beam 9 feet, depth 3 feet 6 inches. A sketch showing the sections at the frames or floors is at Appendix 7. A sketch showing sectional construction detail is at Appendix 6 and a sketch showing the deck lay-out is at Appendix 5.

I am considering here only the larger boats used for offshore fishing, more particularly the pole fishery. A number of smaller boats of from 16 to 28 feet in length also exist; these are used for travelling between islands and for inshore fishing. The method of construction used is similar to that used for the larger vessels. The inter atoll trading boats known as *Batelli* and *Odi* are of very different design and all are lateen rigged ketches usually referred to as schooners. The general pattern of construction for these is the same as for the fishing boats.

Timber for building fishing boats is supplied free by the Maldivian Government. A man wishing to build a fishing boat applies to the Atoll headman who forwards the application to Malé with his recommendations. When an application is approved, the prospective owner is given one third of the timber, when he can show that this is in fact being used to construct a boat and not a house or something else the remainder is supplied. The owner supplies nails and bolts, fittings, cordage and sails.

It is therefore possible to build a *masdhoni* and put it to sea for between Rf. 4,000 and Rf. 6,000. The cost of building a 32-foot pole boat is made up as follows: -

Labour	2,000
Sails	500
Yellow metal fastenings	300
Yellow metal fittings	60
Cordage say	40
Anchors	50
Shark liver oil	150
Oars 10 @ Rf. 10.00 each	100
Quonts and net poles 6 @ Rf. 5.00 each	30
Bailing scoops 2 @ Rf. 8.00	16
Knife	5
Gaff	3
Water cask	25
Fishing gear (30 rods, lines, hooks, splashers, bait net)	650
Total	<u>3,929</u>

The master boat builder may agree to build to a contracted price, more usually the owner pays the master builder and his workmen an agreed daily wage and provides them with food. The labour charge of Rs 2,000 given here would cover labour costs in Malé, elsewhere I believe lower rates are paid and a boat can therefore be built more cheaply.

As will be seen from the sketches and photographs these boats are double ended and pointed at bow and stern; the keel is flat and the bilge is deep with a sharp turn.

The boats are built entirely by eye no templates or building frames being used.

A typical 32 foot boat has ten frames or floors, these are 3" x 3½" or larger and are usually built up by scarping as grown timber is not usually available, these are fitted at 32" centres. Over each floor, three beams are fitted. The two lower beams average 2" x 2", the top beam at frames 2, 3, 5, 6, 7, is 4" x 2", at frame 1 it is 5" x 2" and at frame 4 it is 7" x 2" in way of the mast. The beams 8, 9, 10 are 3" x 2". All are of local hard woods.

Two light intermediate frames averaging 1½" square are fitted between each pair of main frames or floors; these are also local hardwood.

Fore and aft beams are used to tie frames 2 to 5 together to provide strength in way of the mast, these are 7" x 2" hardwood.

All strakes except the steer strake are coconut planks 2" x 4½". The steer strake is a massive piece of hardwood about 5" x 7", this is scarfed as necessary, single lengths of timber this size are almost never available. The other strakes are butt jointed where lengths are inadequate; the butts are not necessarily placed near a frame and this butt jointing is one of the few constructional weaknesses in the boat.

The steer strake is capped with 3" x 3½" hardwood; the inwale is 4" x 2½" coconut.

Construction starts with the laying down of the keel, this is usually 4" x 5", rebates are cut in this for the garboard strakes. The stern and stern posts may be set up before or after fitting the garboards. The garboards are cut in one or more lengths and are fitted very accurately to the keel. In this fitting as in all other fitting work a thin paste of charcoal in water is used, this mixture is brushed on to the keel rebate and the garboard is offered up. At this stage it fits where it touches, where it touches it picks up a black coating. It is then shaved with an adze to remove the high spots and offered up again, this operation is repeated until a perfect fit is obtained. A number of ½" holes are then drilled in plank and keel and when the builder is finally satisfied with the fit the plank is fastened to the keel by driving hardwood pegs. When the garboards are fitted on each side the next plank is similarly fitted and pegged, the work proceeds in this way the planks being fitted in opposite pairs until the hull is planked up completely. The hull is supported as and where necessary with wooden props.

The ends of the strakes are deeply rebated into both stern and sternposts, the ends are pegged and also fastened with brass bolts or copper nails, both are clenched.

All the strakes are fitted over size as regards thickness, the fairing of the outside with an adze produces the final shape, and the inside is also cleaned up. When the future position of the frames or floors has been determined the inside of the strakes is left oversize where the frames will be fitted, the remainder is cleaned up to produce a smooth surface.

Next comes the fitting of the main frames, these are built up by scarphing and are shaped accurately to fit the hull, they are then pegged in place and

the beams are made and fitted over the frames. The lighter intermediate frames are shaped as far as possible and are then bent into place; they are also fastened by pegging. If yellow metal fastenings are available these are also used for the frames and intermediate frames. In Malé, nails were in use, these are rooved with a round flat roove and then clenched. In Faadhippolhu brass bolts were in use, these were fitted with square nuts and clenched. Both nails and bolts were locally made, I did not see the nails made but the bolts and nuts are made by casting, rough filing and then cutting the threads. Almost any yellow metal may be used for these fastenings, if no metal is available when the boat is built it may be put into service, the metal fastenings put in years later. I suspect that as at present used their main value lies in prestige.

The gunwale and inwale are next fitted and then the decking over the space between frames 2 - 5 and 9 - 10. The forward decking seemed to be optional. The rudder, fishing platform, yard crutch, oars, mast and yard are the last items made. The fishing platform is removable as is the decking.

Square thole pins are fitted permanently just aft of each frame, oars are lashed to these with a loop of coir or twist of palm fronds. Oar looms are coconut 2" diameter varying from 9 to 10 feet long, the shield shaped blades 8" x 16" are hardwood lashed or nailed to the looms. The rowers sit on the beams and a short chopping stroke is used.

In the Southern Atolls a long sail, which is almost square, is used. In Malé and most other atolls, all the boats use a lateen sail.

One mast, which I measured, was 22 ft. 3 inches long made from a coconut palm of 7" diameter, this tapered to 4" diameter at the truck and to a 3" x 3½" rectangle at the foot. The top two feet was made from hardwood, teak being preferred, this section was fitted to the lower by a two step scarfed joint and fastened with copper nails. Two holes roughly one-inch diameter were drilled fore and aft in this for the twin halyards.

On the smallest boats the yard is occasionally made of a single bamboo pole, in the larger boats it is made of light hardwood, which is scarfed, pegged and lashed to obtain the required length. A yard 36 ft. long would have an additional piece 7 ft. 6 inches long which can be lashed on for use with the large sail, the joint is scarfed.

Two or more brass hook shaped fairleads are fitted to the sheer strake in the after part of the boat, similar hooks are fitted between frames 5 and 6 to which the halyards are fastened, the halyards thus act as shrouds. A brass bar of 1" diameter is fitted right forward to which the heel of the yard is bowsed down after hoisting the sail.

The yard carries a coir grommet near the point where the halyards are attached, on this is threaded a simple hardwood peg-like block, this is used for a topping lift which keeps the yard close to the mast when it is hoisted.

The mast is often removed when the boat is moored; it is raised into position by hauling on the forestay with the keel held in the step. The forestay is thus made off and the halyards, which also act as shrouds, are bent to the yard, the yard is hoisted and topped off and the halyard/shrouds made off. All the rigging is locally made six-stranded coir. Three sizes of coir rope are common corresponding roughly to 1½", 2" and 3" rope. Larger sizes are also made.

All fishing boat sails are made of Indian cotton, they are made with vertically cut cloths, very small light tabling at tack, clew and head with light coir roping. The sail is tied to the yard with light coir.

Three sizes of sail are carried, all made from the same weight cloth. This Indian cotton cloth comes in 30" widths in bales of roughly 40 yards. For a typical Malé boat four bales of cloth is purchased as the large light weather sail needs two bales, the normal working sail 1½ bales and the storm sail ½ bale of cloth. A 40-yard bale of cloth costs about Rf. 90. Sails are usually cut by a sail maker who charges for each seam sewn, typical charge for making up a sail would be Rf. 32, Rf. 25 and Rf. 15 for sails of each size. The owner supplies sewing cotton and the sail is roped by the crew. The quantities allow some spare cloth for eventual repair.

A coir main sheet is tied to the clew with a single sheet bend.

The rig is therefore simple and functional.

The rudder is shaped to the curve of the sternpost, the lower fastening is a brass gudgeon and short pivot, the stock is lashed to the sternpost with coir and the boat is steered with a beautifully curved tiller.

A solid hardwood crutch about 2" x 10" is dropped into a slot in the fishing platform, this is used to support the yard when the sail is lowered and is also used as a hitching post for the main sheet.

Before a new boat is launched the coconut planking is waterproofed by soaking it in shark liver oil, at least 60 pounds of oil is used in the first oiling. Twice a year this oiling is repeated, two kerosene tins or 32 pounds of oil are said to be required on each occasion. The boats are usually hauled out on Friday and some oil may be painted on them, in Malé the boats are hauled out stern first and washed down inside out, there is a large drain, bored through the keel between frames 2 and 3 and 1 and 2. Since the boats are normally kept at anchor in the harbour some fouling by marine organisms does occur, this is dealt with by burning off (breaming) using palm frond torches.

I examined the tool kit used by a builder at Malé, he had six men working for him, each of the men possessed an adze and two locally made axes one with a small and one with a large blade. The master builder owned all the other tools; some of these were purchased pre-war, as it is seldom that tools are available in Malé. The builders regarded their kit as adequate.

The kit comprised:

- Two double handed rip saws.
- Four single rip saws.
- Stanley wood planes, Nos. 4 and 5.
- Several sets wood chisels from 2" to ½" some locally made.
- Two wooden shelled planes.
- 2 – 20 lb. wooden mallets.
- 2 – 20 lb. hammers.
- Marking line.
- Set square.
- A few files.
- Two small Archimedes drills and set of 18 spade type drill bits up to ¾ inch.
- Wheel brace.
- Archimedean lathe.
- Archimedean grind stone.

He also had a vice on a crude workbench and an assortment of wooden wedges. Ray skin is used for sanding. The builders in Faadhippolhu had

generally similar tool kits but I saw no metal shelled planes and no wheel braces; a large Archimedean drill worked by three men replaced this.

### 7.1 Coir Rope Manufacture

All the cordage used for running and standing rigging and cables is locally made coir. The equipment used is simple and the final product is excellent.

Coconut husks are retted in water until the strands can be separated by beating with a wooden mallet; the fibres are dried and then combed with the fingers. Wisps of the fibre are then laid up into double strands by rolling between the palms. These strands are used for light lashings. Girls and women do all this work as an evening occupation, two or three 30 fathom bundles will be produced in an evening's work. Photographs 23 to 26 illustrate the processes.

Boat owners purchase these bundles of strands and ropes are made by the boat crew who carry out this task on Fridays. Laying up five strands, right handed round a heart strand makes six stranded ropes. Each strand is wound onto a short pole, one pole being held by each man. The strands are passed through holes in a plank which acts as a former, one man pulls the strands through and forms the rope which is then tied to a six foot pole which is twisted or spun by the eighth member of the team. The process is illustrated by photograph No. 27.

## 8. REPORT ON MALDIVIAN FISHERIES SURVEY

### RECOMMENDATIONS

The most important factor in planning and carrying out any programme for the improvement of the Maldivian fishing industry is continuity. The existing Fisheries Board on which all the atolls are represented and which meets from time to time under its President the Hon. Mr. Ibrahim Rasheed, the Home Minister, whose portfolio includes Fisheries, seems to be a body admirably suited to the task of interpreting to the Government in Malé the needs of the industry in the Islands as a whole. In its present form, the Board is perhaps too large and its members too scattered to do more than oversee in the broadest way experimental and development work on the lines of my recommendations. I suggest therefore that the Maldives

Government might consider setting up for this purpose a smaller body under the Chairmanship of the Minister. This body would report to the Board and would control a small experimental section, which should be set up as soon as possible. This section should be in charge of a Director who would be responsible for carrying out experiments in fishing and mechanisation and for liaison with any firms selected for development work. For these purposes, he would employ a staff of fishermen and a few clerks to maintain records. I would like to emphasise that the person selected for such a post must have a practical knowledge of fishing and must be prepared actually to go out with the fishermen.

It is of course highly desirable that a Maldivian should fill the proposed post of Director of Fisheries. If a Maldivian is not at present available with all the qualifications needed to carry out the full range of duties of such a post, and if the Maldivian Government so wish, it might prove possible to recruit a Fisheries Advisor from Abroad to provide advice generally and to assist particularly in the planning of the experiments. Any such Advisor should work in close association with suitable Maldivians who could look forward to a long period of service with the Board.

In considering whether a Fisheries Advisor should be required from abroad, the Maldivian Government will no doubt bear in mind that given suitable arrangements some of the experimental work could be overseen by existing commercial organisations but some measure of co-ordination would be essential. I also regard local knowledge of conditions in the Maldives as being more important than technical knowledge of methods used elsewhere. At the same time, it must be recognised that the introduction of new methods into this traditional industry will require patient hard work over a long period.

New skills have to be acquired. There are two ways of providing for this, either people having the required 'know how' are brought to the Maldives and live there, teaching the local people, or Maldivians are sent abroad to places where they can see for themselves how other people have overcome similar problems. It is my view that it is far better to send Maldivians abroad for training. If a team of experts is sent to the Maldives it will take time for them to acquire any useful knowledge of local conditions, there will be difficulty in housing and feeding them and the process will be expensive and time consuming even supposing that a team of experts could in fact be recruited. Training Maldivians abroad has the twin advantage of relative cheapness and of producing results more quickly, there is also the

undoubted advantage that in travelling outside their own country these people will broaden their outlook and acquire knowledge of skills other than those they have been sent to study specifically. On their return, their local knowledge will enable them to apply their newfound skills quickly and effectively.

I have not attempted to plan a timetable for my recommendations. I have instead suggested priorities. A summary of my recommendations in order of priority and with approximate estimates of their cost is appended in Appendix 9.

Detailed recommendations for development follow.

### 8.1 The Bonito Fishery

Two methods are at present used to catch bonito (and other small tunas); the pole fishery is the most important single fishery and it is upon this fishery that the welfare of the Maldivians ultimately depends; trolling is of minor importance only.

