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Technical Reports No. 21

SMALL-SCALE ONE-BOAT PURSE SEINING IN SRI LANKA

by

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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ABSTRACT

As Masterfisherman in the FAO/UNDP Fishery Development Project in Sri Lanka (SRL/72/051) the author has conducted extensive exploratory, experimental and demonstration fishing with encircling nets for small pelagic species. As a result a purse seining technique with light attraction was developed which is suitable for commercial application. A number of private fishermen in Sri Lanka have consequently taken this up. Since this technology is of interest to many tropical small-scale fisheries with similar fishing conditions, a concise compilation of the technical reports of the Masterfisherman (G. Pajot) is published in the IOP Technical Reports series to enable wider distribution.

This report describes with a minimum of text complemented by technical drawings and figures the technique in sufficient detail so that any professional fisherman can adopt it. This covers the whole range of craft, deck layout, machinery, light attraction equipment, two different purse nets for different size fish and fishing operations. Obviously, it cannot be guaranteed that the method as described in detail will work satisfactorily under all conditions. Modifications and adaptations may be required using the report as a technical guide.

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1. INTRODUCTION

Small pelagic fish species are contributing roughly 40 percent of Sri Lanka fish production. Though there has been a small increase in production over the last decade, it is still considered that the present production could be further increased by approximately 20 to 30 percent, as indicated in Technical Report No. 3 "Exploratory Fishing for Live Bait and Commercially Important Small Pelagic Species", of the FAO/UNDP Fishery Development Project (SRL/72/051) in Sri Lanka.

The main fishing methods so far used for the exploitation of the small pelagic species are beach seining and gillnetting.

The beach seine operation is carried out from rowed dugout or planked canoes (wallam) and is restricted to a very narrow coastal strip approximately one half mile wide and mainly along a sandy coastline with a clear bottom.

The small mesh gillnet fishery is carried out from traditional craft, such as kattumaram and teppam, which are mostly mechanised and from 17 ft class open type FRP boats, both types powered by outboard engines (6.5 - 15 hp) and sometimes by sail. Though the gillnetters fish beyond the beach seiners areas, their operating ranges seldom exceed 7 mi from the shore and their bases.

As discussed in Project Technical Report No. 1, "Small Mesh Monofilament and Multifilament Experiment with Gillnets", small mesh gillnetting could contribute to an increase of production by:

a) Introducing a slightly larger open FRP craft (6 m) which could carry more gear.

b) Securing the full complement of gear for each operating boat.

c) Partly using monofilament netting instead of multifilament on board the FRP open boat.

As part of the programme of the FAO/UNDP Fishery Development Project (SRL/72/051) in Sri Lanka, complying with the Sri Lanka Ministry of Fisheries development plan, alternative possibilities of harvesting small pelagic species by more advanced fishing methods were investigated. The results of this investigation clearly showed that small-scale one-boat purse seining, with or without light attraction, is a highly viable fishing method for catching small pelagic species of commercial value and for human consumption. Therefore, it was concluded that to substantially increase small fish production, this fishing method should be encouraged. This work and findings are discussed in Project Technical Report No. 3.

To some extent, the work of the project included extension services to private entrepreneurs for the introduction of small-scale purse seining. After the first venturers requested assistance, there were problems in obtaining acceptable boats, hauling devices, light equipment, fishing gear, etc. After considerable difficulty, two boats could be rigged and equipped locally. Their performances have confirmed the previous results and the viability of this method for harvesting small pelagic species from small inshore fishing craft. From these two ventures it was clearly evident that the use of a second-hand boat, engine, light equipment, etc., resulted in much hardship for the owner in ensuring a good fishing operation and a rather low sea-going fishing time was recorded, which upset the overall profitability of such fishery. Therefore it is considered that, for the introduction of this method, steps should be taken to enable the best profitability of this new fishery.

It was also evident that the extension service rendered to the fishermen by the project had not been adequate. If these fishing methods are considered for harvesting these resources, extension services should be organized and given to private fishermen in all aspects of this fishery.

Based on the foregoing, it was felt necessary to produce a technical paper describing in detail the various aspects of this fishing method, boats and accessories, fishing operations, etc. This report gives basic information on the requirements for engaging in small-scale one-boat purse seining.

2. FISHING BOATS

2.1 Class of boats

Experience has shown that rather small boats can be used for purse seining and that the smallest type of boat should have approximately the following specifications:

Loa	10 m
Beam	3 m
Draft	1.20 m
Engine	45 - 60 hp
Fish hold capacity	7 m^3

Boats of these specifications are a stable working platform, with good working deck space and large enough carrying capacity. For details see Figures 1 and 2.

2.2 Deck layouts and accessories

For single boat purse seining, two deck layouts have been considered (see Figures 1 and 2). In both, the fishing operation would be similar to the Portuguese method, which consists in shooting and hauling the purse seine over the side, in this instance the starboard side. This method is certainly one of those most adapted for small inshore purse seining with manual net hauling.

Though it is not illustrated in these two deck layouts, the combination aspect was considered and either of them could be adapted for other fisheries without major modification.

2.2.1 Wheelhouse

In both layouts, the wheelhouses have been offset on the port side. The main purpose of this feature is that, on a small boat, this has the particular advantage of giving better working space on deck for handling the purse seine, especially when the cabin is mounted astern or midship.

2.2.2 Deck space for the purse seine

In both deck layouts, the purse seine is stacked on the aft-mid-starboard side. This arrangement permits easy handling of the gear and is best suited for hauling in the gear by hand.

2.2.3 Purse line haulers

A line hauler is necessary for hauling in the purse line of the seine. Basically a double horizontal or vertical mechanical capstan is most suitable and such a unit should have the following main features:

a) Hauling pull 1 ton
b) Hauling speed 30 m/min per warping head

Various types of capstans are available from foreign makers but they are often rather expensive and is hard to get foreign exchange. The work done in improvising suitable haulers locally has been described in Project Technical Report No. 5, "Hauling devices for small inshore fishing craft in Sri Lanka". Based on that report, it is clearly evident that by using a rear automobile axle

a comparatively cheap but suitable purse line hauler can be assembled locally. Two different types are shown in Figures 3 and 4, giving ample details of the construction. The expert would like to indicate that a drum type winch could be more convenient but its construction, involving a clutch, band brake, etc. is more complex and expensive.

2.2.4 Purse line drum

Though the purse line can be coiled on the foredeck, it is advisable to have a drum for storing it. It eases the shooting process and ensures that the purse line will always stay cleared while shooting the gear. The position of the drum is shown in Figures 1 and 2, its construction shown in Figure 5.

2.2.5 Davit and blocks

For the pursing operation, a davit with blocks leading the purse line to the hauler warping heads is often used. The details of this assembly are shown in Figure 6. In this figure the purse ring bar is also illustrated.

2.2.6 Purse line roller

As well as using the davit with blocks for pursing the gear, a side roller can be used for leading the purse line to the heads of the hauler but this roller is mainly used with the vertically assembled hauler as shown in Figure 1. For details of this roller assembly, see Figure 7. Though the purse ring bar is not illustrated in this drawing, for better handling of the purse rings it can be installed and used.

2.2.7 Floatline - Bunt booms

As shown in Figures 1 and 2, each floatline bunt boom is provided with a small block shackled at the far end through which a nylon rope is rigged with a hook for lifting the floatline and keeping it away from the side of the boat during brailing. These booms project about 2 m from the side of the boat.

2.2.8 Lampshade stand arrangement

Surface lamps are recommended for their cheapness, efficiency and easiness to operate. Different types of lamp arrangement have been studied and the multi-bulb shade stand was retained. Two different stand arrangements which proved to be the best suited for a small purse seiner are shown in Figures 8 and 9. They are detailed enough for easy understanding of their construction. The best location on board is shown in Figures 1 and 2. It must also be noted that on those drawings which show the profile of the lampshade, only one bulb is shown because bulbs are in line.

