Field document 1

EXPLORATORY FISHING FOR LARGE PELAGIC SPECIES IN THE MALDIVES

Technological Report

By Ali Waheed

Ministry of Fisheries and Agriculture, Republic of Maldives

1. THE FISHING BOAT

Initially a Ministry of Fisheries fishing boat was earmarked for the exploratory fishing operations. But BOBP staff who inspected the boat found that repairs and modifications required to make the boat seaworthy and suitable for the work would be expensive and take several months. Consequently a private 15m wooden boat *MA THA HA RI* was chartered on the understanding that the owner would repair and modify it as required. As the converted *Matha Hari* was to perform more than one task during the fishing voyage, an attempt was made to provide a deck layout that allowed smooth and simultaneous fishing operation of driftnets and drift longlines, with trolling being complementary and to be performed from and to the fishing ground. With these points in mind, the original specifications of the boat did not change significantly. They were as follows:

Length overall	—	15.6 m
Beam overall	—	5.0m
Draft max to DWL	—	1.65 m
Engine type	—	Yanmar HFD Diesel
Power	—	Continuous 125 hp
Cooling system	—	Water cooled
Propeller diameter	—	1.5 m
Speed	—	9kn
Fuel tank capacity	—	2400 l
Fresh water capacity	—	1000 l
Fish hold capacity	—	6 tons of fish in ice
Crew accommodation	—	8 persons
Navigation equipment	—	Satellite navigator
Communication equipment	—	SSB Radio/VHF Radio
Gear handling devices	—	Hydraulic net hauler
		Hydraulic longline hauler
		Manual longline drum

a) General arrangement

The general arrangement also remained nearly unchanged (Fig. 1).

Below the deck, the forward compartment was used for crew accommodation. The compartment aft, the crew accommodation compartment, was used to store provisions, fishing boat and gear accessories. Aft to this compartment, an insulated fish hold was provided. The aft compartment was used as the engine room with fuel and a fresh water tank.

The deck house was located forward above the crew accommodation with its access from inside the deck house. In order to provide more deck space on forward and starboard deck and better crew accommodation, the deck house was offset on the port side of the boat. Besides steering, engine control, navigation equipment, toilet and cooking facilities, sleeping bunks were provided for two men. It was also designed to provide the skipper with a clear vision to steer the boat, observe the working deck and see what each crew member was doing during the fishing operation.

h) Deck Layout

Good fishing gear handling practices require that driftnets and longlines are hauled from as forward as possible and are preferably shot under power from the stern. This implies the need for a free deck space on the forward side, and for convenient and safe storage of fishing gear ready for shooting on the aft deck. Nothing, however small, should interfere with the smooth and swift operation of the fishing gear and of catch handling. An efficient working deck must also be as spacious as possible.

The offsetting of the deck house to the portside provided deck space on the forward starboard side for installing a hydraulic net hauler and for removing fish from driftncts while hauling and stacking fishing gear for shooting again.

Aft of the deck house, enough deck space was available for installing a hydraulic longline hauler and for removing the fish on the starboard side during hauling operations.

A deck bin was also provided on the portside to keep catch on deck for loading into the fish hold after completing the hauling operation.

At the centre and portside of the aft deck. space was provided for a removable fishing gear bin where driftnets and/or drift longline accessories were stored safely. ready for fishing.

Other free space around'the deck was used for the crew to safely handle fishing gear and catch.

c) Deck Equipment

A central mast with boom was provided for a rigging tackle to lift the catch and the trolling out-riggers.

For hauling the drift longline with the hydraulic line hauler, a rail lead with one horizontal and two vertical rollers was provided and positioned on the starboard railing. It was made removable so as to stack it away when hauling driftnets with the net hauler.