The highest possible priority must be given to bringing the present pole fishery to a state of full efficiency. The fishing technique is sound; I cannot suggest improvements to the gear. I do suggest however that it is vital that the position with regard to the supply of essential fishing materials be improved. The Fisheries Board now has an organisation to produce estimates of requirements; if a fund is set up with which supplies can be purchased this point will be covered. Distribution of supplies can also be improved. It should not be necessary for a fishing boat owner to purchase his supplies in Malé or to wait until a representative of the Fisheries Board brings them to him. Small stores carrying a stock of sail cloth, sail twine, nylon monofilament, bamboo poles, hooks or mild steel bar for their manufacture, cooking pots, salt, tin, metal, nylon webbing for bait nets and anchors should be set up in each atoll. As mechanisation of fishing boats proceeds these stores could also carry small stocks of spares and perhaps diesel fuel also.

Having watched the movements of the bonito shoals and studied the time spent in each phase of the fishing organisation, I consider that the use of powered boats in this fishery should be economic. Powered boats can travel further a field and with more certainty than sailing craft, they are however much more expensive to operate and must catch more fish to pay their way.

While I am sure that it will be possible to catch bonito with the pole method from powered boats, I would also expect that some modifications to the present fishing technique may be necessary. It may well prove impossible to keep the boat moving and attract the school of fish to the stern; if this proves to be the case the boats should be run up to the school and the fish chummed alongside. This would make it possible for the crew to fish over the side and should enable more men to actually fish.

The use of an engine makes two further modifications possible, the engine can drive a pump which will provide for the change of sea water necessary to keep the small bait fish alive and the same, or another, pump can be used to provide the water spray.

From the records I have collected it appears that on many occasions half of the working day is spent in collecting live bait, in some atolls at certain seasons a full day is spent in collecting bait and fishing is therefore possible only on alternate days. Bonito may be taken at any time during the day but it is my impression that fishing is generally best in the early morning and late afternoon, the early morning period is often wasted because the boats have not been able to obtain sufficient bait. I therefore suggest that the possibility of specialisation in bait catching should be considered; if some boats were employed in catching bait for others to use, more fish might be caught. Whether the bait should be purchased by the fishing boat owner or whether the bait catchers should receive a share in the bonito catch is a matter for local decision.

While at Malé I made some experiments to see whether a light can attract baitfish at night, these experiments established the fact that lights attract the clupeid fishes *Rehi* and *Hondeli*. I suggest that these experiments might be continued to see whether bait can be caught in worthwhile quantities by this method.

Most of the fishes used as live bait are found only in close proximity to the coral reef, it is therefore not possible to catch them with any other net other than the existing lift net or a similar net unless they can be attracted off the reef. It may be possible to do this by using light at night as suggested above. It should also be possible to attract them to a shade lure during the day. A sketch of the type of lure I suggest is at Appendix 10. I suggest that ten of these lures should be made for experimental use in connection with a lampara net. When bait is found under a lure the net would be, shot round the lure and the lure lifted into a dinghy (*Bokkuraa*) as the net is hauled.

This net can also be used to capture bait when schools of baitfish are found in open water.

The lampara is a simple net to operate and I do not think overseas training will be necessary.

Bait catching is always a problem and if, therefore, a fishing technique, which does not require live bait, can be introduced and operated successfully this would be a most desirable development.

I consider that it should be possible to catch bonito in large quantities with a purse seine. It must be emphasised at the outset that this is an expensive piece of equipment requiring a large motorboat for its operation and that a skilled crew can only fish it. The introduction of this gear is a long-term development project involving not only the purchase of suitable equipment and the training of a crew but also prolonged experiment to perfect a technique suitable to local conditions.

There is no purse-seine fishery for bonito conveniently close to the Maldives and operating under similar conditions, which can be studied by Maldivians, bringing a suitable boat, gear and trained crew to the Maldives would be unduly expensive, and I propose that a number of Maldivian fishermen should be trained abroad.

The most suitable place for such training would seem to be the Federation of Malaya. If the Malayan Government are willing to provide facilities for such training I recommend that twelve Maldivian fishermen together with an interpreter should spend a period of six months in Malaya studying the Malayan fishery and working as members of Malayan crews. For obvious reasons only experienced fishermen should be selected for this training and there should be a combination of youth and experience – young men will learn more easily than old men but older fishermen in the Maldives will resent learning a new technique from young men.

The Malayan purse seine is not designed primarily for the capture of bonito but these are sometimes taken when schooling on the surface as the fishing boats go out for the night fishing. Two main techniques are employed; in the first, the boats leave early in the morning in order to fish on permanently anchored shade lures. In studying this technique, the Maldivians would learn to operate the net in daylight hours; the technique would be useless for bonito but would demonstrate the basic method of using the gear. The

technique could undoubtedly be adapted to catch the scads known as *mushimas*. This technique can best be learned at Kuala Kedah. The second main method is night fishing for the small mackerel *Rastrelliger*, this technique is unlikely to be of value in the Maldives but studying it the Maldivians would also see bonito caught in daylight as the boats leave for the fishing grounds. This method can be seen at Pongker.

It is suggested that if the Malayan Government are willing to provide training facilities the Maldivians should spend four months at Kuala Kedah and two months at Pongker. At both places, they could also study the unbaited fish pot (bubu) fishery for snapper. If suitable bait can be caught, they might demonstrate pole fishing to the Malaysians.

The Malayan net, designed for catching small fish, is relatively small (averaging 150 fathoms in length and 25 fathoms in depth) and has a small (one inch) mesh. This net would be perfectly suitable for use inside the lagoons for scads, mackerel tuna or frigate mackerel but might prove too small for use outside the lagoon for bonito. The mesh is certainly undesirably small and I would expect a net 250 fathoms by 40 fathoms having a three-inch mesh to prove more suitable.

If this project is undertaken, I suggest that a motorboat, two net boats and a Malayan net should be purchased in Malaya and shipped to Colombo; the motorboat could then travel to Malé under its own power. While experiments with the Malayan nets are being undertaken, a larger net should be ordered. Larger net boats would be needed for the bigger net; Maldivian boats could be adapted for this.

Trolling for bonito is most unpopular with the pole fishing boats as it is said to break up the schools and make pole fishing more difficult; as practised at present trolling is not very productive as only one or two lines are trolled by each boat. The catch can be increased substantially if the trolling boats use bamboo poles as outriggers and troll more lines; a method of rigging these is suggested in my sketch at appendix 11. In particular this could very usefully be used as a subsidiary fishing method by the powered boats recently introduced for long line fishing as these boats could troll on their way to and from the long lining grounds.



## 8.2 Other Fishing Methods Suggested for Trials

### 8.2.1 Drift Netting

Drift net is a simple, relatively inexpensive fishing gear.

I suggest trials should be made using local sailing boats with a crew of three or four men and twenty pieces of drift net per boat. Nylon drift nets of 6" mesh, 30 ply 500 meshes by 40 set in by 3 in 2 on a double headline of 6 millimetre kuralon and with a single foot line of 3 millimetre kuralon fitted with 5" x 2" plastic floats at intervals of 6 feet on the headline and weighted to sink would be the most suitable. I suggest the use of 12-foot straps of 6-millimetre kuralon at the ends and middle of each piece of net; glass floats would be suitable as buoys on the straps. A fleet of 20 such nets rigged ready for sea should cost about Rs. 5,000 in Ceylon (equals 375). The materials for making up these nets can be obtained from D.V. Mortensteyn in Colombo.

A relatively short period of training in Ceylon should enable Maldivian fishermen to become proficient in the use of this gear, such training could be arranged through the Ceylon Department of Fisheries. Four fishermen should be given two or three months training, they must learn to make up and repair nets as well as fish them. When these men are proficient, I suggest the purchase of materials to make two fleets of 20 nets each; the men should return to the Maldives and make up the nets there with assistance from other local fishermen. One fleet should be used for trials at Malé and the other at Foamulah where seer fish are said to be especially abundant at certain times.

Some damage to the nets will inevitably be caused by sharks, it will therefore be necessary to haul the nets at short intervals, two hours should be about right, if sharks are seen the nets should be hauled at once, the same thing applies if dolphin are seen.

These nets will catch seer fish when these are present and they will also catch bonito and other tunas. A few crayfish may be taken when the nets are used near a reef.

The nets should be set down on the straps on moonlit nights but used at or near the surface on dark nights.

Nets of similar mesh but finer twine which might take larger quantities of fish can be obtained from Joseph Gundry & Co. Ltd. of Bridport, Dorset, at a cost of 460 per fleet of 20 nets. These should also be tried.

### 8.2.2 Unbaited Fish Pots

Fish pots, of the type I made just before leaving Malé will catch large quantities of snapper and other reef fish, experiments with these should continue as this fishing gear could provide a useful source of income to fishermen when no bonito are available. A bonito boat or 27 foot motor boat could work 60 such traps hauling 20 each day and thus hauling each pot every third day.

The catch would be salted and dried for sale in Ceylon. The Ceylon price for such salt fish is low when compared with the price for Maldivian fish (Rs. Ceylon 90 - 100 per cwt. as compared with Rs. Ceylon 180 per cwt.) but five pounds of fish is required to provide one pound of Maldivian fish whereas three pounds of fish will produce one pound of dried salt fish.

Ceylon imports over 500,000 cwts. of salt fish annually from India, Pakistan and Aden and no doubt the Maldives could capture a larger share of this market.

In view of the relatively low price, I suggest this method of fishing and selling the catch as being useful only in the off seasons for bonito fishing.

### 8.2.3 Hand Line Fishing

Hand lining is but little used, largely I suspect because the catch is the despised reef fishes. When handlines are used, the fisherman uses only a single hook. There are good hand lining grounds and it would be possible for motor boats carrying a crew of six to eight men, each using handlines bearing six to ten hooks, to drift near the outer reef at night and take heavy catches of snapper. Shark meat would be a suitable bait and the catch should be salted and dried.

### 8.2.4 Tuna Long Line

I have little to add to my remarks in the note made before I left Malé.

I suggest however that the possibility of towing a second boat behind the motor boats at present in use should be considered, this boat could be manoeuvred under oars when the fishing ground is reached and could shoot and haul lines by hand.

### 8.2.5 Cray Fish

These are at present taken only by hand, if substantial quantities can be taken there is a good market for the frozen tails.

Both the gears, which I suggest for trials, are simple and inexpensive and extensive experiments can be carried out at little cost.

Crayfish pots, baited with dead fish should be set on the edge of a reef and left down overnight. The fixed crayfish tangle net is anchored off the edge of a reef at dusk and lifted at first light; it will catch fish as well as crayfish. I am putting up a specification for a suitable net for this.

### 8.3 Other Fishing Methods Considered Unsuitable

Inevitably, in considering fishing gears which might be introduced a number of methods are weighed in the balance and found wanting.

Some of the methods I have considered, but would not expect to succeed are listed below.

1. Bottom trawling. This would only be possible inside the lagoons, the bottom is coral sand interspersed with coral outcrops. Generally speaking, the bottom is unsuitable for trawling and does not in any case support a worthwhile fish population.
2. Mid water trawling. This demands
  - (a) compact fish shoals which can be located by echo sounding and
  - (b) "thick" or "dirty" water.While I believe that dense shoals of scad are sometimes found I would not expect to find these by echo sounding and in any case the water is always too clear for successful daytime fishing with this gear and too full of luminescent plankton at night.
3. Bottom long lines. These could not be used on the reef because they would foul, in any case handlining would be a more economic way of catching fish there. They could be used in, for example,

south Malé lagoon where rays are plentiful but the market for rays is a poor one as there is little demand for these as food or bait.

4. Shore or beach seines. There are few, if any, really suitable beaches, the catch would be low-grade fish for which there is no market.
5. Bag nets or traps. Physical conditions are such that it would not be possible to anchor bag nets where bonito or other tunas could be caught – the water is too deep. It might be possible to use these at Nilandhe Atoll but I did not visit Nilandhe and therefore cannot recommend trials.
6. Palisade or corral type traps. My remarks regarding bag nets apply. There is also the difficulty that the poles from which these might be constructed are in short supply.
7. "Drive in" reef bag nets (the Japanese moro ari). It might well be possible to introduce these but the catch would be reef fish for which the market is very poor.

### 8.4 Mechanisation Of Fishing Boats

A number of powered fishing boats have recently been purchased, all have marine diesel engines, all were built overseas as were the Government owned motor boats at Malé. I believe there are a total of nine motorboats and that there are four different makes of engine in these.

I would recommend most strongly that the Maldivian Government should decide to encourage the purchase of a range of engine produced by one manufacturer only. This has numerous advantages. Sooner or later, spares will be required for these engines; if a range of engines is selected with care, many of the spares will be interchangeable between engines of different sizes. Because the Maldives is so isolated, it will be most important that a fairly full range of spares be available in Malé for every engine. If there are a large number of different makes of engines spares for all of them will have to be available otherwise boats will have to be laid up for long periods while spares are obtained. No manufacturer will be prepared to maintain stocks of spares in the Maldives unless he has sold a substantial number of engines; spares are expensive and represent idle capital.

For similar reasons a manufacturer can only provide an adequate maintenance advisory service if his market is a good one.

A good, thoroughly experienced mechanic can service and repair any diesel engine. No experienced mechanic exist at present, they will have to be trained. Training will be easier and servicing more efficient if the trainee mechanics can concentrate on a single engine range.

In selecting a range of engines the following points should be borne in mind:-

- (1) Reliability. Some of the powered craft will be making long trips and an engine, which can be expected to give long service without breakdown or expensive repair, is essential.
- (2) Availability of spares in Ceylon. At present, if a manufacturer does not maintain an adequate stock of spares in Ceylon for his engines should not be considered. I assume that only engines at present available in Ceylon will be considered because the backing of a spare and servicing organisation in Ceylon will be required for a long time ahead. If a manufacturer does not have an efficient organisation in Ceylon now it is unlikely that he will be able to provide one in the Maldives.
- (3) Price of spares. Some manufacturers sell cheap engines and dear spares.
- (4) Availability of expert engineering advice. Some agents are interested only in selling engines and provide no after sales service, their engines must be avoided.
- (5) Price. I put this last because I consider it to be the least important factor. While it is largely true that there are few really bad diesel engines on the market at present some are much better than others and these are inevitably a little more expensive in first cost, in the long run they are cheaper.

Few Maldivian fishermen have any experience of handling diesel engines and as far as I am aware, none of them is at present capable of effecting even the simplest repairs at sea in the event of a minor breakdown. All engines require some routine maintenance and this is best carried out by the operator.

There is no doubt that the number of diesel engines in use will increase as fast as funds allow. It is therefore essential that facilities for training engine drivers be provided.