3. LIGHT BOATS

Light attraction was found to be essential for small-scale purse seining. Different types of light boats have been used and the most suitable are described below.

3.1 Light skiff for purse seining

Whenever the light attraction is to be carried out from the main boat (purse seiner), a small skiff (row boat) is required. This skiff carries aboard equipment providing a source of light (batteries) and lamps for taking over the school of fish from the purse seiner and holding it during the fishing operation.

The optimum size of skiff for this use (row boat) is approximately 3.5 m with a beam of 1.3 m. This type of small boat can be constructed with different material, such as

wood planking, plywood and FRP. For illustration and details of a light skiff see Figure 10. The general arrangement and dimensions of a V-bottom light boat, locally constructed from planked wood or plywood, are given.

This boat is also meant to perform other work, such as beaching or landing the catches when and wherever necessary. See Plate 2.

3.2 Auxiliary light boat

The degree of success of purse seining with the help of light attraction depends very much on how many sources of light are used. In the case of the local fishery, at least two sources of light should be used at the same time from different boats. They could either be used from the main boat and a separate auxiliary light boat or from two small auxiliary light boats.

Besides using the boat for light attraction, during heavy fishing, this type of boat should be suitable for carrying fish, therefore it should have its own propulsion engine, driving the electric generator as well. For illustration and details of an auxiliary light boat, see Figure 11 which shows the general arrangement and gives dimensions of a V-bottom auxiliary light boat, for construction with planked timber, plywood or FRP.

3.3 Auxiliary gas lamp boat

Though gas fishing lamps have not been used for commercial fishing in these waters, it is anticipated that, at least to some extent during certain seasons and within specific areas, this lamp type could be used for attracting small pelagic species.

For the use of gas as a source of light, the arrangement of the gas fishing lamp on a light boat is illustrated in Figure 12. The dimensions and specifications of the light boat are also given.

To use the same boat for carrying fish, an optional arrangement can be made for using an outboard engine as shown in the same figure.

4. LIGHT FISHING EQUIPMENT

Electric generators are the most common source of power for light fishing and have been used nearly exclusively in this area. The generator assembly can be fixed either in the engine room or coupled to an engine and mounted as a portable assembly.

For use in light attraction of small pelagic species on a commercial scale, the generator must have the following specifications and features:

Engine		6 - 8 hp
Fuel		gasoline, kerosene, diesel
Generator output		2 - 3 kW
Voltages		24 - 32 DC
	or	110 AC
Single phase		

4.1 Engine

The generator engine must be powerful enough to drive the generator and, assuming that 3 kW is the optimum power required, the engine should have a continuous rating of approximately 6 hp.

The use of gasoline engines has some disadvantages:

a) Fire risk
b) Ignition problems due to seawater spray and high humidity

c) High running cost when compared to other fuel such as diesel or kerosene
d) Short life span
e) Higher maintenance when compared to diesel type.

The advantages of a gasoline engine are:

a) Lower purchasing price
b) Light weight compared to diesel engines

One alternative to gasoline as fuel is kerosene, which is used in combination with gasoline. The engine is started with gasoline then is switched over either automatically or manually to kerosene. This results in a substantial reduction of the running cost.

The main advantages of diesel engines are:

a) Safety, specially when used in the engine room
b) Minimum maintenance required
c) Reliability
d) Low running cost.

The main disadvantage is the high purchasing cost.

Based on the above, it is evident that diesel engines are more suitable for driving a light generator, either as a portable unit or fixed in the engine room and, whenever available, should be selected for light fishing.

4.2 Generators

Past light fishing experience has shown that the generating power requirement for attracting small pelagic species on a commercial scale is approximately 2 - 3 kW.

The most commonly used voltage for light fishing on a small boat is 24 - 32 volts direct current. This may be due to the higher safety compared to 110 or 220 volts. In order to avoid undue power losses, low voltage requires a cable with considerably larger cross section which is more expensive than the thinner cable for higher voltage. These additional expenses are often overlooked.

In Sri Lanka waters, various voltages have been used: 32 volts DC, 110 and 220 volts AC. Therefore, as a compromise and considering the safety, cost, availability etc., the 110 volt AC or DC generator should be considered the most suitable. For practical reasons, differences in properties of the DC and AC are not considered and are, therefore, not discussed.

4.3 Switchboard

A simple switchboard can be constructed for an electric surface fishing lamp by using regular household electrical equipment. Provision must be made for each lamp to be switched on and off selectively. A fuse must be included for each lamp. For higher requirements, a voltage meter and, specially, adjustable resistors for dimming the lamps may be included. All components must be of a high enough amperage, depending on the voltage and power of the lamp used. The switchboard must be fitted in the best location, either attached to the generator or fitted in the cabin.

Details of a simple switchboard for surface fishing lamps are shown in Figure 13.

4.4 Wiring

The wiring connecting the generator to the switchboard and the switchboard to each lamp must be of adequate size according to the current intensity required. The wires must be well insulated (water-proof) and fairly flexible.

Assuming that the maximum power requirement is 3 kW, the voltage used is 110 V and the current density is 7 A/mm^2, the wiring connecting the generator to the switchboard should have a conductor cross-section of 4 mm^2 for each core (total 8 mm^2).

4.5 Fishing lamps

Different lamps are necessary for purse seining with light and these are discussed below.

4.5.1 Multibulbs fishing lamp

For light attraction by the main boat or an auxiliary light boat, multibulb shades are considered the best for the cheapness, practicability, easiness to handle and fit on board a small boat - Figures 8 and 9 show the profile of a multibulb shade (3-4 bulbs).

4.5.2 Single bulb surface fishing lamp

As a lamp for taking over the school of fish from the light of the purse seiner with the help of a battery set fitted on board the light skiff, a small deep hooded surface lamp is most suitable and considered the cheapest. For illustrations of details and installation see Figures 10 and 14.

4.5.3 Submersible fishing lamp

A submersible fishing lamp is considered suitable as an alternative to the single bulb surface fishing lamp for use on the light skiff but its construction and use is more difficult and costly (see Figures 10 and 15). For a more simple and cheaper underwater fishing lamp, using a regular incandescent bulb, refer to the FAO Fishing Manual "Fishing with Light" (Ben-Yami, 1976) pages 55-56. However, in constructing this type of lamp, a section of a bicycle inner tube can be used as alternative to the rubber hose.

4.6 Bulbs

The type of bulb used so far in these waters is the regular incandescent one. Different powers of from 200 to 1 000 W and voltages from 24 to 220 have been used. For main light attraction bulbs of 110 volts and 500 to 1 000 W are considered most suitable. For use on the small light skiff with surface or submersible lamps 12 to 24 volt and 200 to 500 W bulbs are considered most suitable.

4.7 Batteries

As a source of light on the small light skiff, storage batteries were used almost exclusively for taking the fish school over from the light of the purse seiner and holding them during the shooting and hauling of the purse seine.

Considering the short time required for such fishing operations, the use of batteries was found to be most suitable and is recommended. A battery set consists of two 12V 90Ah batteries connected in series so as to obtain 24V, or one 12V, 120Ah battery for powering the surface or submersible lamp of the light skiff. The recharging of the battery set is done either with the light generator during the light attraction operation or off the main generator of the purse seiner. For easy, more convenient handling, the batteries are put in a wooden box. This assembly is illustrated in Plate 1.

4.8 Gas fishing lamp

As discussed before, although gas fishing lamps have not been used here, they could be an alternative source of light, at least during certain seasons in areas where fishing

conditions are favourable.

For this purpose, it is assumed that the gas lamp should have a minimum power of 2 000 candles. For illustration of this type of lamp and its installation see Figures 12 and 16.