For hauling a long fleet of nets or longlines of more than 2 and 10 kms respectively with this size of boat, a net and line hauler are an essential part of the deck equipment. Given the location of the installation and the large size of fish caught with driftnets, a hydraulically driven net hauler with wide rubberized sheaves mounted on a pedestal was selected and installed on the forward starboard side. (Fig.2) For hauling the drift longlines and heaving the catch on board, a hydraulically driven capstan-cum-line hauler was provided and installed on the central mast (Fig.3)

Handling and storing several kilometres of drift longline manually is tedious and hard work and requires deck space which is limited on a medium size boat. For this boat a manually operated drift longline drum with a capacity of about 10,000 m was constructed locally and installed on the aft starboard side for storing longlines and free running shooting operations. Fig.4 shows the drift longline drum and its position on deck.

2. FISHING GEAR AND METHODS

To exploit the known offshore large pelagic resources with this type and size of boat, driftnetting and drift longlining are the two most suitable fishing methods. Trolling is a complementary fishing method for use from and to the fishing ground.

a) Driftnets

The fishing trials to be conducted with this 15.6 m boat being exploratory in nature, designs of driftnet commercially proven in this region were to be used. The designs and specifications of drift-nets given in Fig.5 were therefore based on the following criteria:

PA multifilament nylon was selected because of its proven cost-effectiveness for constructing drift-nets for large pelagic species and its availability in the region. The superiority of the PA multi mono-filament versus PA multifilament nylon netting for this fishery is still to be proven in this region.

Double weaver's knot which ensures good knot stability has therefore been specified for the netting. Single weaver's knots have not proved to be stable enough for large pelagic species driftnets.

For reinforcement of the top and bottom edge of the netting, a half mesh selvedge is used. In order to use the same twine size for all parts of the netting, it was made with a double twine of the same size as used for the netting.

Netting was made of medium-twist twine, because of its softness.

Nets of different colours are being used without significant technical justification. A widely used colour (light green) was selected.

For comparing catch efficiency of different mesh sizes, three mesh sizes were selected (125, 150. 180 mm stretched mesh).

For easy construction of driftnets, a depthwise knot direction was adopted.

Depth of nets for offshore driftnetting differs from one fleet of nets to another. For the Maldives trials, the deeper nets so far used in Sri Lanka were put to use. The stretched depth of nets of different mesh sizes was kept the same for easy comparison. Likewise. the length of nets (1000 meshes) was kept the same regardless of mesh sizes, for easy reference to design and specification of nets.

The hanging ratio (length of framing line : stretched length of netting) ranges in the commercial fishery from 0.50 to 0.60. A hanging ratio of 0.55 within that range was adopted. It ensures good enmeshing or entangling of fish of different sizes.

Large PVC floats of 120 mm and 150 mm were selected, because of their cost effectiveness, ease of handling and local availability.

Galvanized steel rings were selected as ballast for similar reasons.

b) Drift longlines

Ocean-going drift longliners carry as much as 100 km of lines, which differ in design and specification according to fishing conditions.

The main difference between the deep-swimming tuna drift longline referred to above and the close surface shark billfish drift longline is that the float and branch lines are made much shorter so that the baited hooks hang much closer to the surface. This type of drift longline is successfully used by small offshore boats of Sri Lanka. Similar types of drift longlines were provided for this boat.(Fig.6).

The supply and quality of bait fish are very important for the success of drift longlining. Bait must be always available and of good quality. The pre-requisites ofdrift longline bait are freshness and hardbone, reducing drop off from the hooks. The most common species used – mackerel pike, squid and sardine. For shark drift longline, cut pieces of fresh blood fish are prime quality bait. In small boats of this class, bait fish is kept in ice or may be collected daily from the catch of driftnets and/or trolling lines when combined fishing operations are carried out.

c) Driftnetting-cum drift-longlining operations

On reaching the selected fishing areas, driftnets and drift longlines are generally put out for fishing before sunset. If drift longlines and driftnets are simultaneously used, the drift longlines will be shot first, then the driftnets after being attached to the last end of the drift longlines. When the laying of the drift longlines and/or driftnets is completed, the boat is attached to the last end of the fleet and kept adrift. The soaking time varies from 6 to 12 hours depending on the fishing conditions but never exceeds 8 hours for the driftnets and 12 hours for the drift longlines. Then hauling operations commence in reverse order - driftnet and/or drift longline. As the driftnets or drift longlines are hauled onboard, fish are removed from the nets, or hooks prior to restacking, and kept ready for shooting. The fish are kept in a deck bin till the hauling operation is completed and then transferred to the fishhold for preservation in ice.