Experience elsewhere suggests that a formal school, which trainees can attend for a period of several weeks, provides the best form of training. The

course should consist of instruction in the theory of diesel engine operation, routine servicing and maintenance, emergency repairs and replacement of broken or worn parts. On the practical side, it will be necessary to first teach the trainees to use tools, then how to strip, re-assemble, and adjust an engine.

I have considered the possibility of a travelling school which would visit the different atolls in turn to conduct courses but do not feel that this is a feasible proposition, the demand for such courses will be small at first and therefore a school at Malé attached to the marine workshop will be more useful.

It will be some time before a school of this kind can be set up; in the meantime, I suggest that a group of six or eight Maldivians should be trained in Ceylon. The Ceylon Government might be willing to arrange for these people to attend the Ceylon Fisheries Department School; if this is not possible, training can be arranged with a commercial organisation. Harrison's Lister might be willing to arrange this at their Colombo workshop.

In addition to the equipment which will be provided in the workshop, discussed later, the school will need a work bench and vice and small tool kit, blackboard, chairs and tables, some old engines which can be stripped for practice and a new engine or two set up to run on which adjustments can be carried out and servicing explained.

I understand that Lister Blackstone Marine are willing to provide training in engine maintenance for a small number of Maldivians at the Lister Engineering works at Dursley, Gloucester. If the Maldivian Government decides to purchase Lister engines, this offer should most certainly be accepted.

There are four possible ways of mechanising a fishing fleet.

Firstly it is possible to fit outboard engines to existing boats, this has the advantage that the engines are cheap to buy and that the existing boats can be used. It has the disadvantages that the engines have a relatively short life, are inefficient when fitted to heavy boats and, being petrol engines are expensive to operate. I do not consider that outboard engines would be of any use for fishing in the Maldives.

Secondly, it is possible to provide tugs; some boats fitted with engines tow the others. This can work well for some fisheries but would be of very limited use in the extremely mobile fishery for bonito.

Thirdly, it is possible to build new fishing boats and fit them with diesel engine (inboard petrol engines are now regarded as out-moded in most countries). Since the hulls can be designed in such a way that an engine can be fitted with no difficulty and the layout of the boat can be planned for a particular fishery. While this is the most expensive method, it is often the most satisfactory in the long run.

Lastly, it is sometimes possible to fit diesel engines in the existing fishing boats. Where this can be done it has the obvious advantages of cheapness (as against the expense of building new hulls) and the fact that the fishermen already have faith in the boat; where it is possible it is most certainly the best first step in mechanisation.

In the brief note of my recommendations which I prepared on 4<sup>th</sup> December I stated that I did not think it would be possible to fit engine in the existing boats. Since my return to this country I have discussed this problem with the Naval Architect employed by Lister Blackstone Marine who has a great deal of experience in this type of work. After examining my sketches and photographs, he gives the opinion that it should be possible to make a satisfactory engine installation in a Maldivian boat.

An associated company, Harrison's Lister Engineering in Colombo have an extensive workshop and small boat yard where an experimental installation could be made.

If a successful method of installing engines in the existing boats can be devised, this would prevent the extravagant waste that will result if the existing boats go out of use. I therefore recommend most strongly that a typical Maldivian boat, preferably a relatively new one about 32 - 36 feet in length should be shipped to Colombo as soon as possible. If the Maldivian Government wish to do this it should be possible to obtain such a boat for Rf. 6,000 (450), a suitable engine will cost 600 or slightly less.

Even if it proves possible to make the installation it will still be necessary to produce a new design as new boats will be required to replace those which are too old for engine installation and as additions to the fleet. I suggest that this should also be done at the Colombo yard of Messrs. Harrison's Lister.

Since the technique required for building powered boats is slightly different to that for building sailing craft. There would be much to be gained if a group of skilled Maldivian boat builders are attached to the boat yard, work there while the first boat is built and also if possible while the experimental installation is made in an existing Maldivian boat.

It will eventually be necessary to carry out repairs to motorboats in the Maldivian Islands and for this a small marine workshop will be required. This should be built on the water front at Malé and would consist of a building approximately 60 feet by 40 feet facing a slipway in which boats could be hauled so that repairs can be undertaken under cover, a list of the equipment to be provided is included in my estimates of costs at Appendix 9. I cannot estimate the actual cost of the building; this need not be elaborate and could well be open sided.

In such a workshop it would be possible to effect repairs to engines, to fit new engines and propeller shafts and to carry out some machining and manufacture of parts for replacements. The workshop would also be able to carry out similar work on non-marine equipment.

In my note of 4<sup>th</sup> December I mentioned the problem of fuel supply and would again urge that this question be pressed, a bulk fuel installation is essential if fuel is to be available at a reasonable price.

The question of financing a programme of mechanisation is a difficult one. The change from sailing boats to powered boats is inevitably expensive irrespective of whether existing boats are fitted with engine or whether new ones must be built. Fishing boat owners cannot generally afford to finance engine purchase themselves and I suggest that a loan fund be set up, to be administered by the Fisheries Board.

Since bulk purchase of engines will be cheaper than single purchases the Board would buy the engines and the owner would receive an engine, not the cash with which to buy it.

Where an engine is to be fitted to an existing boat the Board would pay for this when engine trials have been completed to the owners' satisfaction. In some cases, the owners would no doubt finance the installation themselves.

When a new boat is to be constructed, progress payments would be made.

It is reasonable to expect a boat owner to pay off a loan over a period of three years. Loans should bear an interest of 6% per annum on the outstanding balance of the loan; the first payment being made six months after the boat is delivered.

I would suggest that generally speaking quarterly payments would be most suitable. Fishing is a seasonal occupation, providing a seasonally fluctuating income and allowance should be made for this in calculating repayments from owners in the various atolls as it would be easier for an owner to make repayments at the end of a good fishing season than at the end of a period when fishing has been poor.

There is an alternative in the case of boats catching bonito; since the Government has a monopoly over the purchase of Maldivian fish, it would be possible for the Government to recover a loan by taking a percentage of the owner's Maldivian fish. This could be arranged through the atoll headmen.

The question of default of repayment has to be considered. I would suggest that when new boats are purchased these should remain the property of the Maldivian Government until paid for by the owner. When an engine is to be supplied for an existing boat it would be possible for the owner to mortgage his boat to the Government, hire purchase of the engine alone does not provide an adequate safeguard since the recovery of a used engine in case of default would be useless. I would not expect failure to repay a loan to be such a serious problem here as in most other countries unless exceptionally bad fishing seasons are experienced, in normal cases a boat owner will only default if he fails to keep his boat fishing.

It will cost approximately 800 to engine an existing boat if this proves practicable, approximately 1,875 to build a new boat in Colombo (after the first at 2,250) and a lesser sum when building new boats in the Maldives. There will be a limit to the rate at which engines can be fitted and drivers trained. Perhaps at most five boats per month could be dealt with during the first year.

It would seem therefore that a sum of 100,000 would be adequate to finance the first two years operations. The functioning of the fund should most certainly be reconsidered at the end of one year's working.

This fund should only be set up when it has been proved that powered boats can be used economically in the pole fishery or that drift netting is productive but requires powered boats to be fully efficient.

### 8.5 Preparation of Maldivian Fish

Maldivian fish enjoys an excellent market in Ceylon where it is rationed and fetches a relatively high price compared with other dried fish.

It is therefore important that if any changes in the processing are contemplated these must not affect the flavour of the final product.

It would seem that it will be possible to handle considerably larger catches of bonito than are landed at present with the existing crude facilities and I do not think it is necessary at this stage to contemplate the erection of better facilities in the form of small factories in the immediate future.

If, however, purse seine are introduced successfully we can expect large quantities of bonito to be landed at one time. It would then be worthwhile to erect small factories to handle the processing. Since the purse-seiners envisaged at present will not have freezing equipment and will not carry ice as no ice is now available in Malé it will be necessary to cook and smoke the catch quickly. Once the fish has been cooked and smoked it will not deteriorate as rapidly as fresh fish, it must be dried as rapidly as possible however. This is easy during bright sunny weather and difficult in cloudy or rainy conditions. The factory must therefore provide for drying fish in these conditions.

Obviously, no factory can be designed unless one has a fairly accurate idea of the quantity of fish it might have to handle and therefore I make no estimates for this at present.

I do suggest however that if factory scale production is needed to replace the present cottage level production the factories should embody the following features: -

1. Sited close to the waterfront, so that the fish can be moved easily from boat to factory and piped seawater laid on.
2. Wooden topped filleting tables.
3. Concrete washing tanks with piped seawater.

4. Iron cooking tank fitted with metal basket trays, in which the fillets would be cooked and heated with kerosene pressure stoves or diesel oil stoves.
5. Torry type controlled smoking kilns fitted with heaters for mechanical dryers for use when sun drying is impossible.

If such factories become necessary, a small fishmeal plant would be a useful accessory to produce meal from the offal.

Since fuel is in short supply in some atolls, I suggest the purchase of five sets of paraffin pressure stoves for trials. Messrs. T.E. Bladen & Son Ltd. of Northwood Street, Birmingham, at my request have produced a diagram of a suitable stove, which is appended, their quotation is 40 for one stove, (Appendix 12).

It would also be worthwhile to experiment now with a Torry kiln so that the smoking technique with this is learned and its operations costs in case it becomes necessary later on to go into factory production of Maldive fish.

#### 8.6 Preservation of Fish at Sea

No attempts are at present made to preserve the catch at sea, fish, which will be processed to Maldive fish, is almost invariably landed within a few hours of being caught. I was told that in the northern atolls fishermen sometimes travel some distance to sea and are becalmed and therefore lose their catch, this will not happen once motor boats are employed.

Since the catch is landed within a few hours of being caught and does not deteriorate beyond the point at which it would become unsuitable for processing to Maldive fish I do not expect that ice will be required by the pole fishing boats even when this fleet is mechanised.

Purse-seiners will not be able to operate on the same fishing grounds as the pole boats without friction between the crews. They may therefore have to make longer trips than the pole fishermen. Of the three possible ways of preserving their catch at sea, i.e., quick-freezing, brine chilling and iced seawater, the latter would be the cheapest.

If a drift netting fleet is built up and part of the catch is to be quick frozen this part of the catch at least must be landed in perfect condition if ice is

carried. Cray fish would be landed alive having been kept in a live well or live box.

No ice is at present available even in Malé. There is no present need for it, a need for it may well develop in the future however and in planning the extension of drift netting and purse-seining the Fisheries Board must allow for this. In other words, these boats will have to operate as fleets from bases at which ice can be made available.

It has been suggested that the processing of Maldive fish should start at sea. It would obviously be possible to take the process only to the cooking stage. Cooked fish will certainly keep longer than fresh fish but once cooked it becomes fragile and needs careful handling. I do not think it would be possible to commence processing at sea on any worthwhile scale and in any case consider that it is unreasonable to expect a crew, which has been fishing all day in an open boat in tropical conditions to undertake the extra work involved.

#### 8.7 Freezing Fish

There is a small but growing market in Ceylon for frozen fish, in 1959 Ceylon imported 384 cwt. valued at Rf. 58,679. In the first ten months of 1960 the import figures were 920 cwt. valued at Rf. 116,760. The bulk of these supplies comes from the United Kingdom but in 1960 frozen fish was imported from Japan for the first time.

It would appear that the local (as opposed to the European) population of Ceylon is becoming accustomed to purchasing frozen fish and that this market will increase in importance.

At present retail prices in Ceylon are:-

Frozen seer fish Rf. 2.60 lb.

Frozen lobster (crayfish) Rf. 2.50 lb.

Frozen "mullet" (snapper & c) Rf. 1.60 lb.

There would appear to be a good market for frozen seer and for snapper. The so-called lobster does not offer a good market in Ceylon but there is the possibility of marketing frozen crayfish (lobster) tails in America.

At present seer fish is not available for export in large quantities in the Maldives, the tuna long line at Faadhippolhu had been catching seer fish

when I visited the atoll and I expect drift net to catch this fish. Snapper can be caught in quantity by handlining or by using unbaited fish pots, whether this cheaper fish will bear the cost of freezing, cold storage and transport can only be decided after trials.

Before any freezing experiments are made it will be necessary to prove that seer fish and crayfish can be caught in quantities large enough to make export a paying proposition. I do not think a quick freezing industry can be based on snapper or the other cheaper grades of fish at present available.

If these more valuable fish can be caught in larger quantities I suggest that a one-ton quick freezing plant should be erected at Malé and a one-ton cold store fitted in the Maldivian Star. This would enable the Fisheries Board to carry out trials and assess the economics of the operation. I would suggest freezing fish, cleaned and beheaded, in polythene bags and freezing crayfish tails in waxed cartons. The frozen fish would be taken off to the Maldivian Star in insulated containers and off loaded in Ceylon in similar containers. The cold store in the Maldivian Star could perhaps be used to bring chilled foods to Malé, whether frozen or chilled cargoes can be found for her other runs is more doubtful. The cold store could be removed after the trials if these, while otherwise successful, show that the space is not paying its way in the Maldivian Star – a ton of seer will be worth only about Rf. 4,000.

This type of operation can only be profitable if freezing plants and cold stores, erected in the outlying atolls can be cleared at regular intervals. This will only be possible if a vessel equipped with cold storage space and capable of making trips from Ceylon to the Maldives in any weather is purchased. It would also be necessary for cold storage space to be available in Ceylon, close to the waterfront. This might be hired, possibly at Mutwal.

All this sounds expensive and is. That is why I feel that the Maldivians should concentrate most of their energies on increasing the production of Maldivian fish. Freezing trials should only be carried out when it has been proved that good quality fish can be caught regularly in quantity. Freezing will only be a commercial possibility if the trials prove that a good quality product can be achieved and marketed.

If it can be shown that suitable fish available for freezing a group of three Maldivians should be trained to quick freeze and store fish in Ceylon. This could be arranged through the Ceylon Fisheries Department, which has a freezing plant and store at Mutwal, or through a commercial organisation. If

this stage is reached it would be advisable to train a refrigeration engineer, this man could best be trained at the Dartford works of J. & E. Hall & Co., if they are prepared to accept him.

### 8.8 Fish Canning

In my brief note of recommendations, I said "I do not see this as an economic proposition in view of the difficulty of finding a market for the product."

Ceylon imports in 1959 and the first ten months of 1960 were: -

1959 – 86,101 cwts. valued at Rf. 7,391,364

1960 – 98,776 cwts. valued at Rf. 7,759,478

In 1959 most of the import was from Japan and South Africa, in 1960 the Japanese import remained at the same level, twice as much was imported from South Africa and imports from China showed a big increase.