5. ECHO SOUNDER

Although, in the past, purse seining with and without light attraction has been done without the use of the echo sounder, its application could improve the catches, prevent damage to the net and thus significantly contribute to the feasibility of the whole operation.

There is a great variety of equipment available on the international market and it is recommended that, to keep capital investment down, purchase of unnecessarily sophisticated units be avoided. A small and relatively inexpensive recording echo sounder with the following operational characteristics should be quite sufficient:

Maximum depth - not exceeding 200 - 300 m
Output power - not exceeding 15 - 20 W
White line - not necessary
Recording paper width - 10 - 15 cm
Desirable characteristics: Variable paper speed;
good scale expansion;
spray resistance;
flasher indication for paper saving;
local service available.

Many hints for the operation of the echo sounder in purse seining with light attraction are given in Chapter 6, pages 68-70, and 81-84 in the FAO Fishing Manual "Fishing with Light".

6. THE NET

The definition, construction and operation of the purse seine are discussed in the following section.

6.1 Definition of a purse seine

A purse seine is a long wall of netting, hanging down between float and leadline with an essential feature, which is pursing the net by pulling a drawline (purse line) which is threaded through a series of rings rigged along and below the leadline, so that the leadline is bunched and hauled up to the surface, closing the bottom of the net and impounding the catch before hauling the net aboard.

A purse seine is made by assembling different parts of the gear having specific mesh, twine sizes, etc., and by definition referred to as follows:

Main components:

1) Body
2) Bunt
3) Selvedges
4) Wing or breast
5) Framing lines (floatline, leadline and gavels (breastlines)
6) Bridles
7) Purse rings
8) Purse line

For illustration see Figure 17.

6.2 Purse seine designs

Designs of purse seines are presented in Figure 18 for small pelagic species like sardine, scad, mackerel, etc., and in Figure 19 for the same small pelagic species but where other species like anchovy prevail. The designs resulted from the work carried out in these waters using small inshore fishing boats which has been reported on previously in Project Technical Report No. 3 "Exploratory fishing for live bait and commercially important small pelagic species". Based on this work, it was clearly evident that, for catching small pelagic species with or without the help of light, the optimum specification range of the gear should approximately be as follows. For detailed specifications of two purse seines, see Figures 19 and 20.

Purse seine specifications

Hung length 200 - 250 m
Depth stretched 30 - 36 m
Hanging ratio 0.80 - 0.85
Netting: knotless and knotted

Twine sizes (R tex)

Body	75 - 125
Bunt	125 - 200
Selvedges	250 - 380
Wing	375 - 500

Mesh sizes (stretched mesh mm)

Body	12 - 20
Bunt	10 - 16
Selvedges	18 - 30
Wing	30 - 40

Ropes

Floatline	PA Ø 10 - 12 mm
Leadline	PA Ø 10 - 12 mm
Towline	PA Ø 10 - 12 mm
Purse line (braided)	PA Ø 14 - 16 mm
Floats	plastic
Sinkers	lead
Purse ring	brass or galvanized iron

In the designs, the abbreviations and symbols used may not be familiar to all local fishermen. Therefore, to assist in reading the drawings, an explanatory table was prepared (see Figure 20).

6.3 Net construction

A purse seine is made by assembling the different sections with their specific mesh, twine sizes, etc., into one body of netting. This is done by lacing the different sheets of netting along their depths to each other by evenly taking up the extra meshes in the deeper sheets. The tapered bunt is laced to one end of the body by evenly taking up the extra meshes of the bunt, which results in an additional taper, due to the smaller mesh size in the bunt.

As for the bunt, the cut tapered wing is also hung to the other end of the body by taking up the extra meshes in the same way.

The selvedges are also laced to the body and bunt while taking up the extra meshes in the latter parts. Finally, the netting wedges for reinforcement of the lower selvedge are laced to the latter according to the position of the purse ring bridles. For details see Figures 18 and 19. Thus, the assembling of the netting is completed and it is ready for hanging to the framing lines. All ropes have to be pre-stretched and the floats or leads strung on. At the bag end more floats per rope length unit are required. The hanging of the selvedge strips to the framing lines can be done in different ways and two alternatives are proposed (see Figure 19). In alternative A, a 2-3 mm diameter cord (hanging twine) is reeved through the first mesh of the selvedges, then the same rope is lashed to the floatline, making sure that the desired hanging ratio is according to the design. For detailed illustration see Figures 18 and 19. In alternative B, the hanging twine is first seized to the stretched framing lines strung with floats or leads forming a series of arcs created by knotting the hanging twine to the framing line at regular intervals. The knot used is illustrated in Figures 18 and 19. Then the netting is hung to the hanging twine, taking great care that the hanging ratio is as indicated in the design.

The purse ring bridles are fastened to the leadline at reinforcement points of the selvedge and are evenly distributed as per the design. The knot used for attaching the purse ring to the bridle is shown in Figures 18 and 19.

The purse line is made out of synthetic fibre, preferably of braided polyamide (PA). The other essential accessories are gavels and buntline with a large float. For details see Figures 18-19.

Then the gear is completed and ready for fishing.

7. LIGHT ATTRACTION TECHNIQUE

The light attraction technique begins with selection of the best fishing ground, either at random or even better with the help of an echo sounder/fish finder, for identification of the fishing depth, the nature of bottom if necessary and the location of any traces of schools or layers of scattered small fish.

After the location of the best fishing grounds, the light boats and the purse seiner are anchored at different stations at a distance of at least 500 metres. Then the lights are switched on, generally for 2 to 4 hours, a period which is sufficient for attracting small pelagic species when present. As the light attraction process is going on, the aggregation of fish should be observed approximately every 30 minutes either by eye or better by using a fish finder. The final decision to set the purse seine will depend on the visual observation and/or recording and, regardless of the time, if the school of fish found is sufficient, the masterfisherman will decide to set the purse seine. Prior to setting, the main light attraction power will gradually be reduced by switching off one lamp at a time, then finally the fish will be transferred to the light skiff by simultaneously switching off the last lamps of the main light attraction and switching on the small lamp of the light skiff. The purse seiner then starts the fishing operation.

8. FISHING OPERATION

The fishing operation consists of surrounding or encircling sighted schools or aggregations of fish attracted to the light. This operation results in the formation of a rough circle, often egg shaped. First the bunt end of the net and the purse line are fastened to the buoy. Then the purse seiner moves in a circle, paying out the net, to reach back to the buoy attached to the first end of the net set. Once the encircling is completed, the purse line is drawn with the help of a double capstan or other type of line hauler. On completion of the pursing operation, the leadline is bunched on the surface, closing the net and preventing the fish from escaping. Then the net is hauled on board, starting from the wing end so as to gradually drive the fish into the bunt, of which the floatline has already been lifted and kept away from the side of the boat with the help of the booms and thereby preventing fish jumping out of the net and facilitating the brailing of the catches. The brailing of the catch is done with large scoopnets, often hand operated, or with a brailer

rigged to a cargo boom.

The purse seine is retrieved in the reverse order of setting and by this procedure, at the end of the haul, the net is ready for the next fishing operation. For illustrations of the fishing operation see Plate No. 3.

* * * * *

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Ben-Yami, M., Fishing with Light. FAO Fishing Manual, London, Fishing News (Books) Ltd. 1976 121 p.

Technical Report No. 1, FAO/UNDP Fishery Development Project, SRL/72/051. Small Mesh Monofilament and Multifilament Experiment with Gillnets.

Technical Report No. 3, FAO/UNDP Fishery Development Project, SRL/72/051. Exploratory Fishing for Live Bait and Commercially Important Small Pelagic Species.

Technical Report No. 5, FAO/UNDP Fishery Development Project, SRL/72/051. Hauling Devices for Small Inshore Fishing Craft.