d) Trolling

Trolling lines for small and large tuna are commonly usedby small-scale offshore fishing boats in Sri Lanka and Maldives. It may be used as the main fishing gear when shoals of tunas are spotted on the surface or as complementary fishing gear from and to the fishing ground. For this boat engaged in combined fishing operations, trolling was considered a complementary fishing method for use from and to the fishing ground. A maximum of six lines were deployed at a time on the portside outrigger and the stern.

e) Others

Multihook handlines were also rigged to catch squids attracted to the light of the boat as it drifts. **Pole** and line were also rigged to catch skipjack feeding near the boat.

CONCLUSIONS

Fishing operations of the Exploratory Offshpre Fisheries Survey lasted a total of 366 days. The following table details the duration of various activities:

Table 1: Number of days spent by survey vessel "Matha Hari" on different activities, 1 December 1987 to 30 November 1988.

	In Male	Out of Male	Total
Fishing days		49	49
Sailing to and from fishing ground		24	24
Disposal of catch and buying supplies	11	33	44
Sailing between operational areas		20	20
Repairs	34	16	50
Regular maintenace of boat	52		52
Modification of boat	13		13
Maintenance of fishing gear	8		8
Poor weather conditions	12	7	19
Crew shortage/sickness	20	1	21
Holidays	56	10	66
TOTAL	**206**	**160**	**366**

Ship-to-shore communication between the boat, the Ministry of Fisheries and the Fish Purchasing Company (TEL) greatly facilitated the overall fishing operation of the boat.

To conduct this exploratory fishing operation, eight persons were required on board. The Fishery Biologist and the Assistant Fishing Technologist of the Marine Biological Research **Station were to collect** reliable biological data, ensure good operation of the fishing boat and gear arid mobilize **crew members to** operate and maintain the fishing boat and gears.

While the general arrangement of the boat was found suitable, the hull as well **as engines and** other equipment needed too many repairs, somewhat hampering the exploratory work **programme. Of** a total of 366 days of the survey, 115 days were spent on minor modifications, **maintenance and repairs of the** boat.

The deck layout and deck equipment worked very well and facilitated the work of the crew. Driftnets **and drift longlines** were handled simultaneously with ease by the crew, which over time improved **the handling of the fishing gear.**

The following table details the time spent for hauling and shooting of fishing gear during the earlier **and the latter part** of the project:

	Driftnets		Drift Longlines	
	Shooting	Hauling	Shooting	Hauling
First 5 operations (12/87-l/88)	73 mins	243 mins	47 mins	151 **mins**
Last 5 operations (1 l/88)	31 mins	182 **mins**	28mins	117 mins

The difference in time taken for the operations shows the changes in skill levels over a period of about 10 months.

The soaking time varies for fishing gear. Over the full period of fishing operations, the soaking time on an average was eight hours 50 minutes for driftnets and 12 hours 50 minutes for the drift longlines.

Each fishing gear was operated in the following depth range:

Trolling lines	:0 - 1m
Driftnets	:2 – 13 m
Shark drift longline	: 25—50 m
Tuna drift longline	: 60— 100 m

The short term assistance provided by the BOBP Fishing Technologist and the Masterfisherman in preparing the fishing boat and gear and in training technical personnel was appreciated.

Exploratory fishing vessel used in the Maldives — the Matha Hari.