These imports consisted chiefly of canned mackerel, white tuna and salmon from Japan and mackerel pike and pilchards from South Africa. Some tinned herrings were also imported.

In the Maldives no salmon or clupeid fish such as herrings or pilchards are available. The so-called white meat tunas are not caught in any quantity.

It would be possible for bonito to be canned in the Maldives but the product would be difficult to market.

It would be possible for some of the clupeids sold as bait fish to be canned as white bait. They are needed as live bait however and this would be a particularly difficult product to market.

The countries which are exporting canned fish to Ceylon all have large supplies of cheap fish regularly available and all can operate on a large scale with fully mechanised factories which lower production costs. They also have cheap supplies of oil or sauce making materials available in which the fish is tinned.

It is for these reasons that I consider canning unlikely to be profitable in the Maldives.

## 8.9 Berthing and Navigational Facilities

The harbour at Malé is extensive and is adequate for the sailing craft at present in use. It will also be adequate for motorboats of the size envisaged for the pole fishing fleet.

I would suggest however that the Maldivian Government should consider developing the western arm of the harbour as a fishing harbour. This would imply siting the marine workshop and any fish products factories, which may be built there, and also the building of a small jetty alongside which the fishing boats would unload their catches.

There does not appear to be any need for guiding lights or other navigational aids at Malé for the fishing fleet.

I am not familiar with the conditions in other islands as my experience is limited to a brief visit to Faadhippolhu atoll and a single low level flight over the south eastern chain of Atolls. My general impression is that outside Malé harbour facilities exist but are not quite so good as at Malé, they will be adequate for small motorboats. Where no harbour walls exist, I suggest that permanent moorings should be laid for motorboats since it will be more difficult to haul these out if bad weather is experienced.

Because hauling out as a protective measure will be more difficult than with sailing boats and because small fuel dumps will be required in any atoll, where motorboats come into use I suggest that the Fisheries Board should carry out a survey of existing facilities and decide where and how these require improvement.

## 8.10 The Marketing of Live Marine Aquarium Fish

This is certainly on the fringe of my brief if not completely outside it.

Anything, which can increase foreign currency earnings, is valuable to the Maldives however and the sale of marine aquarium fish is a possible source of such earnings.

There is an ever-growing market in America and Europe for marine aquarium fish of the species available over the coral reefs in the Maldives. I recommend that the Fisheries Board should investigate this market and find out what species are most in demand and which can be supplied.

No expensive equipment would be required as fish can be kept in boxes in the lagoons until shipped, they would be shipped under oxygen in plastic bags in insulated containers and could be sent out either by sea or by air to Ceylon. Storage facilities in Ceylon would be required and from Ceylon the fish would be air freighted. There is certainly scope for a small commercial enterprise.



## Appendix 1.

### LIST OF MALDIVIAN GOVERNMENT OFFICIALS AS AT 15.11.60

Prime Minister	Hon. Mr. Ibrahim Nasir
Acting Prime Minister	Hon. Mr. Ibrahim Rasheed
Minister for the Department of Justice	Hon. Mr. Hassan Zareer
Deputy Minister for the Department of Justice	Mr. Ali Ahmed
Minister of Home Affairs	Hon. Mr. Ibrahim Rasheed
Deputy Minister of Home Affairs	-
Acting Deputy Minister of Home affairs	Mr. N.T. Hassan Didi
Minister of Finance	Hon. Mr. Ibrahim Nasir
Deputy Minister of Finance	Mr. Adam Naseer Maniku
Minister of Education	Hon. Mr. Ibrahim Nasir
Deputy Minister of Education	-
Acting Deputy Minister of Education	Hon. Mr. Faarooq Ismail
Minister of Public Endowments	Al-Sheikh Ibrahim Rushdy
Deputy Minister of Public Endowments	Mr. Jaufaru Kamaaluddeen
Minister of Health	Hon. Mr. Ahmed Hilmy Didi
Deputy Minister of Health	Mr. Hussein Ali Didi
Minister of Trade and Commerce	Hon. Mr. Ahmed Zaki
Deputy Minister of Trade and Commerce	Mr. Samshudheen Hilmy
Acting Deputy Minister of Trade and Commerce	Mr. Mohamed Ibrahim Didi
Minister for the Department of External Affairs	Hon. Mr. Ibrahim Nasir
Deputy Minister for the Department of External Affairs	Mr. Abdulla Khaleel
Acting Deputy Minister for the Department of External Affairs	Hon. Mr. Faarooq Ismail
Minister for the Department of Public Safety	Hon. Mr. Ibrahim Nasir
Deputy Minister for the Department of Public Safety	Mr. Adam Naseer Maniku
The President of Municipal Council	Mr. Abdul Majeed Mahir
Post Master General	Mr. Abdul Majeed Mahir
Passport officer	Mr. Ahmed Ali Didi
The Principal Collector of Customs	Mr. Hassan Ali Didi
W/T Officer	Mr. Doshee Seedi

## ATOLL CHIEFS

1	Thiladhunmathi (Northern Part)	Mr. Mohamed Zahir
2	Thiladhunmathi (Southern Part)	Mr. Ali Kalegefan Kuda Tuttu
3	Miladhunmadulu (Northern Part)	Mr. Mudimu Kuda Maniku
4	Miladhunmadulu (Southern Part)	Mr. Al-Sheikh Ahmed Shathir
5	Maalhosmadulu (Northern Part)	Mr. Maizan Mohamed Maniku
6	Maalhosmadulu (Southern Part)	Mr. Manaage Saeed
7	Faadhippolhu	Mr. Ahmed Shafeeq
8	Malé Atoll	Mr. Ibrahim Haleem
9	Ari Atoll	Mr. Malan Dontuttu
10	Felidhe Atoll	Mr. Hassan Adam Maniku
11	Mulakuatholhu	Mr. Ahmed Mufeed
12	Nilandhe Atoll (Northern Part)	Mr. Mohammed Hassan
13	Nilandhe Atoll (Southern Part)	Mr. A.D.T. Mohammed Fulhu
14	Kolhumadulu	Mr. Tuttidi Don Maniku
15	Hadhhdhunmathi	Mr. Hussein Sabri
16	Huvadhu Atoll	-
17	Foamulaku Atoll	-
18	Add Atoll	-

## MEMBERS OF FISHERIES ADVISORY BOARD

- |    |                                |                                 |
|----|--------------------------------|---------------------------------|
| 1  | Thiladhunmathi (Northern Part) | -                               |
| 2  | Thiladhunmathi (Southern Part) | Mr. Himitheege Seedi            |
| 3  | Miladhunmadulu (Northern Part) | Mr. Tinu Ali Fulhu              |
| 4  | Miladhunmadulu (Southern Part) | Mr. Sayyid Saeed                |
| 5  | Maalhosmadulu (Northern Part)  | Mr. Adam Hassan Maniku          |
| 6  | Maalhosmadulu (Southern Part)  | Mr. Mohammed Ahmed Didi         |
| 7  | Faadhippolhu                   | Mr. Maduge Kuda Dontuttu        |
| 8  | Malé Atoll                     | Mr. Abdulla Hameed              |
| 9  | Ari Atoll                      | Mr. Edhuru Dontuttu Didi        |
| 10 | Felidhe Atoll                  | Mr. Mas Odi Kuda Mohammed Fulhu |
| 11 | Mulaku Atoll                   | Mr. Ali Shareef                 |
| 12 | Nilandhe Atoll (Northern Part) | Mr. Hilihilaage Mohammed Didi   |
| 13 | Nilandhe Atoll (Southern Part) | Mr. Velidooqe Moosa Didi        |
| 14 | Kolhumadulu                    | Mr. Dapparu Moosa Maniku        |
| 15 | Hadhdhunmathi                  | Mr. Ahmed Jaleel                |
| 16 | Huvadhu Atoll                  | Mr. Ibrahim Zaki                |
| 17 | Foamulaku                      | Mr. Mugurige Donmaniku          |
| 18 | Addu Atoll                     | Mr. Kuda Ahmed Kalegefan        |
| 19 | Malé                           | Hon. Mr. Ibrahim Fareed Didi    |

## MEMBERS OF COIR AND COWRIES ADVISORY BOARD

- |    |                                |                            |
|----|--------------------------------|----------------------------|
| 1  | Thiladhunmathi (Northern Part) | Mr. Jaaria Moosa Kalegefan |
| 2  | Thiladhunmathi (Southern Part) | Mr. Bodibath Dontuttu      |
| 3  | Miladhunmadulu (Northern Part) | Mr. Mohammed Luthfi        |
| 4  | Miladhunmadulu (Southern Part) | Mr. Kudakoi Donmaniku      |
| 5  | Maalhosmadulu (Northern Part)  | -                          |
| 6  | Maalhosmadulu (Southern Part)  | Mr. Naibuge Lhatuttu       |
| 7  | Faadhippolhu                   | Mr. Bilaal Tuttu Maniku    |
| 8  | Malé Atoll                     | Mr. Ahmed Kamaal           |
| 9  | Ari Atoll                      | Mr. N.T. Mohammed Didi     |
| 10 | Felidhe Atoll                  | Mr. Kuda Ibrahim Maniku    |
| 11 | Mulaku Atoll                   | Mr. Mohammed Thaufeeq      |
| 12 | Nilandhe Atoll (Northern Part) | Mr. Malinge Don Deedi      |
| 13 | Nilandhe Atoll (Southern Part) | Mr. Ahmed Riza             |
| 14 | Kolhumadulu                    | Mr. Abdulla Jameel         |
| 15 | Hadhdhunmathi                  | Mr. Mas Odi Ibrahim Fulhu  |
| 16 | Huvadhu Atoll                  | Mr. Sayyid Abbas           |
| 17 | Foamulaku                      | -                          |
| 18 | Addu Atoll                     | Mr. Ismail Abdulla         |

Appendix 2.

1959: AVERAGE CATCH PER BOAT PER MONTH BY ADMINISTRATIVE DISTRICTS.  
Based On Statistics Compiled by the Fisheries Board

District	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Thiladhunmathi S.	2189	1436	583	316	61	1278	252	170	258	227	378	1236
Thiladhunmathi N	4205	1991	687	301	225	309	691	355	366	406	354	1339
Miladhunmadulu S	1342	637	443	309	435	540	588	434	997	431	442	513
Miladhunmadulu N	2127	1495	42	0	483	2082	931	456	7492	904	1123	413
Maalhosmadulu S.	1942	1142	315	441	484	343	681	417	388	288	545	1617
Maalhosmadulu N.	1245	1318	607	270	235	337	684	708	729	172	926	1227
Faadhippolhu	929	815	707	399	493	497	743	704	565	504	1243	1411
Malé Atoll	365	905	674	1444	1199	432	781	865	496	438	567	558
Ari Atoll	1303	974	603	662	523	709	1352	529	170	549	276	284
Felidhe	1868	1614	1498	1150	1268	1485	4057	1278	75	852	1239	636
Mulaku	88	179	399	416	216	182	493	159	32	563	881	253
Nilandhe S.	414	585	680	1121	414	0	365	455	124	314	350	500
Nilandhe N.	1512	963	254	1007	202	597	683	784	188	478	380	282
Kolhumadulu	895	395	375	406	847	611	1810	860	345	225	347	978
Hadhdhunmathi	2676	1203	425	1396	782	408	2503	345	306	486	551	39
Malé Island	-	-	-	-	-	157	913	845	638	1087	1438	638
Number of boats Fishing.	878	832	768	723	698	752	808	853	794	855	899	1034
Average catch for Maldivé Islands	1656	1045	518	588	498	691	1025	565	1369	479	733	921

Appendix 3: RETURNS SHOWING ACTUAL NUMBER OF FISH CAUGHT AND NUMBER OF BOATS FISHING IN EACH MONTH (JAN-JUNE) IN 1959.

Atolls	B.E	January		February		March		April		May		June	
		B.F	F.C.	B.F	F.C.	B.F	F.C.	B.F	F.C.	B.F	F.C.	B.F	F.C.
Thiladhunmathi S.	176	90	197048	61	87606	91	53081	80	25318	51	3148	14	17897
Thiladhunmathi N.	116	54	227092	64	127408	59	39674	30	9024	17	3830	24	7423
Miladhunmadulu S.	81	59	79148	51	32504	37	16401	24	7421	14	6087	35	18904
Miladhunmadulu N.	119	75	159529	51	76261	3	127	-	-	16	7723	100	208201
Maalhosmadulu S.	143	124	240837	121	138138	116	36592	113	49835	108	52257	114	39124
Maalhosmadulu N.	86	64	79650	61	80471	56	34020	55	14865	66	15536	70	23570
Faadhippolhu	114	92	85485	82	66837	80	56652	87	34740	84	41457	84	41753
Malé Atoll	64	18	6568	28	25324	26	17517	18	26004	24	28795	49	21176
Ari Atoll	103	75	97731	55	53562	35	21124	33	21858	29	15160	23	16320
Felidhe Atoll	21	14	26159	15	24214	15	22470	17	19555	20	25360	21	30620
Mulaku Atoll	68	39	3435	42	7536	47	14080	55	22922	59	12727	53	9642
Nilandhe S.	38	26	10751	36	21060	32	21574	34	38122	31	12823	2	-
Nilandhe N.	53	28	42339	44	42316	47	11958	47	47310	39	7872	27	16143
Kolhumadulu	99	69	61756	72	28499	72	26968	75	30451	83	70273	78	47647
Hadhdhunmathi	67	51	136504	49	58940	52	22097	55	76820	57	44550	47	19177
Huvadhu Atoll	-	-	-	-	-	-	-	-	-	-	-	-	-
Foamulaku	-	-	-	-	-	-	-	-	-	-	-	-	-
Addu Atoll	-	-	-	-	-	-	-	-	-	-	-	-	-
Malé Island	29	-	-	-	-	-	-	-	-	-	-	11	1726
Total			1454232		869676		398335		424245		347598		519323