Figure 1

GENERAL ARRANGEMENT FOR INSHORE PURSE SEINER
WITH ENGINE-WHEEL HOUSE ASTERN-MID SHIP

PARTICULARS

LOA	9·90m.
LWL	9·00m.
DECK BEAM	3·25m.
WL BEAM	2·95m.
DRAFT	1·50m.
ENGINE	45 - 50 HP
FISH HOLD CAPACITY	~ 7m.^{2}

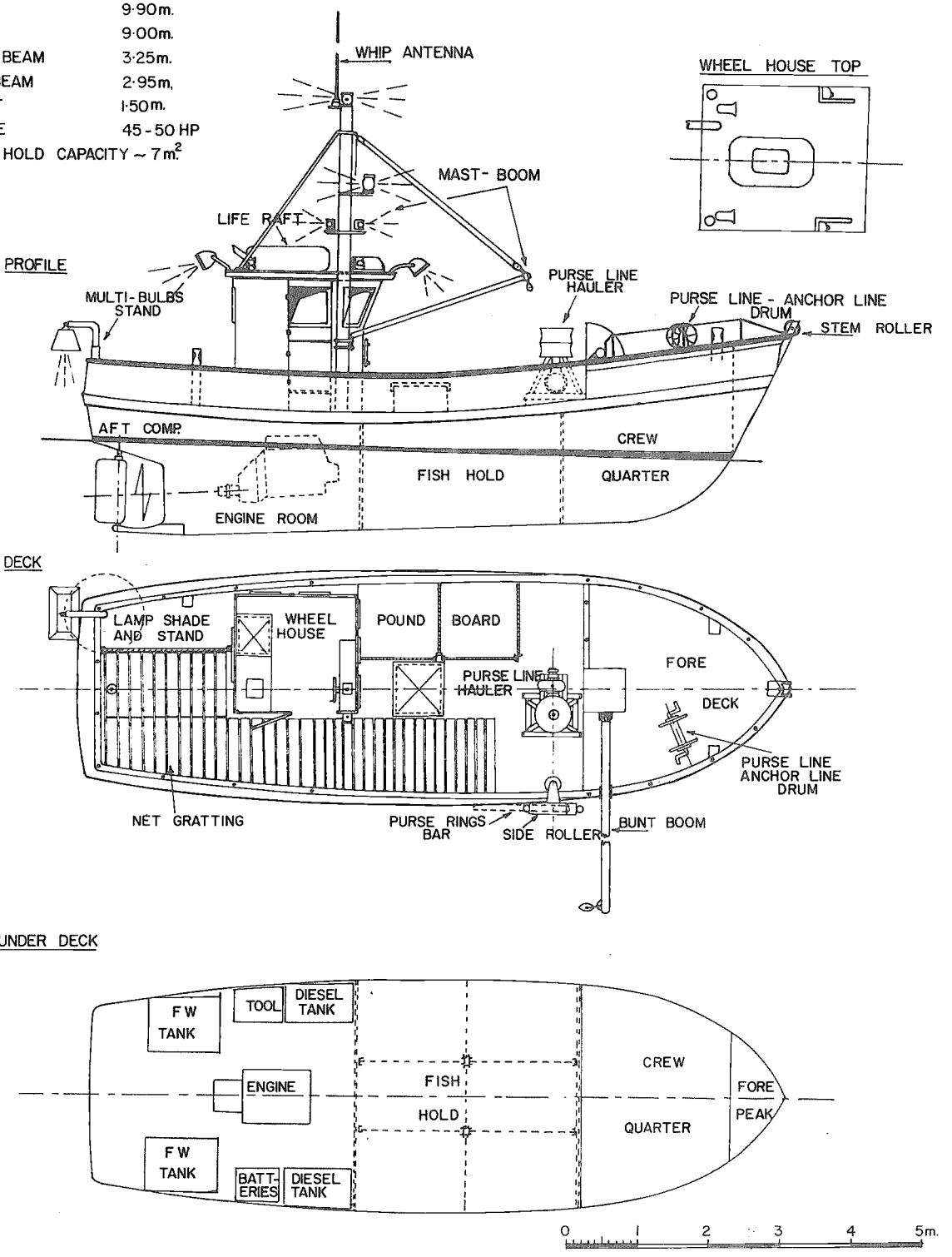


Figure 2

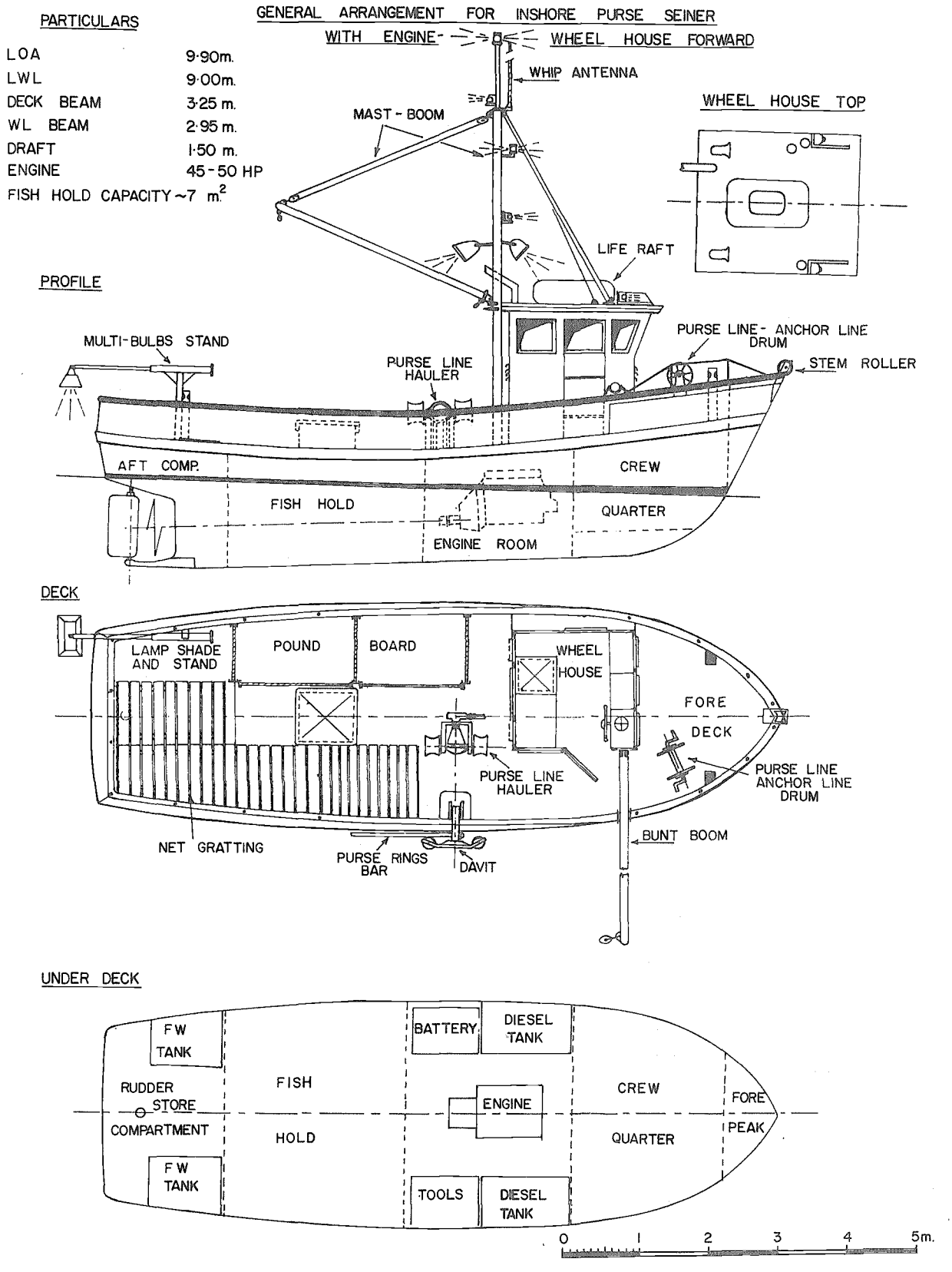
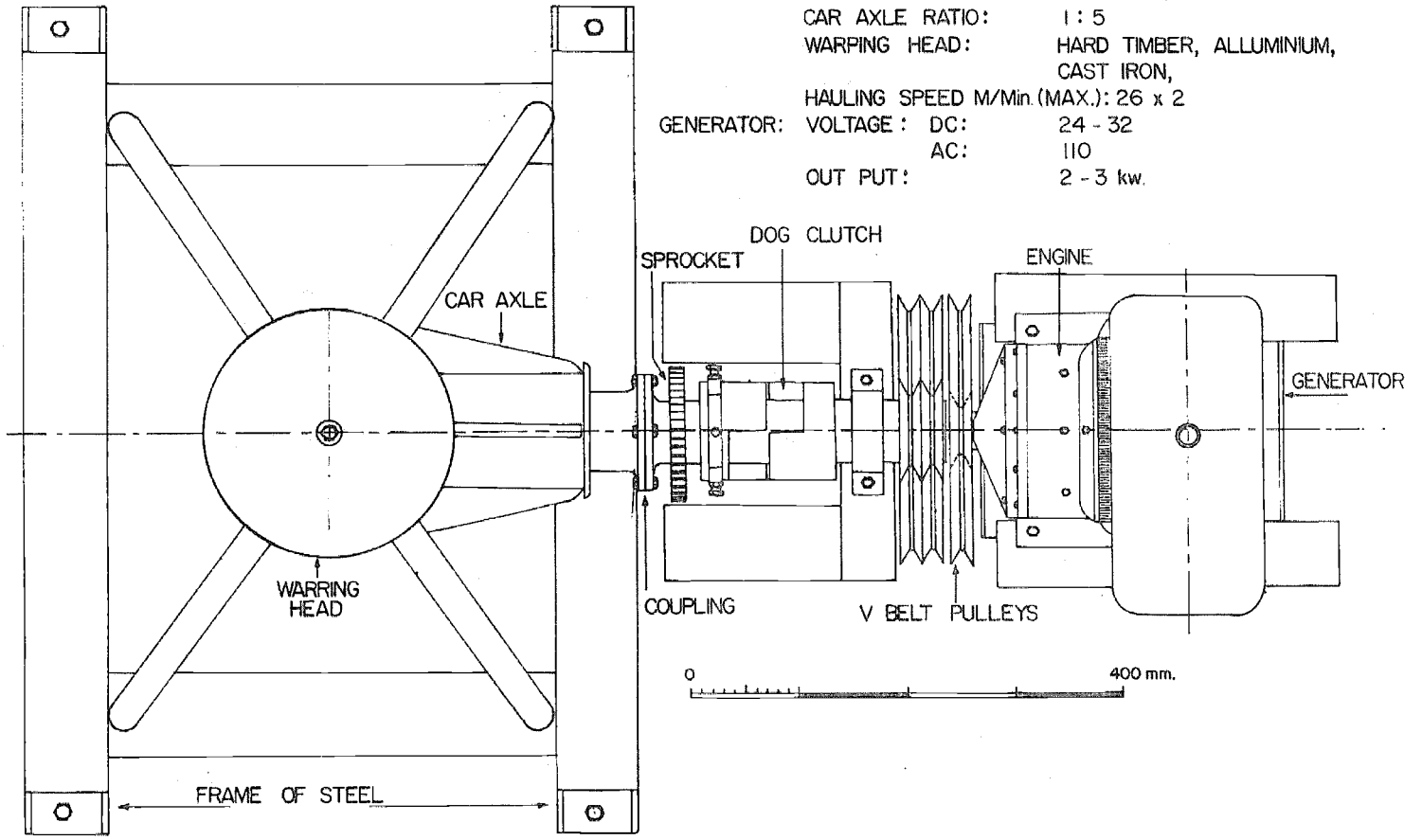

GENERAL ARRANGEMENT FOR INSHORE PURSE SEINER WITH ENGINE - WHEEL HOUSE FORWARD
PARTICULARS
LOA 9·90m.
LWL 9·00m.
DECK BEAM 3·25 m.
WL BEAM 2·95 m.
DRAFT 1·50 m.
ENGINE 45 - 50 HP
FISH HOLD CAPACITY ~7 m²
WHIP ANTENNA
MAST - BOOM
WHEEL HOUSE TOP
LIFE RAFT
PROFILE
MULTI-BULBS STAND
PURSE LINE HAULER
PURSE LINE - ANCHOR LINE DRUM
STEM ROLLER
AFT COMP.
CREW
FISH HOLD
QUARTER
ENGINE ROOM
DECK
LAMP SHADE AND STAND
POUND BOARD
WHEEL HOUSE
FORE DECK