Fig. 1. **GENERAL ARRANGEMENT OF THE BOAT "MATHA HARI'**

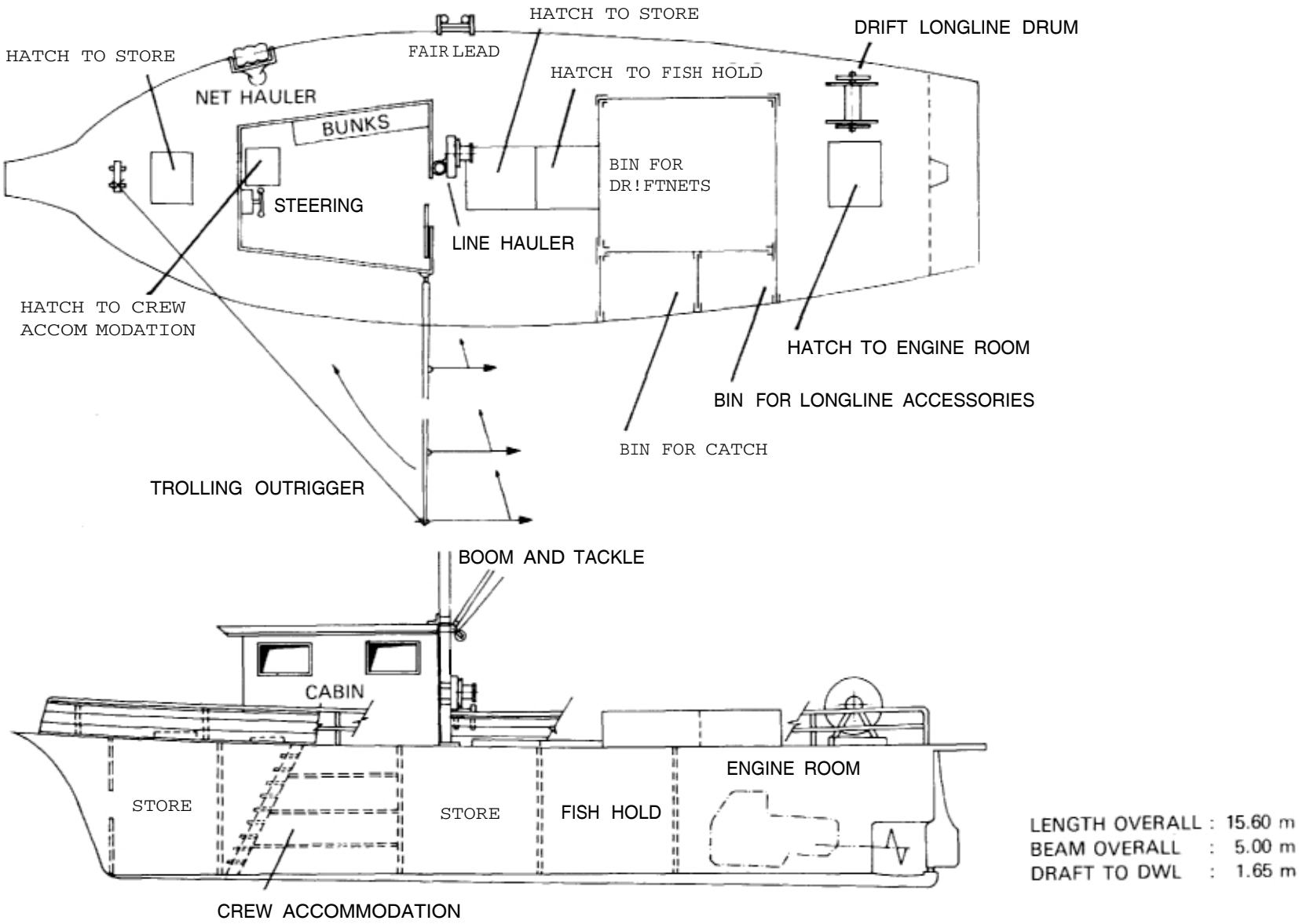


Fig. 2. **DRIFTNET HAULER**