**RETURNS SHOWING ACTUAL NUMBER OF FISH CAUGHT AND NUMBER OF BOATS  
FISHING IN EACH MONTH (JULY-DECEMBER) IN 1959.**

Atolls	July		August		September		October		November		December	
	B.F.	F.C.	B.F.	F.C.	B.F.	F.C.	B.F.	F.C.	B.F.	F.C.	B.F.	F.C.
Thiladhunmathi S.	15	3774	35	5961	67	17252	92	20856	146	55190	155	191622
Thiladhunmathi N.	23	15884	28	9939	25	9163	31	12597	64	22643	99	132557
Miladhunmadulu S.	41	24133	43	18655	40	39863	45	19400	43	19023	61	31321
Miladhunmadulu N.	110	102389	111	50658	104	779136	108	97620	105	117912	78	32221
Maalhosmadulu S.	114	77712	120	50003	120	46641	121	34773	120	65437	123	198859
Maalhosmadulu N.	73	49956	80	56624	78	56876	72	12377	74	68528	83	101881
Faadhippolhu	88	66399	81	57021	84	47449	87	43840	91	113121	90	126956
Malé Atoll	48	37465	41	35474	36	17850	39	17095	52	29488	52	29013
Ari Atoll	33	44624	36	19052	17	2889	10	5488	34	9361	35	9947
Felidhe Atoll	15	60858	15	19175	15	1124	12	10221	20	25789	16	10180
Mulaku Atoll	56	27623	56	8905	41	1311	58	32627	57	50197	50	12626
Nilandhe S.	22	8028	27	122842	21	2599	22	6907	27	9461	22	11009
Nilandhe N.	30	20505	30	23508	23	4325	35	16726	44	16721	32	9016
Kolhumadulu	80	144816	85	73083	65	22439	71	15981	71	24673	77	72283
Hadhdhunmathi	50	125162	46	15854	44	13454	40	19455	38	20949	49	1979
Huvadhu Atoll	-	-	-	-	-	-	-	-	-	-	-	-
Foamulaku	-	-	-	-	-	-	-	-	-	-	-	-
Addu Atoll	-	-	-	-	-	-	-	-	-	-	-	-
Malé Island	20	19268	19	16065	14	8932	13	14138	13	18697	12	7658
Total		828596		482261		1077303		389901		667190		960928

Reference: B.E. Number of boats exist. B.F. Total of boats that went fishing. F.C. Total of fish that are caught

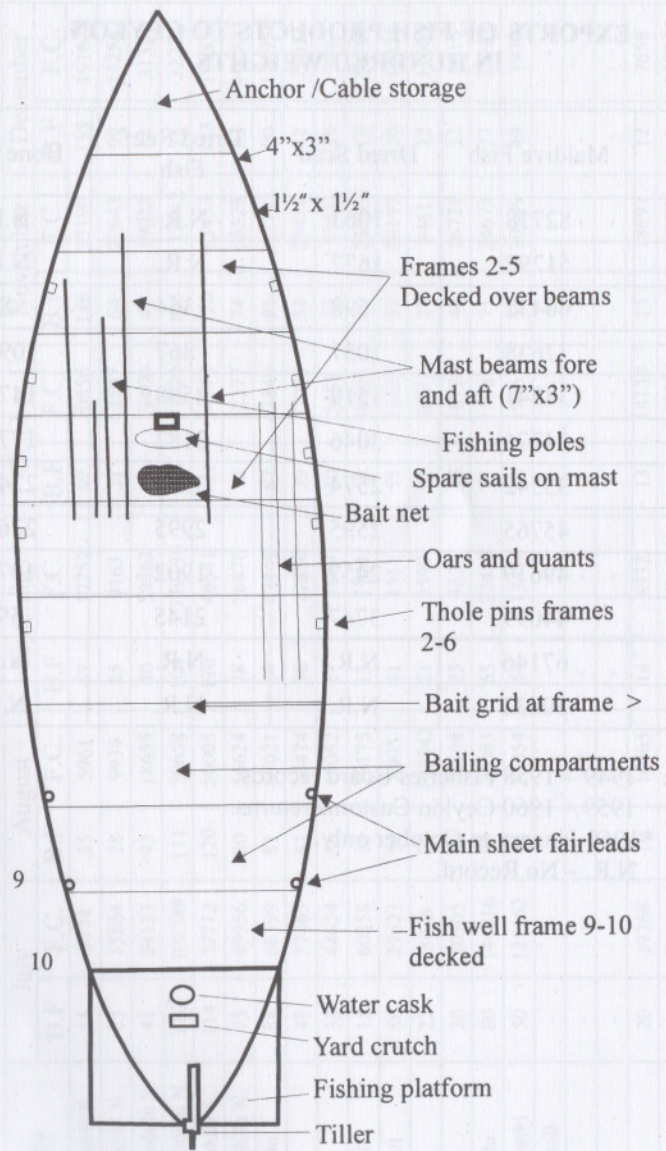
64

**EXPORTS OF FISH PRODUCTS TO CEYLON,  
IN HUNDRED WEIGHTS.**

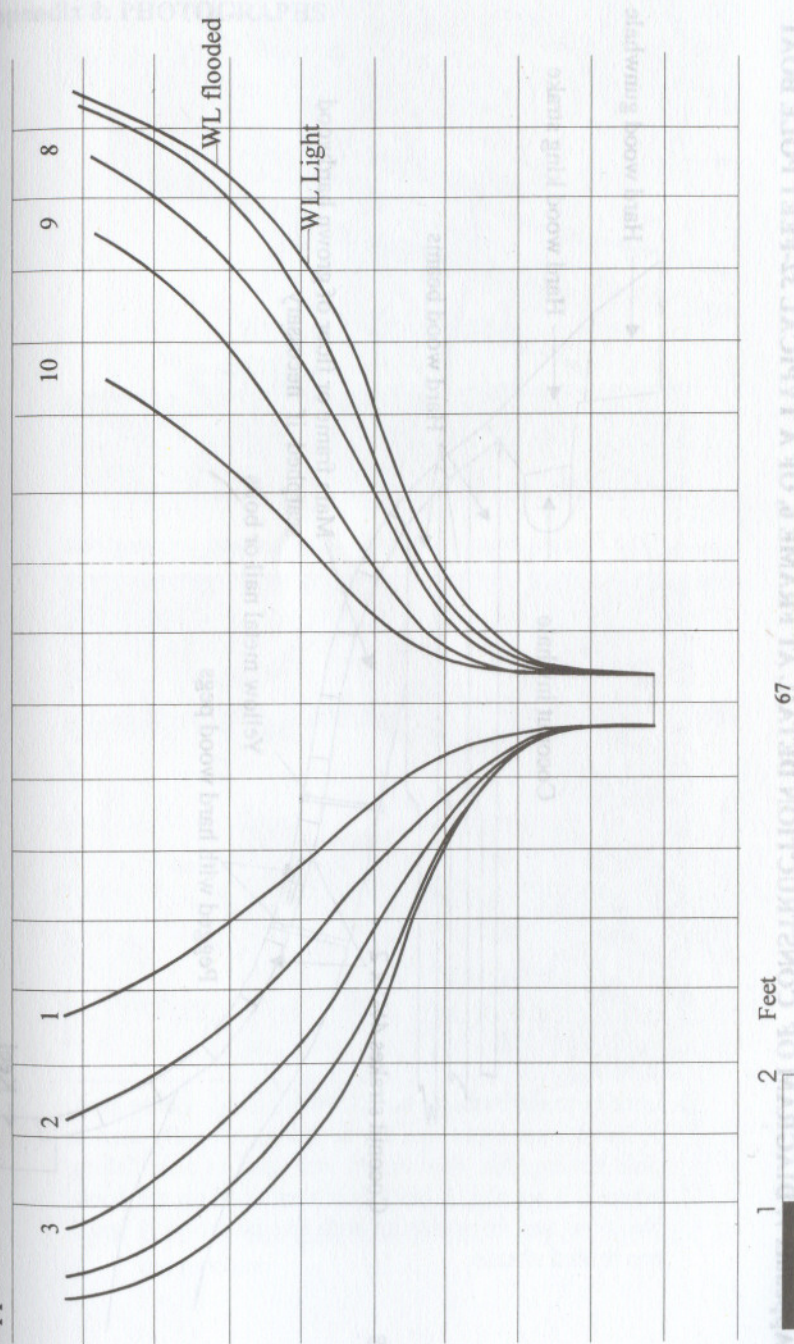
Year	Maldivé Fish	Dried Scad	Dried Reef Fish	Bone Dust
1949	82718	1063	N.R.	N.R.
1950	51292	1677	N.R.	N.R.
1951	40432	598	364	846
1952	37638	1057	867	10921
1953	34841	1519	2508	14737
1954	34776	3046	3182	17756
1955	35342	2574	3568	22453
1956	45765	2595	2995	22605
1957	49619	2457	1902	10738
1958	44099	3747	2145	5953
1959	67146	N.R.	N.R.	N.R.
1960*	50833	N.R.	N.R.	N.R.

Source: 1949 - 1958 Fisheries Board records.  
1959 - 1960 Ceylon Customs returns.  
\*1960 January to October only.  
N.R. - No Record.

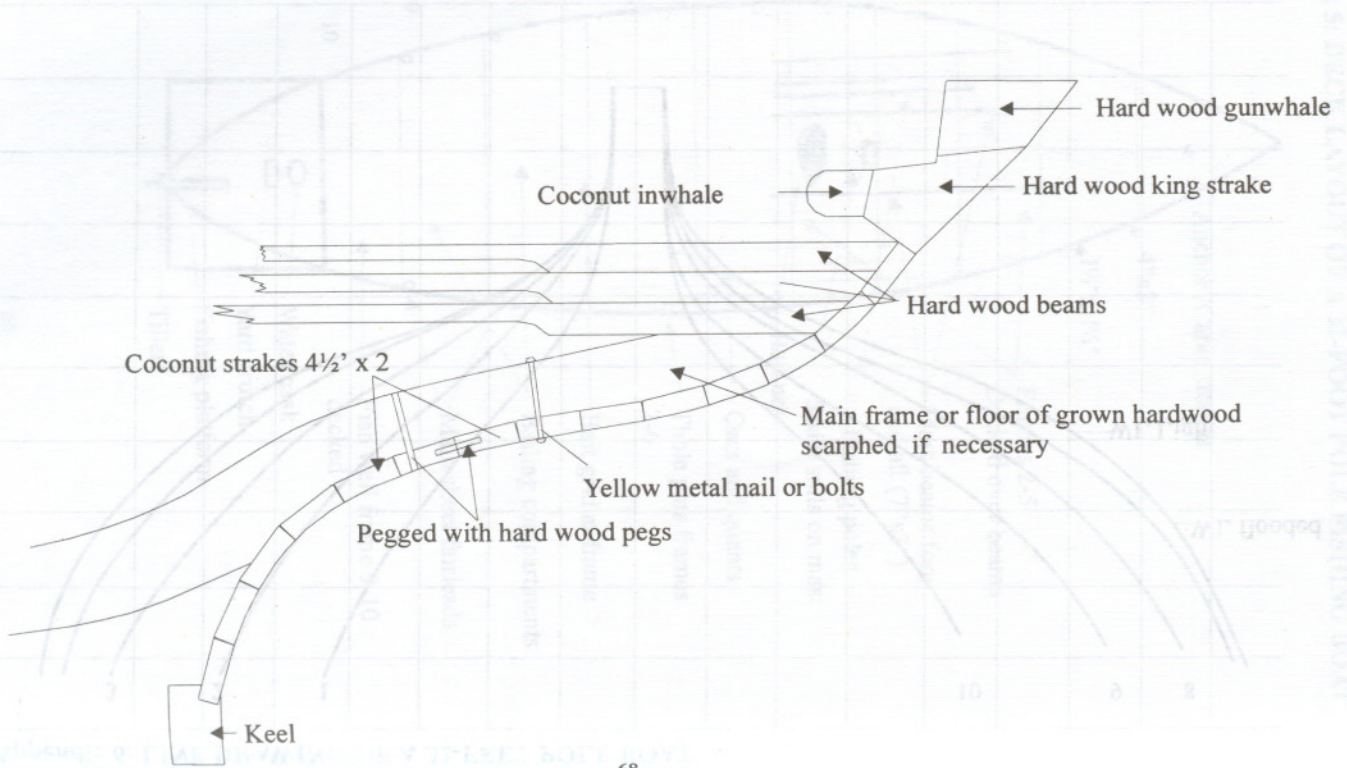
## Appendix 5: DECK LAYOUT OF A 32-FOOT POLE FISHING BOAT



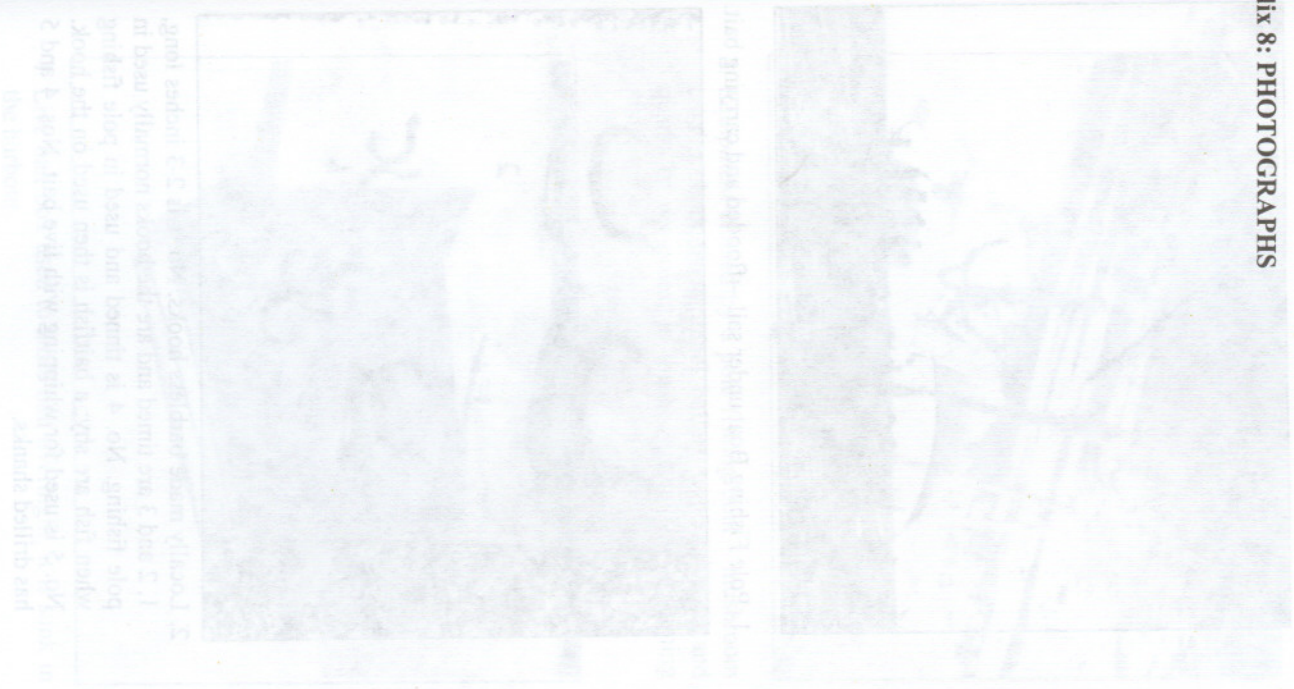
## Appendix 6: LINE DRAWING OF A 32-FOOT POLE BOAT