PURSE LINE HAULER
PURSE LINE ANCHOR LINE DRUM
NET GRATTING
PURSE RINGS BAR
DAVIT
BUNT BOOM
UNDER DECK
F W TANK
BATTERY
DIESEL TANK
RUDDER STORE COMPARTMENT
FISH HOLD
ENGINE
CREW QUARTER
FORE PEAK
F W TANK
TOOLS
DIESEL TANK
0 1 2 3 4 5m.

Figure 3

ENGINE DRIVEN PURSE LINE HAULER, GENERATOR ASSEMBLY

PLAN



SPECIFICATIONS:

ENGINE:

MODEL :	2-4 STROKE
FUEL:	GASOLINE
OUT PUT:	7 HP AT 3600 RPM
GEAR BOX RATIO:	1 : 6
V PULLEYS:	C x 1 24 cm. ø
	C x 2 24 cm. ø
	C x 1 6 cm. ø
	C x 2 8 cm. ø
V PULLEYS REDUCTION RATIO FOR THE HAULER:	1 : 3
V PULLEYS REDUCTION RATIO FOR THE GENERATOR:	4 : 1
CLUTCH:	DOG CLUTCH
CAR AXLE RATIO:	1 : 5
WARPING HEAD:	HARD TIMBER, ALLUMINIUM, CAST IRON,
HAULING SPEED M/Min. (MAX.):	26 x 2

GENERATOR:

VOLTAGE :	DC:	24 - 32
	AC:	110
OUT PUT:		2 - 3 kw.

Figure 3 (cont.)