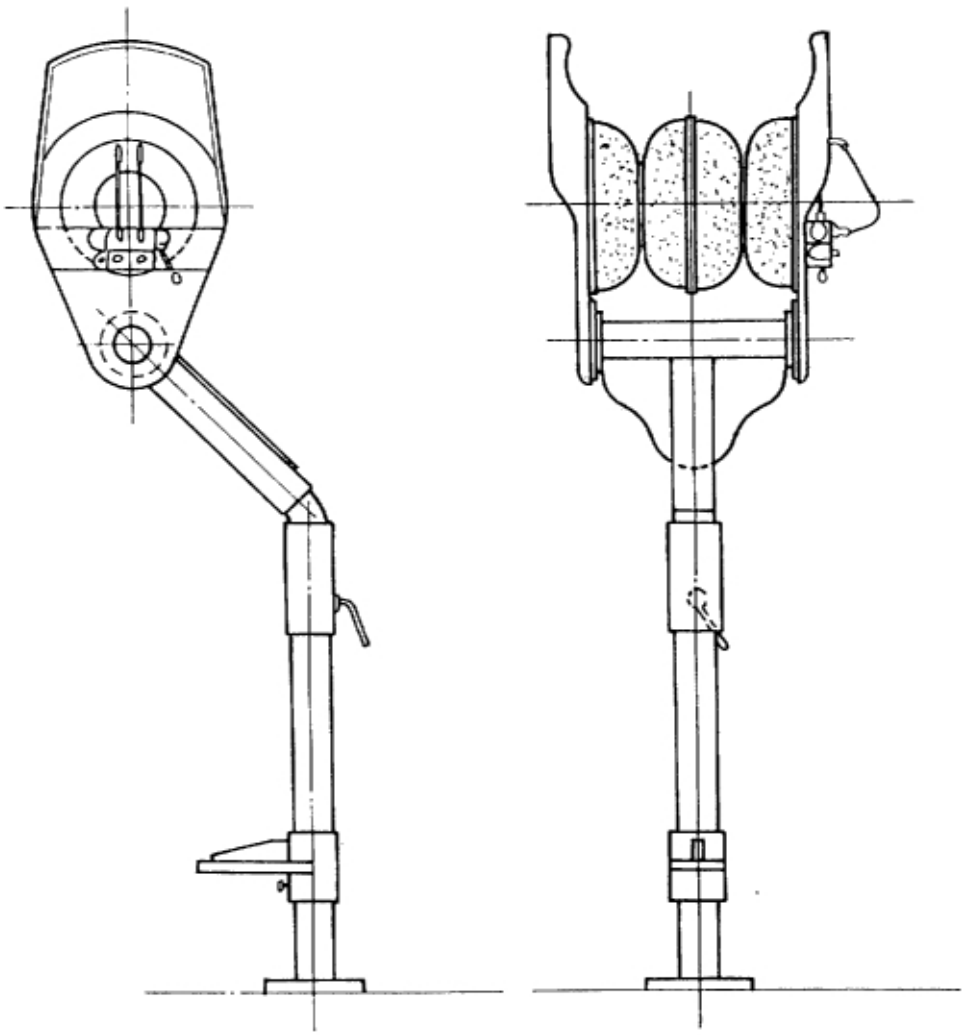


Fig. 3. DRIFT LONGLINE HAULER

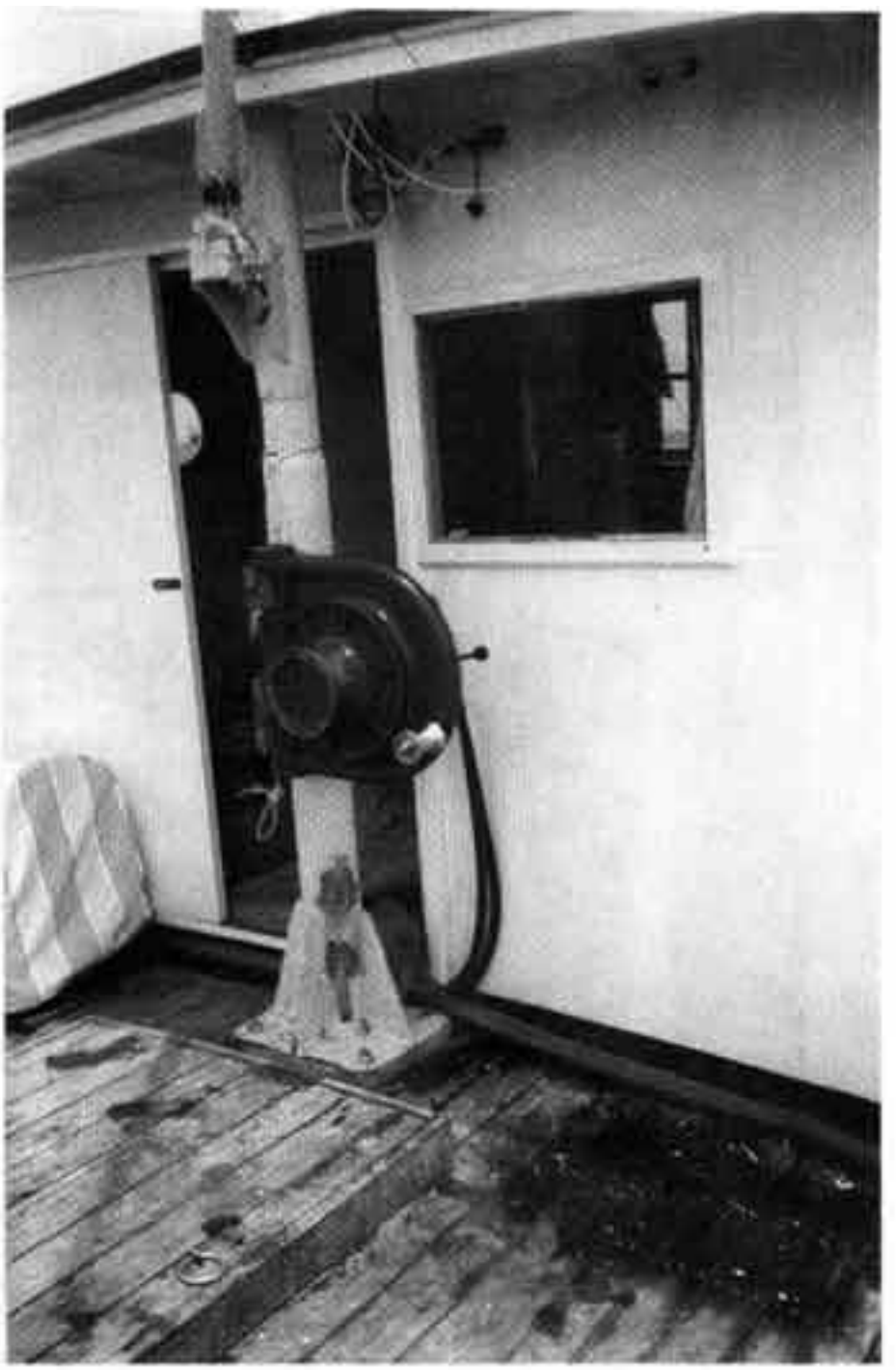