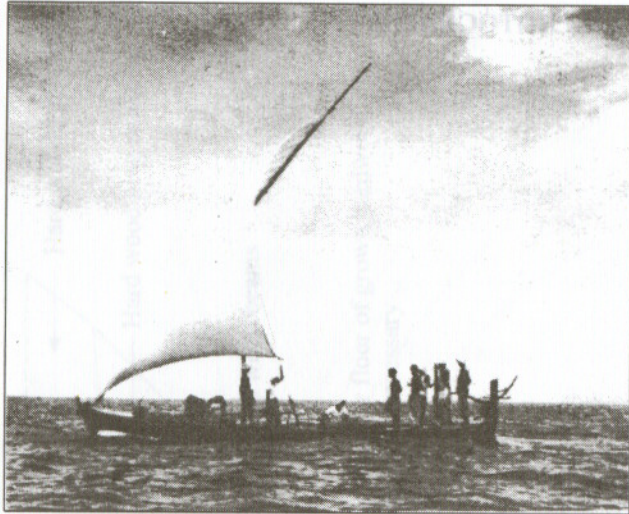


**Appendix 7: DIAGRAM OF CONSTRUCTION DETAIL AT FRAME 6, OF A TYPICAL 32-FOOT POLE BOAT**

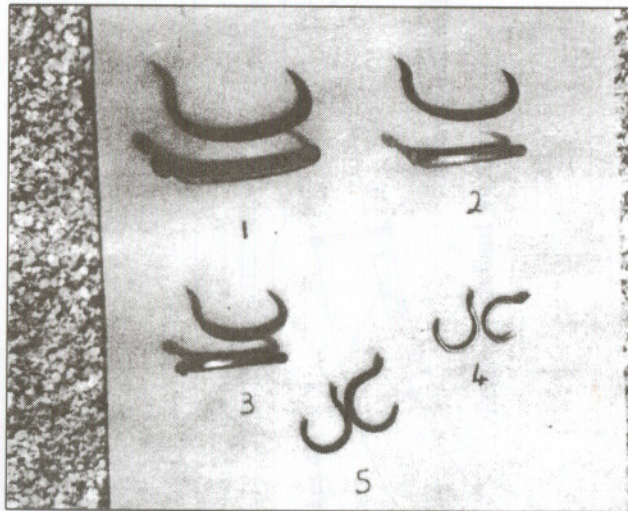


**Appendix 8: PHOTOGRAPHS**





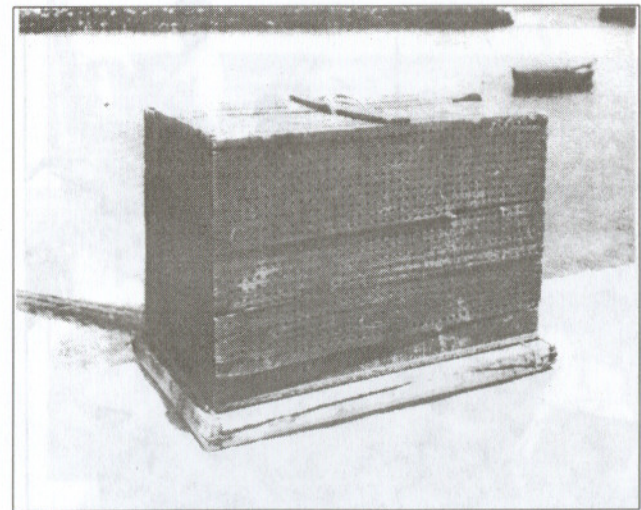
1. Pole Fishing Boat under sail – flooded and carrying bait.



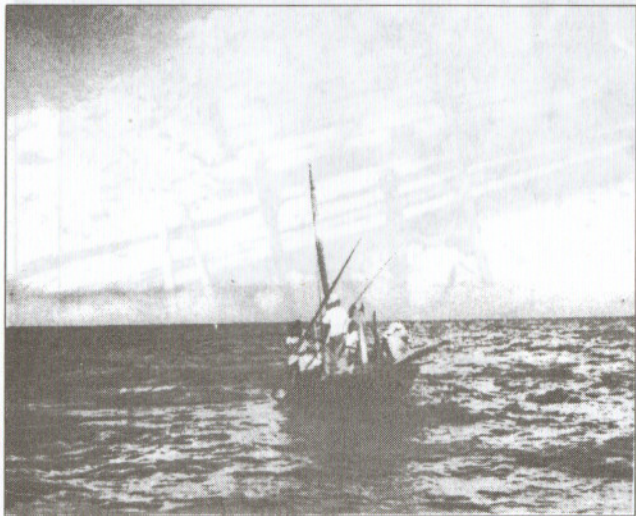
2. Locally made barbless hooks. No. 1 is 2-3 inches long, 1, 2 and 3 are tinned and are the hooks normally used in pole fishing. No. 4 is tinned and used in pole fishing when fish are shy; a baitfish is then used on the hook. No. 5 is used for whipping with live bait. Nos. 4 and 5 has drilled shanks.



3. Equipment carried by a pole fishing boat – mushroom coral anchors, iron grapnel, bailers, water splashes and quants or net poles; in the background is the fishing platform.



4. Live bait box used to store bait overnight, it is sunk in the harbour.



5. Boat moored and fishing for bait with lift net.



6. Bait net spread.



7. Bait net lifted, the bait can be seen in the mid foreground, the hull is already flooded.

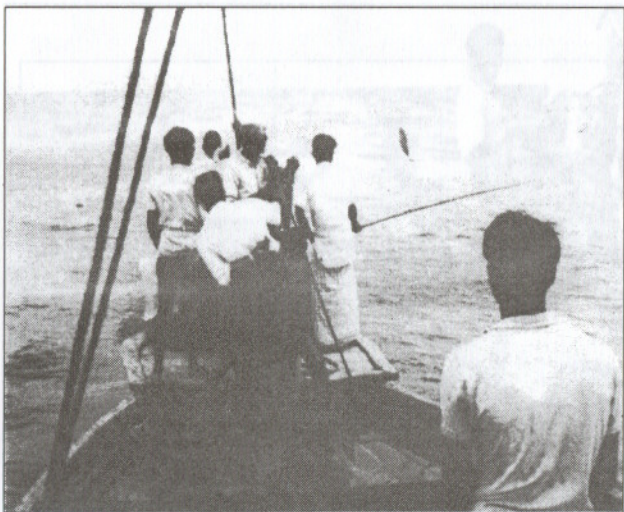


8. Method of bailing.





9. Fishing. The water spray and surfacing fish are obvious as is the hooked fish.



10. Fishing.



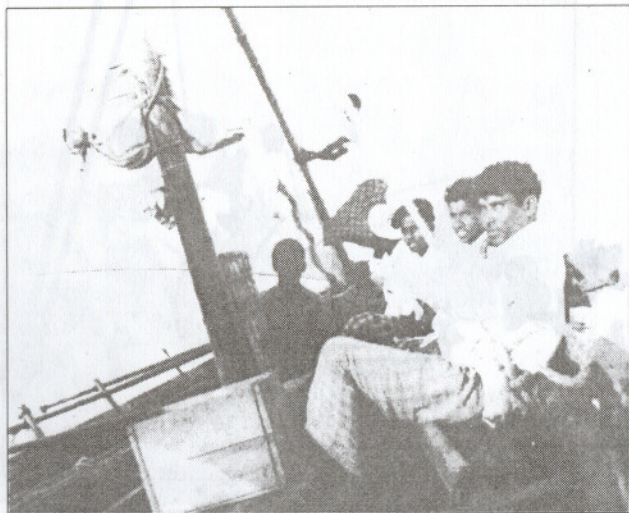
11. Fishing – bait scoop at left.



12. Fishing. Crew positions. This is a small crew – 8 men only and only two poles appear to be in use, sail bag on mast, bait net drying on mast.



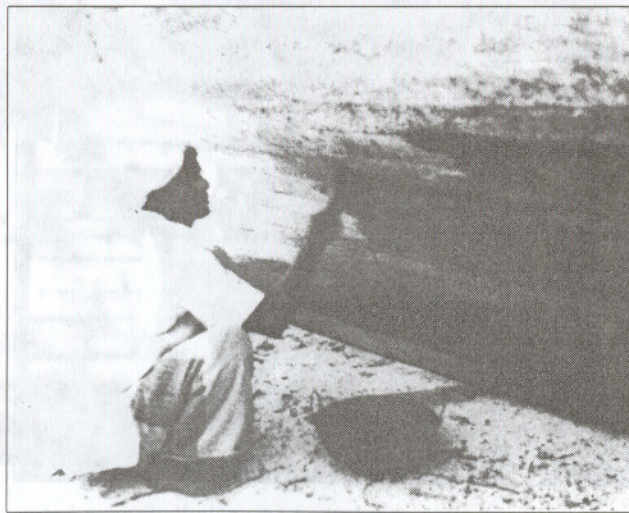
13. Under oars.



14. Under sail.



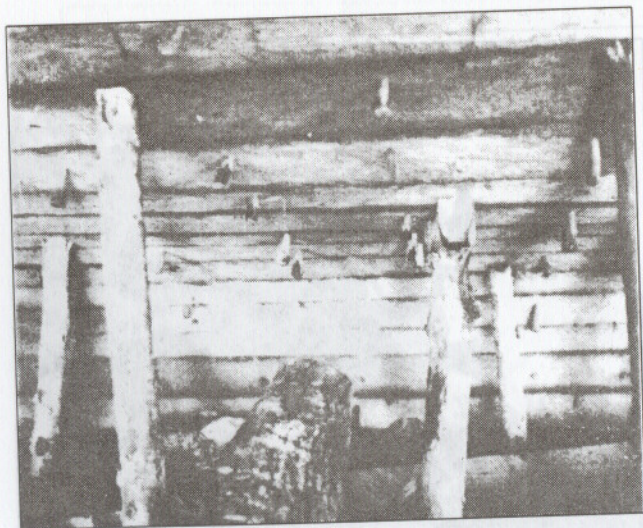
15. Boat careened for cleaning – breaming – burning off to clean and dry the hull.



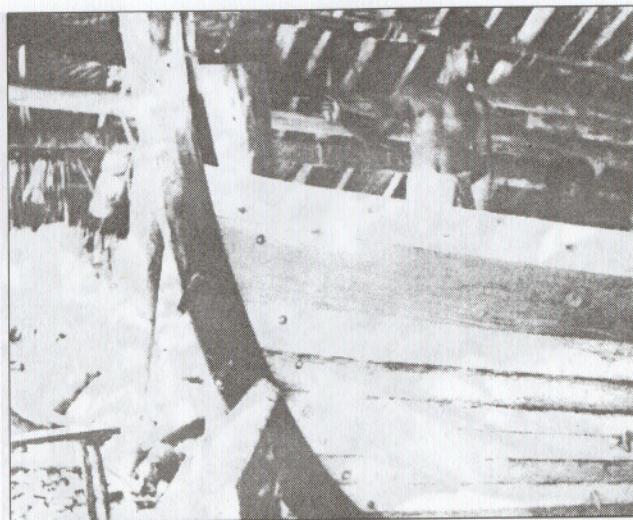
16. Boat careened for cleaning – painting with shark liver oil. Note butt joined planks.



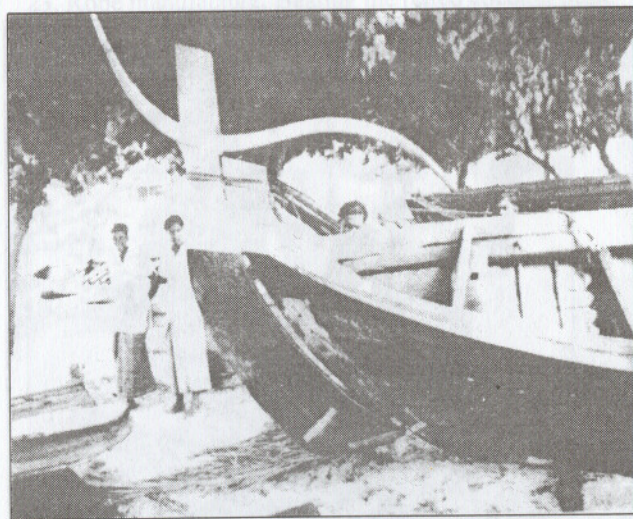
17. A small boat in the planking up stage (Photograph by Mr. H. A. Artington Davy).



18. A view of part of the planked up hull, frames being pegged in position.



19. Bow detail.



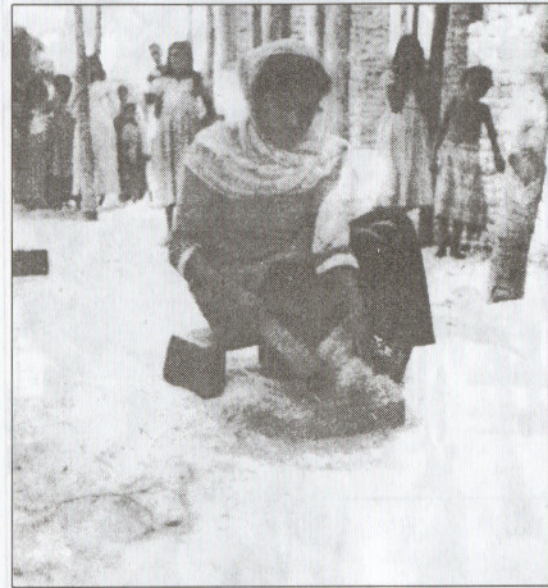
20. Stern detail, method of hanging rudder.



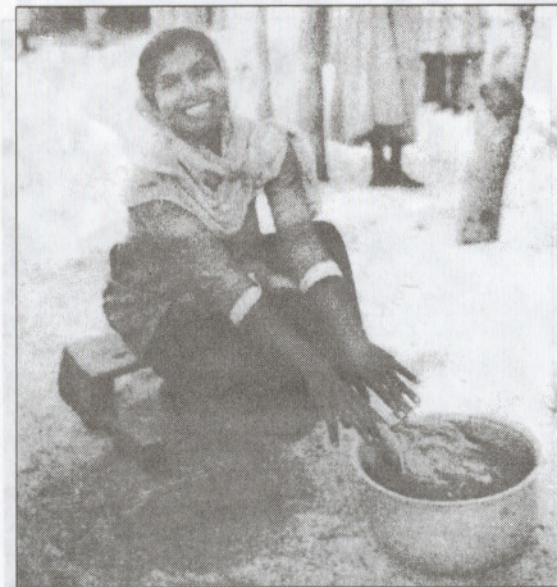
21. The simple lathe used for turning posts, tillers etc.