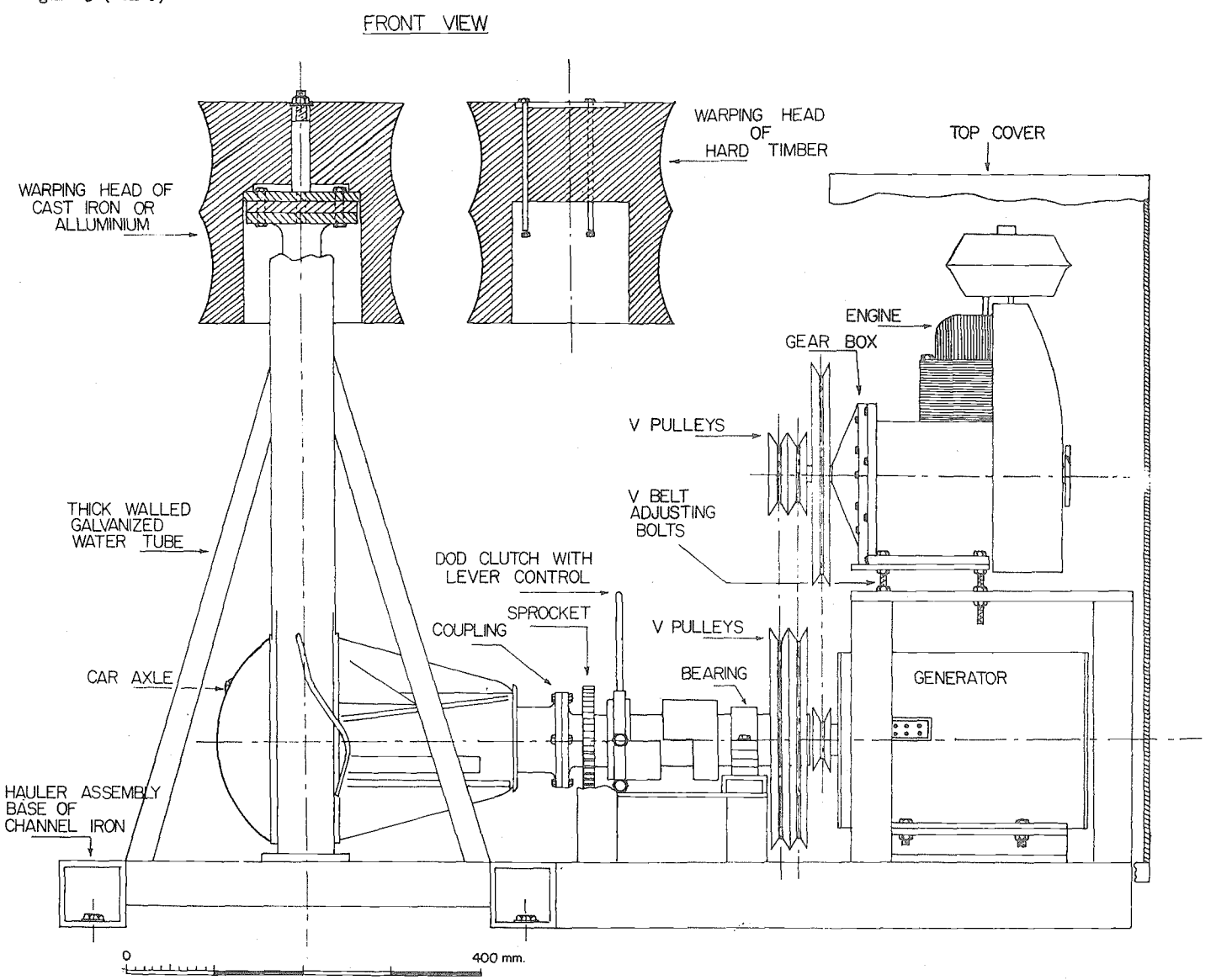
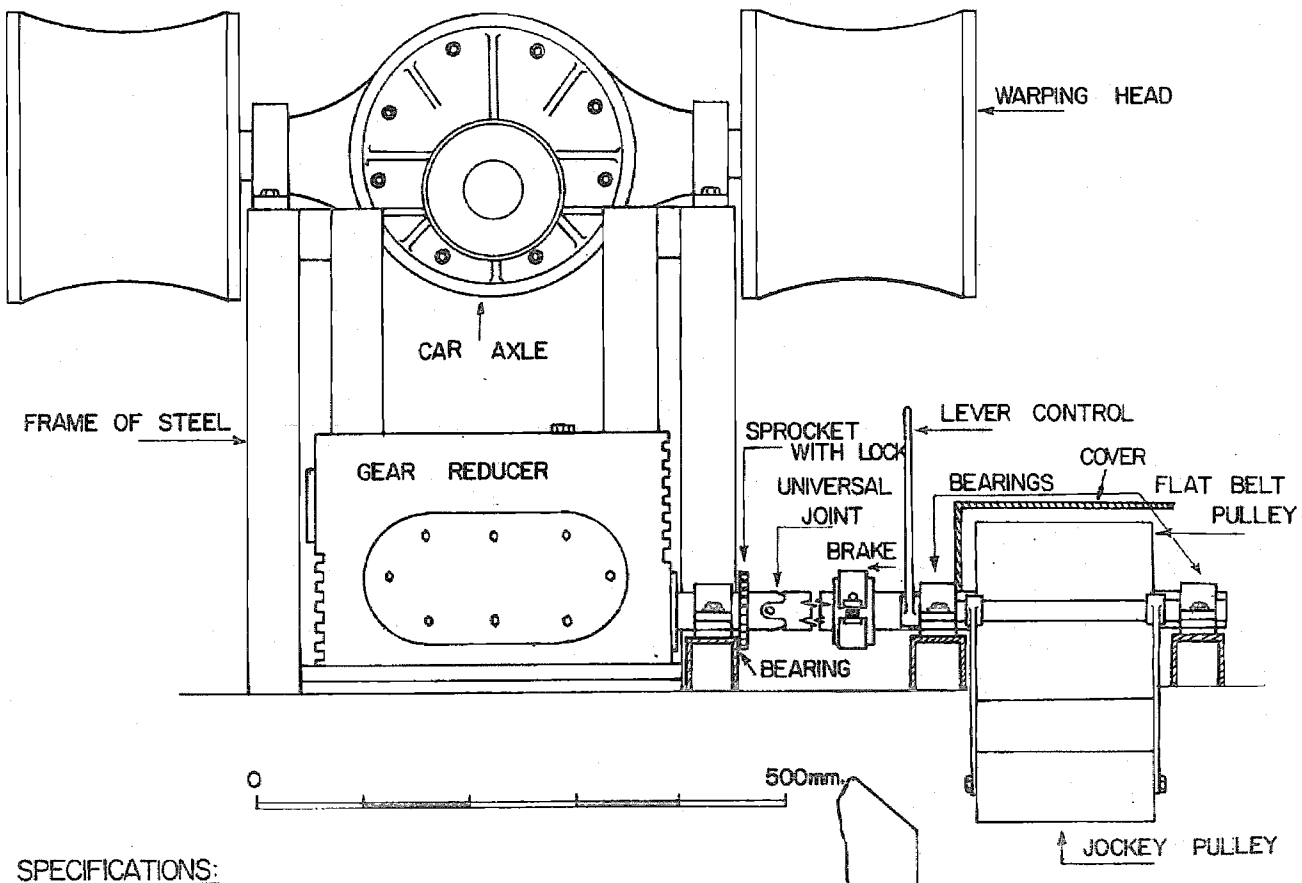


Figure 4

MECHANICAL PURSE LINE HAULER FROM CAR AXLE REAR VIEW



SPECIFICATIONS:

ENGINE PTO RPM	:	800 - 1600
FLAT BELT PULLEY	:	1 : 1
CONTROL	:	JOCKEY PULLEY
GEAR REDUCER RATIO	:	1 : 10
BRAKE	:	LINING
CAR AXLE RATIO	:	1 : 3
HAULING SPEED MAX. M/Min.	:	40 X 2