Fig. 4. DRIFT LONGLINE DRUM

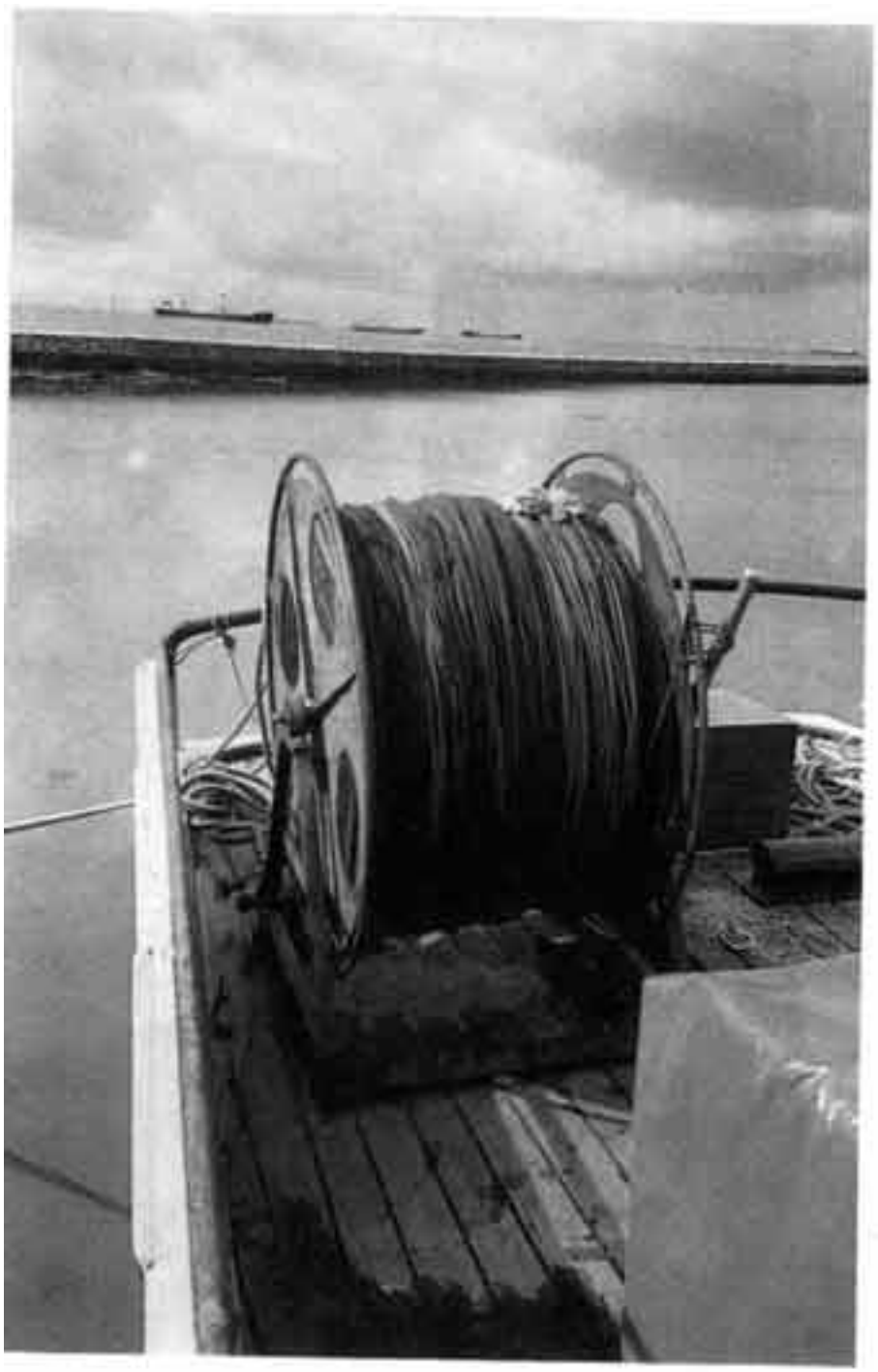
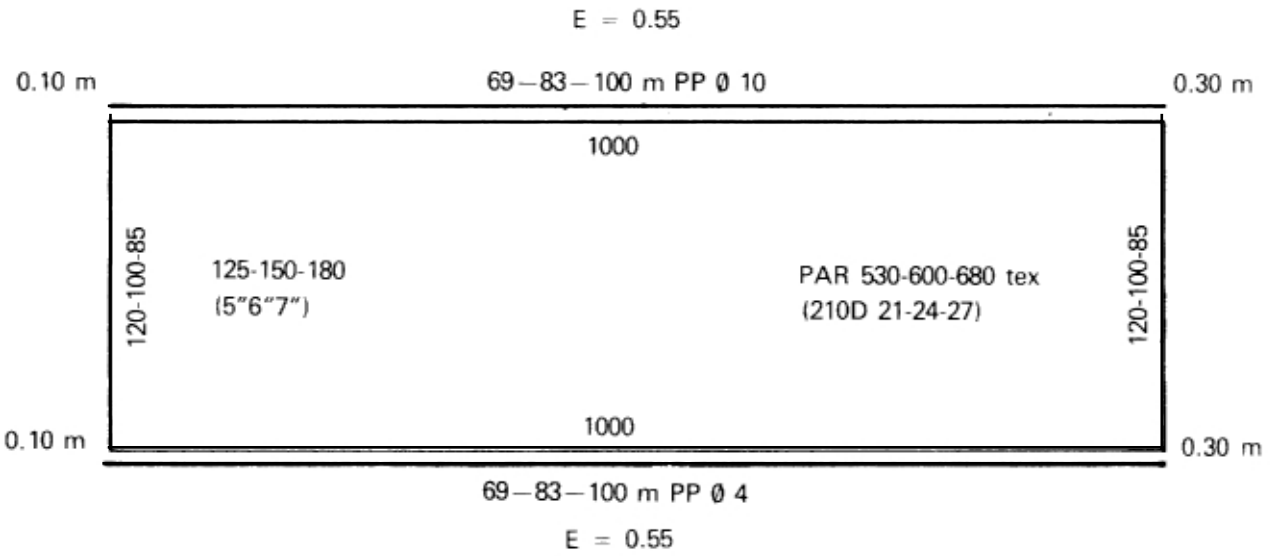