22. Maldivian axe, the carpenter is producing a new oar loom from a coconut plank.



23. Rope manufacture. Beating the retted coconut husk.



24. Rope manufacture. Washing the coir.



25. Cording and spinning coir strands.



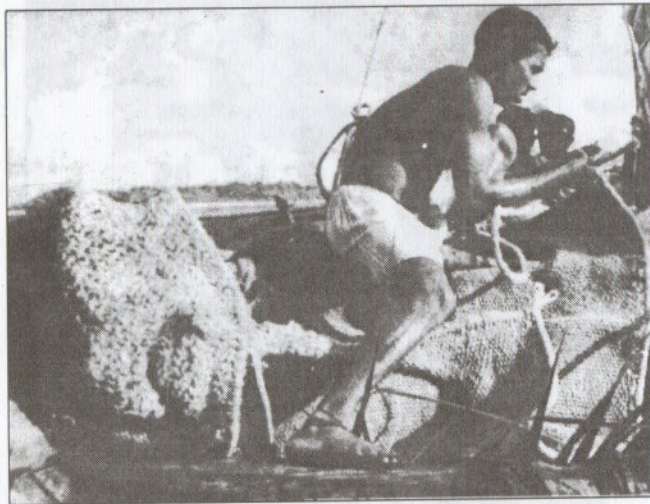
26. Spinning coir strands.



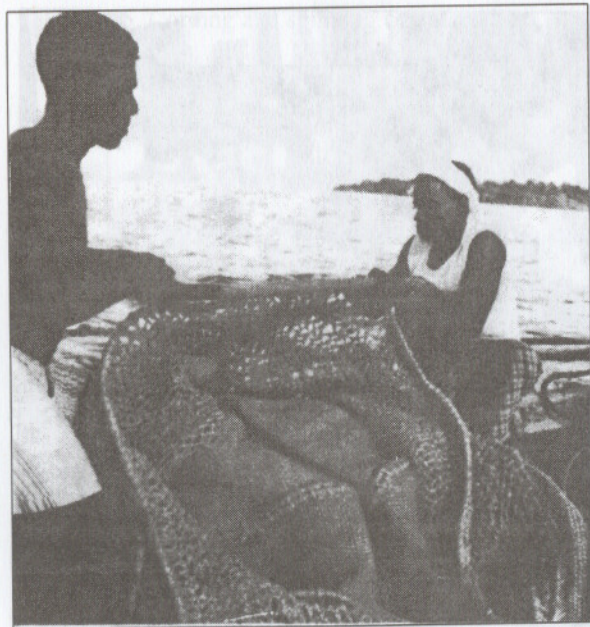
27. Making a rope.



28. Another use for coir – weaving a Faadhippolhu bait net.



29. Faadhippolhu bait net.



30. Faadhippolhu bait net.

## Appendix 9

### PROVISIONAL ESTIMATES OF COSTS OF DEVELOPMENT PROGRAMME

Priority 1. Establishment of a revolving fund for the purchase of fishing equipment. The administration of the fund would be the responsibility of the Fisheries Board therefore no administrative costs arise. If my suggestion for the provision of fishing gear stores in the outlying atolls is accepted this should be a charge on Maldivian Government funds.

£50,000

Priority 2. Experimental fitting of a marine diesel engine in an existing Maldivian fishing boat. There may be no request for funds for this, as I understand that Messrs. Harrisons Listers are negotiating this with the Maldivian Government. Since this is experimental I would expect the fitting of this engine to be much more expensive than later jobs if the experiment is successful. Including the engine cost this may be estimated at £2,000

£2,000

Priority 2. Designing and building a new type of boat to be fitted with a marine diesel engine. In Colombo and preferably at Harrisons Listers yard. This may also involve some experiment in order to determine the best way of achieving a water spray and method of keeping bait alive.

£2,250

Priority 2. Training four Maldivian boat builders in the techniques of building powerboats and fitting engines. They would work in a Colombo boat yard and be paid an allowance while doing so, a six months training period would be adequate. The Maldivian Government may wish to make these arrangements themselves. I would expect subsistence allowances to cost £400

£400

Priority 2. Training six Maldivian fishermen to operate and maintain diesel engines, two months training in Colombo or nearby.

£180

Priority 2. Purchase of ready-made barbless hooks for pole fishing trials. O. Mustad & Son, P.O.Box Oslo, Norway, make suitable hooks - their quality 9402 Numbers 3 and 4. Mustads are sending samples of these and other hooks suitable for other fishing methods to the Fisheries Board at Malé. I suggest that 500 each of Numbers 3 and 4 should be purchased for trials. Mustads quote No.4 1536/- and No.3 1534/- per 1000 net. delivered F.O.B. Oslo.

£ 80

Priority 3. Purchase of drift net for fishing trials and training fishermen in their use.

Training 4 fishermen in Colombo for three months ..... £180

Purchase of materials for making up two fleets of drift net from D.V. Mortensteyn & Co. of Colombo..... £750

Purchase of ready-made drift nets from Gundry & Co. Ltd., Bridport, Dorset, including freight..... £920

If local sailing boats can be hired by the Fisheries Board for these trials, the cost would be borne by the Maldivian Government. If it becomes necessary to purchase motorboats in Ceylon these would cost 1,300 each.

Priority 3. Purchase of Lampara net for bait catching trials. Gundry & Co. of Bridport quote 210 for a suitable net.

£ 210

Priority 3. Purchase of baited pots and set net for crayfish catching experiments. There are several possible sources of pots, which might be suitable. Trials would establish the most suitable type; if crayfish can be caught in commercial quantities, any of these types could be made locally.

Purchase of 20 English lobster pots, metal folding type R & B Leakey, Settle, Yorkshire, standard folding lobster traps 18" x 24" height 14"; these are quoted at 3.12 6d each including freight and packing. 20 would cost about ..... £80.

Purchase of 20 Australian pots. .... Quotation awaited.

Purchase of 20 South African pots ..... Quotation awaited.

Purchase of fleet of set tangle net, Gundry & Co. Bridport, Dorset. .... Quotation awaited.

I attach a sketch of a lift net for cray fishing, which could be made locally for trials.

Priority 3. Purchase of textbooks to form the nucleus of a library of books on fishing and allied subjects.

Priority 3. Training three or four Maldivians to service and repair diesel engines either in Ceylon or in U.K. This would necessitate at least one year's training, it might be arranged through an engine manufacturer and I can make no estimate of costs.

Priority 3. Establishment of a marine workshop at Malé. I can make no estimate for the costs of the actual building at this stage, if it is built largely of locally available materials and with local labour the Maldivian Government might provide funds for this.

Provision of power tools listed ..... £ .3000

Provision of hand tools listed ..... £ ..300

Provision of electric and other and other equipment listed £ .300

Total ..... £ 3600

Priority 3. Setting up revolving fund for loans to boat owners for engine purchase and installation.

£ 100,000

Priority 4. Training Maldivian fishermen to operate purse seines and purchase of boats and equipment.

The advice of the Government of the Federation of Malaya should be sought regarding the payment of allowances etc. For 13 men for six months this would be of the order of 3,000 including travelling costs and housing in Malaya. I do not estimate travelling costs to and from Malaya since travel could be arranged to coincide with routine flights from Singapore to Hulhule the aeroplane being diverted to Butterworth.

£ 3,000

If a purse-seine boat and two net boats are obtained in Malaya and sent by sea to Colombo, the cost would be of the order 6,000.

£ 6,000

Two Malayan nets of synthetic twine can be purchased for 4,000; these nets will be suitable for scad, mackerel tuna and frigate mackerel in the lagoons. If, as I expect, they are too small for bonito fishing on the open sea a purse-seine 250 fathoms x

40 fathoms from Gundry & Co. Ltd. will cost approximately 3,700 including pursing rope and freight.

£ 7,700

Total £ 16,700

This is an expensive experiment the success of which cannot be guaranteed. The expenditure would not end with the training of fishermen and the purchase of boats and equipment since some 30 fishermen would be needed to operate the net while fishing trials are carried out in the Maldives, they would have to be paid allowances or wages during the trials.

If the experiments proved successful, the results would be of overwhelming importance to the Maldivian people as a whole.

Priority 5. Purchase of pilot scale freezing plant. I have discussed the problem with Cdr. Ranken of J. & E. Hall Ltd. and await an estimate of costs.

## EQUIPMENT SUGGESTED FOR MALE MARINE WORKSHOP

The workshop would be housed in a shed on the waterfront. No estimate of costs of the actual building is possible until a site has been selected and the advice of an architect obtained. I suggest provisionally that an open shed 60 feet x 40 feet would be adequate, this would be built facing a concrete slipway fitted with metal rollers and having a hand winch for hauling out boats up to 50 feet overall. The building should have roof beams and chain blocks (one ton lift) for removing and replacing engines. Iron girder construction with aluminium or asbestos roofing might be the most suitable.

### Power Tools and Machines

Centre lathe, 6 feet between centres to swing 9 inches, complete with tools and automatic thread cutting equipment.  
Pedestal drill to drill up to 1" complete with two sets of twist drills.  
Power hacksaw.  
Wood band saw.  
Bench grinder / polisher.  
Two electric hand drills.  
Portable electric circular saw.

£ 3,000

### Hand Tools

Stocks and dies and taps up to 1" Whitworth.  
Stocks and dies and taps up to 7/8" Unified.  
Surface plate.  
Outside micrometer 1".  
Adjustable micrometer 0" to 4"  
Test set and dial gauge.  
Vice blocks.  
2 - 12" hacksaw frames and 10 dozen assorted blades.  
12 dozen assorted files.  
3 triangular scrapers.

### Electric Equipment.

Avometer.  
Battery charger.  
Flat plate electric heater.  
Electric soldering irons.  
2 inspection lamps.

£ 50



### Other Equipment.

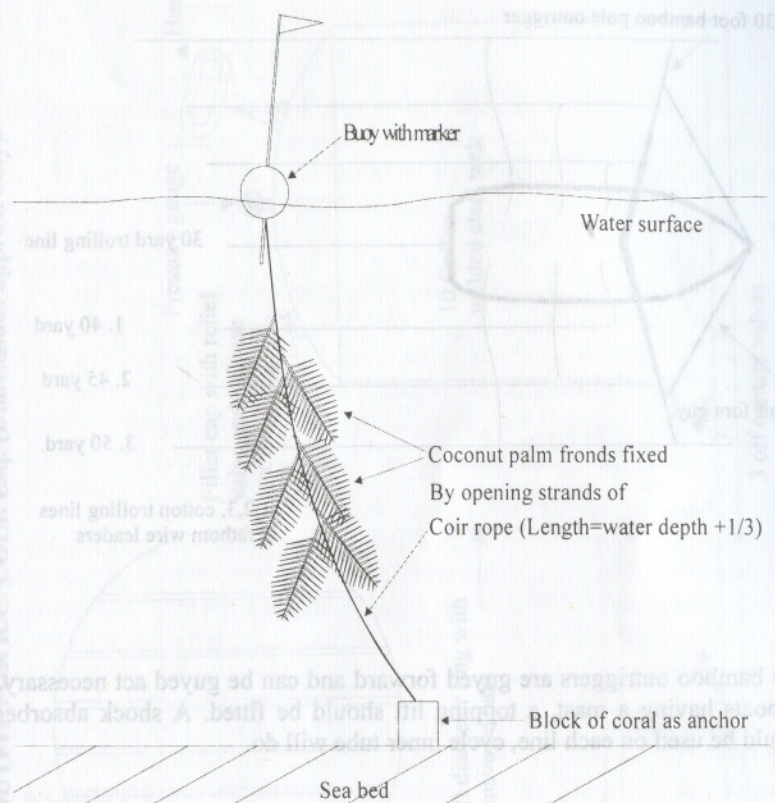
- Portable electric welder.
- Portable oxy-acetylene welder.
- 2 pneumatic jacks 1 ton lift.
- 2 pneumatic jacks 5 ton lift.
- 2 – 10 foot benches fitted 8" engineers' vices.
- 1 – 10 foot bench fitted carpenters vice.
- 1 – 10 foot bench fitted pipe vice.
- 4 tool cupboards.
- Portable forge and anvil.
- 2 – 2-pint paraffin blowlamps.
- 4 – 4-foot crowbars.

£ 250

- 2 dozen wire brushes.
- 2 sets common spanners to 1" Whitworth.
- 2 sets common spanners to 7/8" Unified.
- 1 set socket spanners.
- 1 set box spanners.
- Torque wrench.
- 1 set ring spanners to 1" Whitworth.
- 1 set ring spanners to 7/8" Unified.
- 6 assorted adjustable spanners.
- 10", 14" and 20" Stilson wrenches.
- 1 set copper drifts.
- Assorted screwdrivers, punches, pliers, and cold chisels.
- 1 bolt cutter.
- 2 lead hammers.
- 2 wide faced mallets.
- Assorted ball pens and crosshead hammers.
- Tin snipe.
- 2 hand drills and sets drill bits up to 1/4".
- 2 breast drills and sets drill bits up to 1".
- Manufacturers recommended tool kits for servicing engines.
- Set of wood working tools.

£ 300

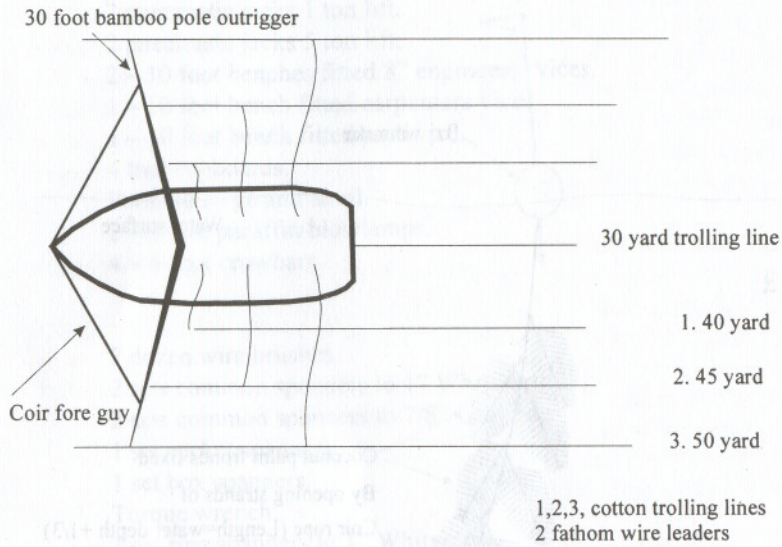
### Appendix 10



The coconut palm fronds form a shade shelter and fish gather for the shade and because marine organisms which provide food grow on the fronds.