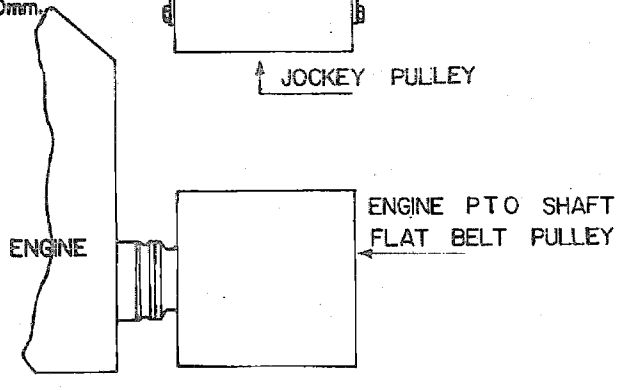


Figure 5

PURSE LINE DRUM

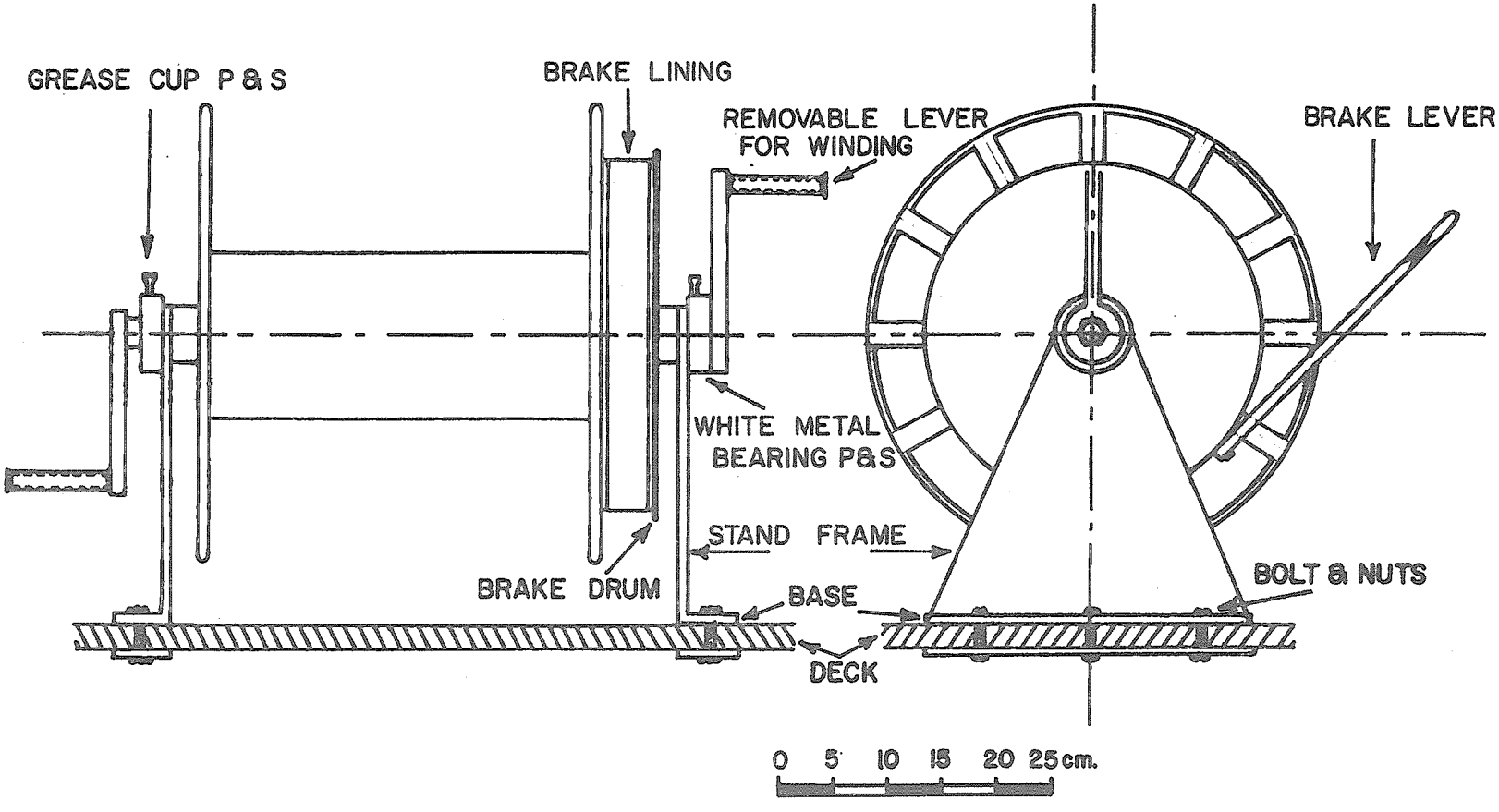
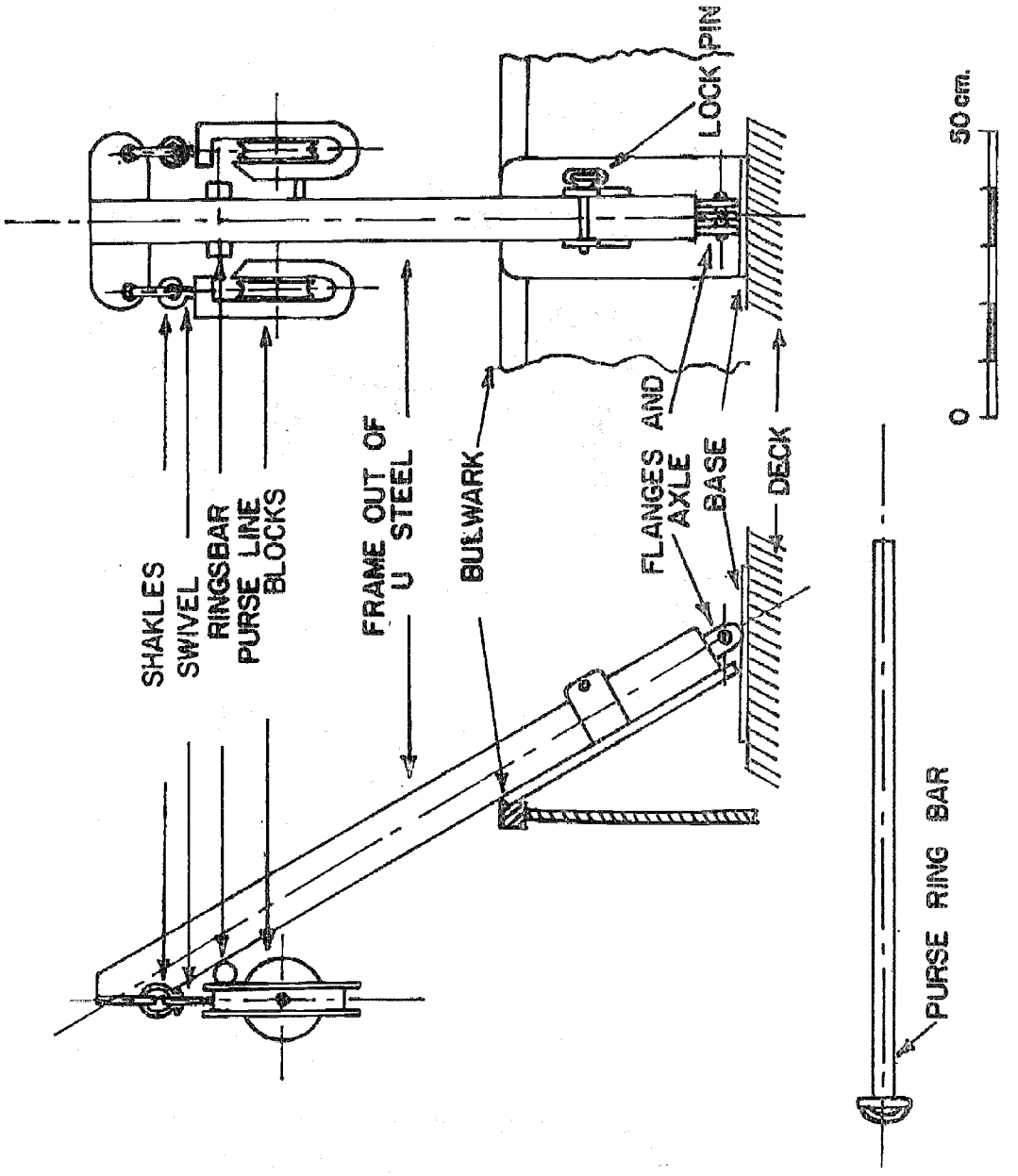