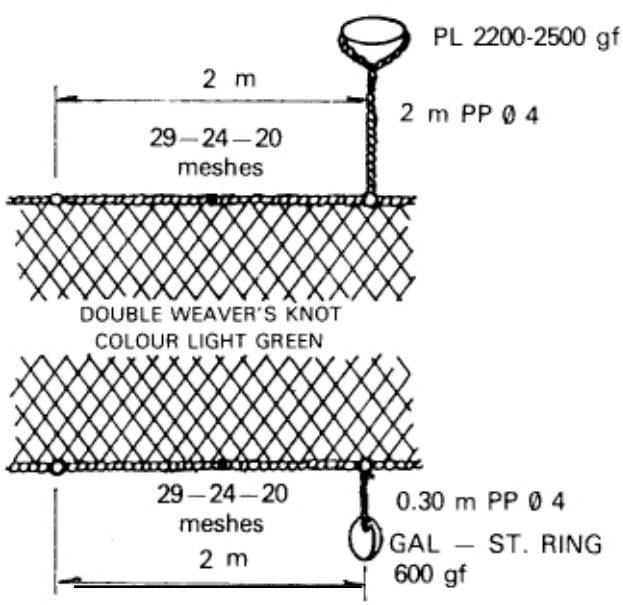


Fig. 5. **DESICN OF DRIFTNETS**

All dimensions in mm unless otherwise stated.





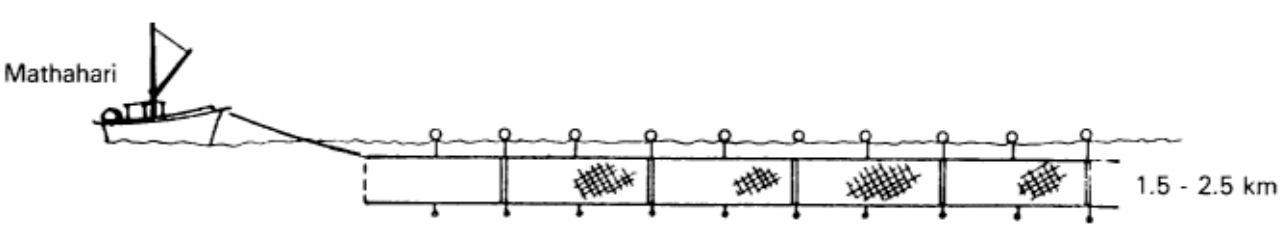


Fig. 6. **DESIGN OF DRIFT LONGLINES**

All dimensions in mm unless otherwise stated.