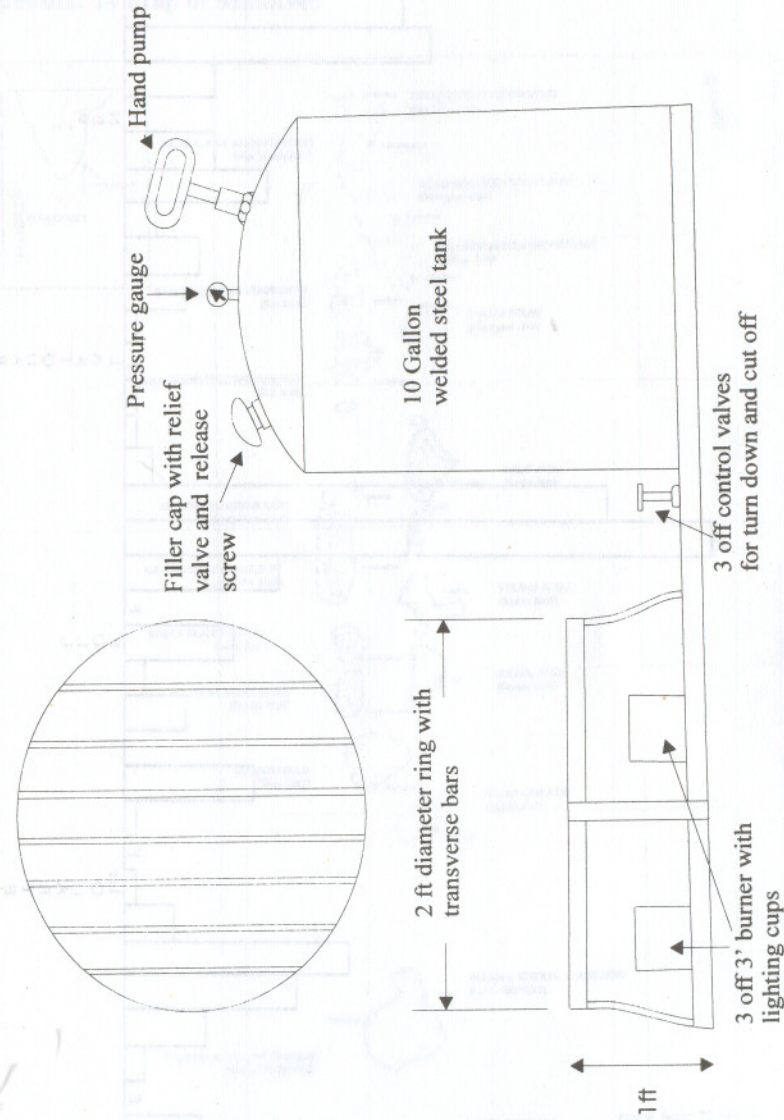
The number of fronds and the depth at which they are set will have a considerable effect on the number and variety of fish attracted. I would suggest for first trials that 10 – 12 fronds should be grouped from one to two gutters below the surface.

## Appendix 11: RIG FOR TROLLING 7 LINES

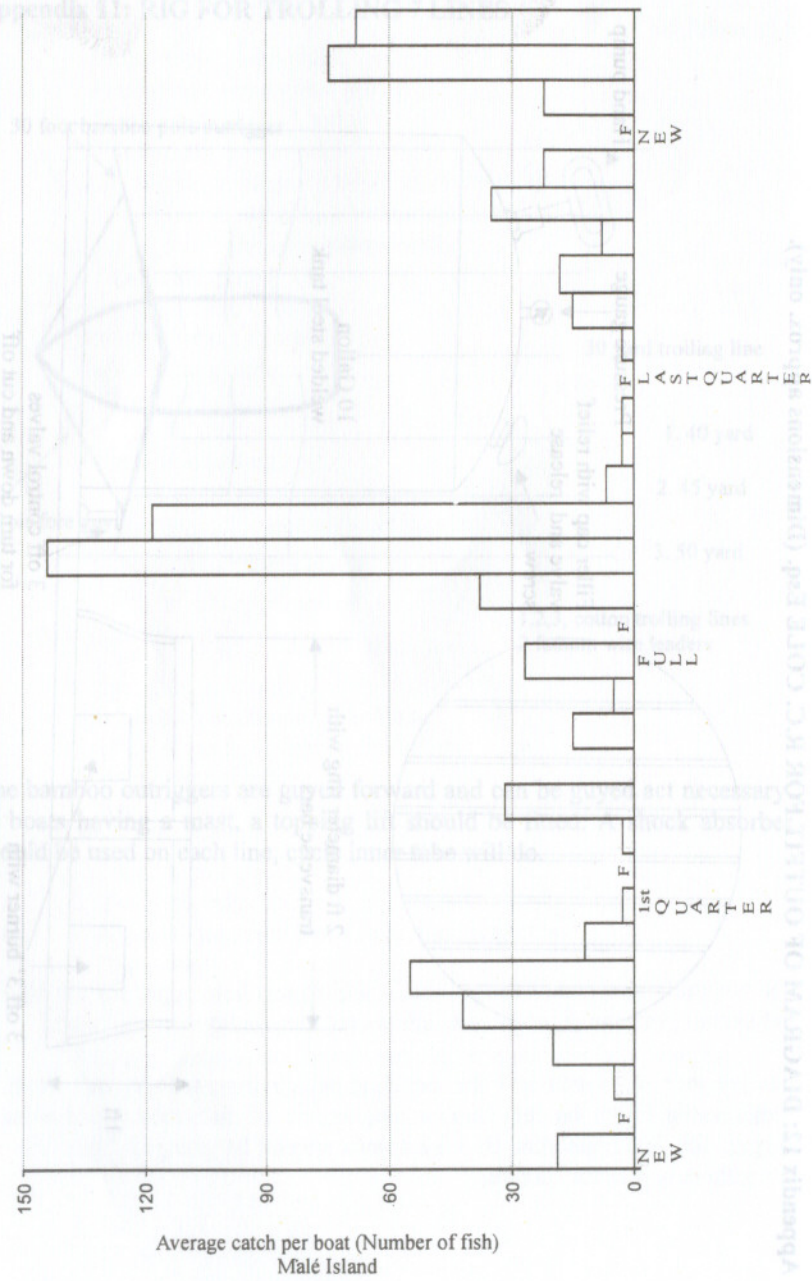


The bamboo outriggers are guyed forward and can be guyed act necessary. In boats having a mast, a topping lift should be fitted. A shock absorber should be used on each line, cycle inner tube will do.

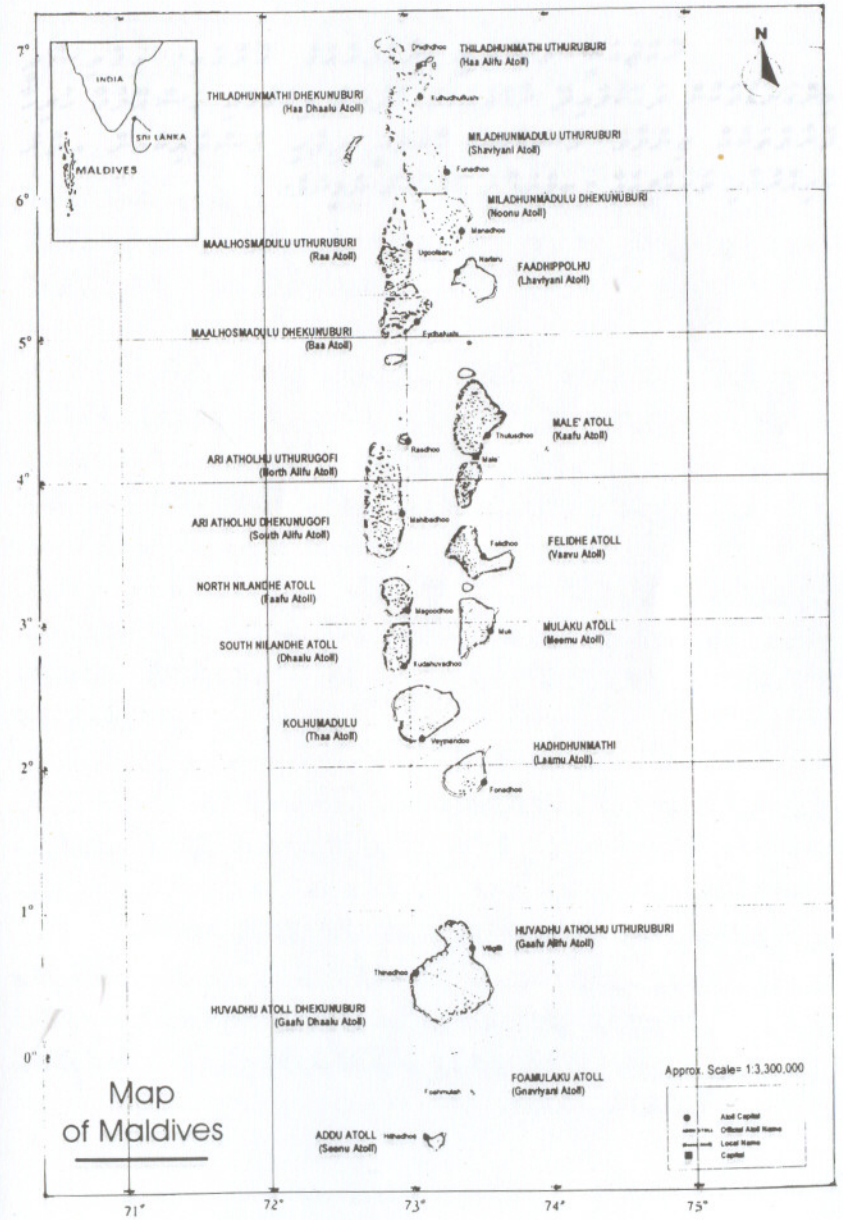
Appendix 12: DIAGRAM OF OUTFIT FOR R.C. COLE Esq. (Dimensions approx. only).



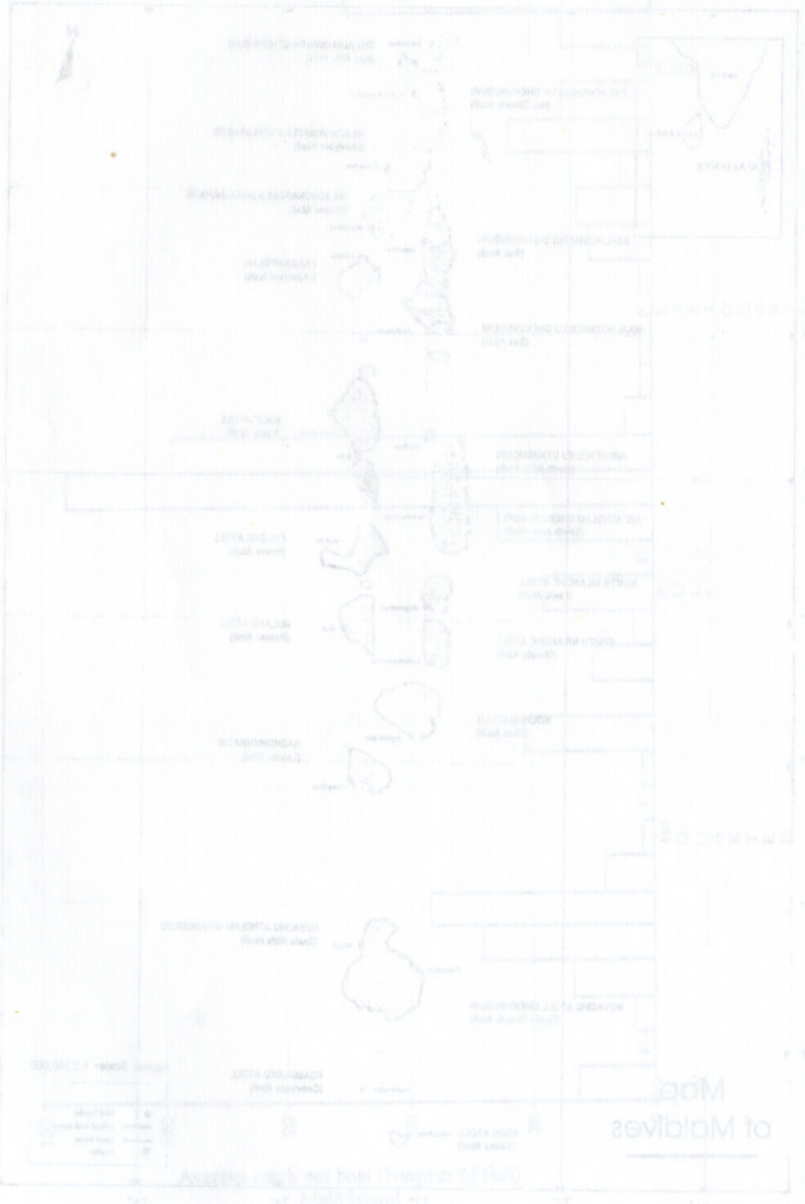
Appendix 13: DAYS AND MOON PHASES (20th OCTOBER - 21st NOVEMBER 1960).



Appendix: 14 Map of Maldives



APPENDIX 13: DAYS AND MOON PHASES (2000 ON CALENDAR - 21st NOVEMBER 2005)



Appendix 14 Map of Maldives

ދިވެހިރާއްޖޭގެ ރާއްޖެ ދިވެހިރާއްޖޭގެ ރާއްޖެ ދިވެހިރާއްޖޭގެ ރާއްޖެ  
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دستورهای متعددی در این زمینه تصویب شده است و در این زمینه دستورات متعددی صادر شده است.

دستورهای متعددی در این زمینه تصویب شده است و در این زمینه دستورات متعددی صادر شده است.

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دستورهای متعددی در این زمینه تصویب شده است

دستورهای متعددی در این زمینه تصویب شده است 1960

دستورهای متعددی در این زمینه تصویب شده است و در این زمینه دستورات متعددی صادر شده است.

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**MALDIVES MARINE RESEARCH BULLETIN VOL 5**

**REPORT ON THE MALDIVIAN FISHING  
INDUSTRY - 1960**

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