Figure 6

DAVIT ASSEMBLY



PURSE LINE ROLLER ASSEMBLY

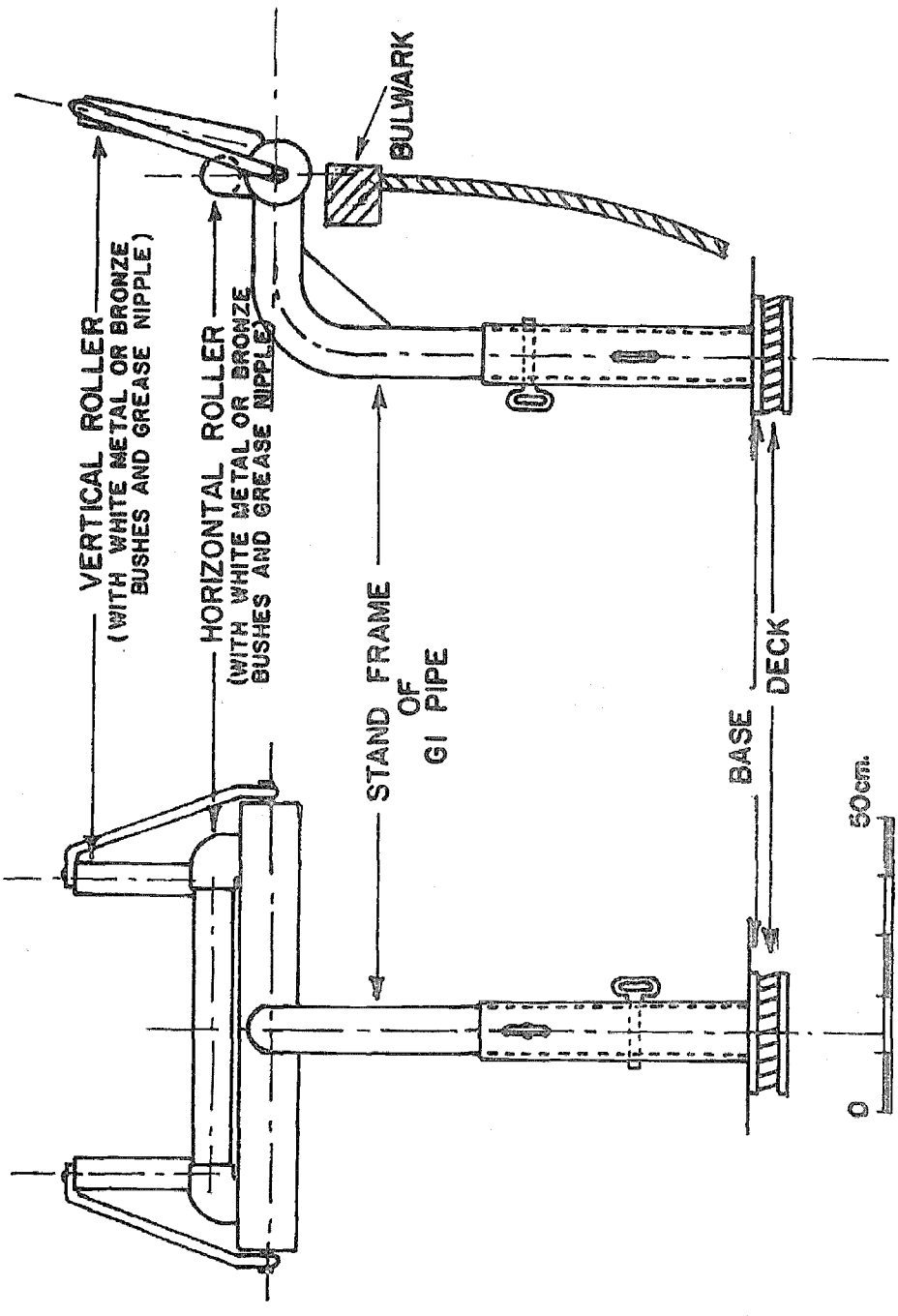


Figure 7

Figure 8

DETAILS OF STAND FOR MULTI BULBS SHADE (A)

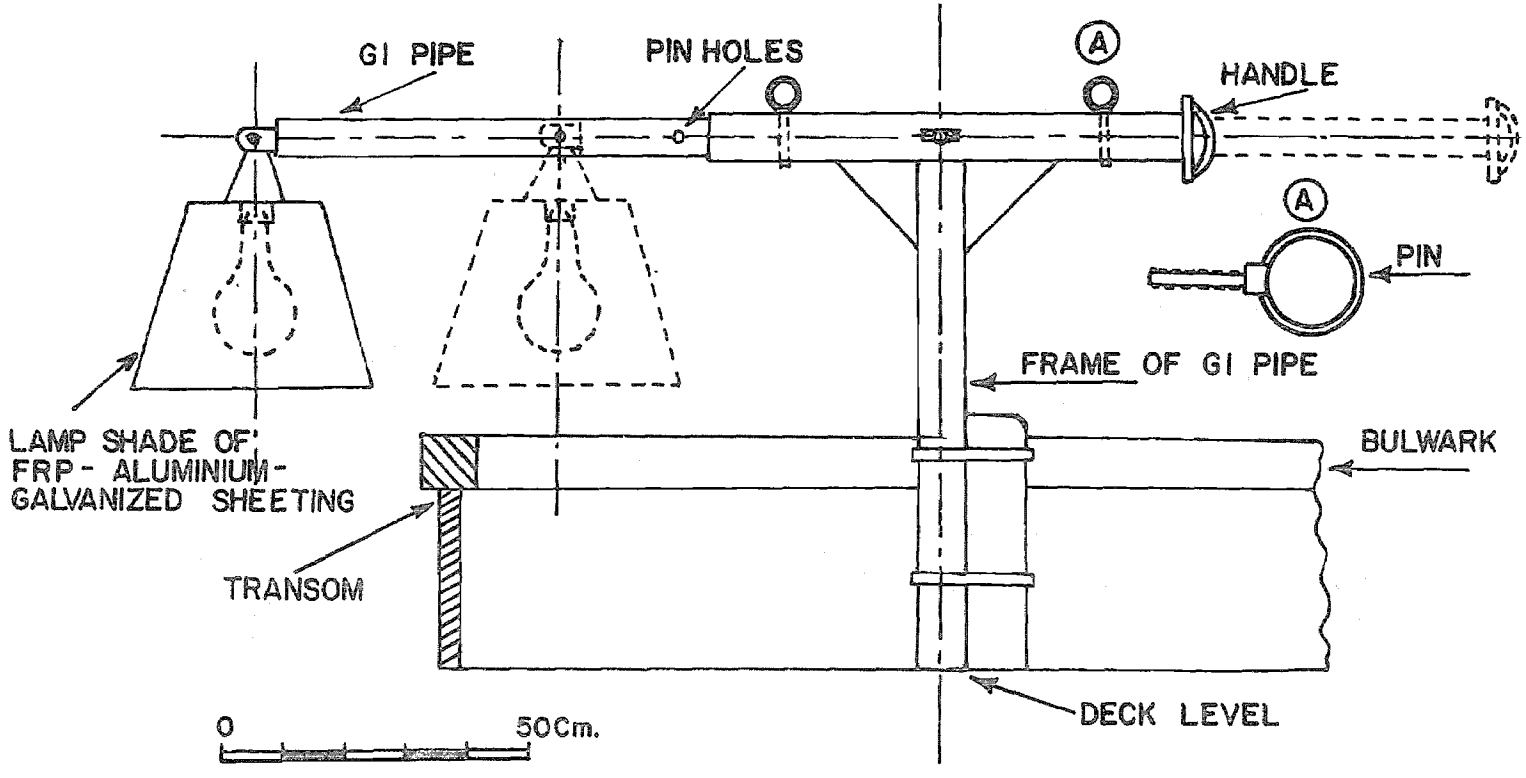


Figure 9

DETAIL OF STAND FOR MULTI-BULBS SHADE (B)

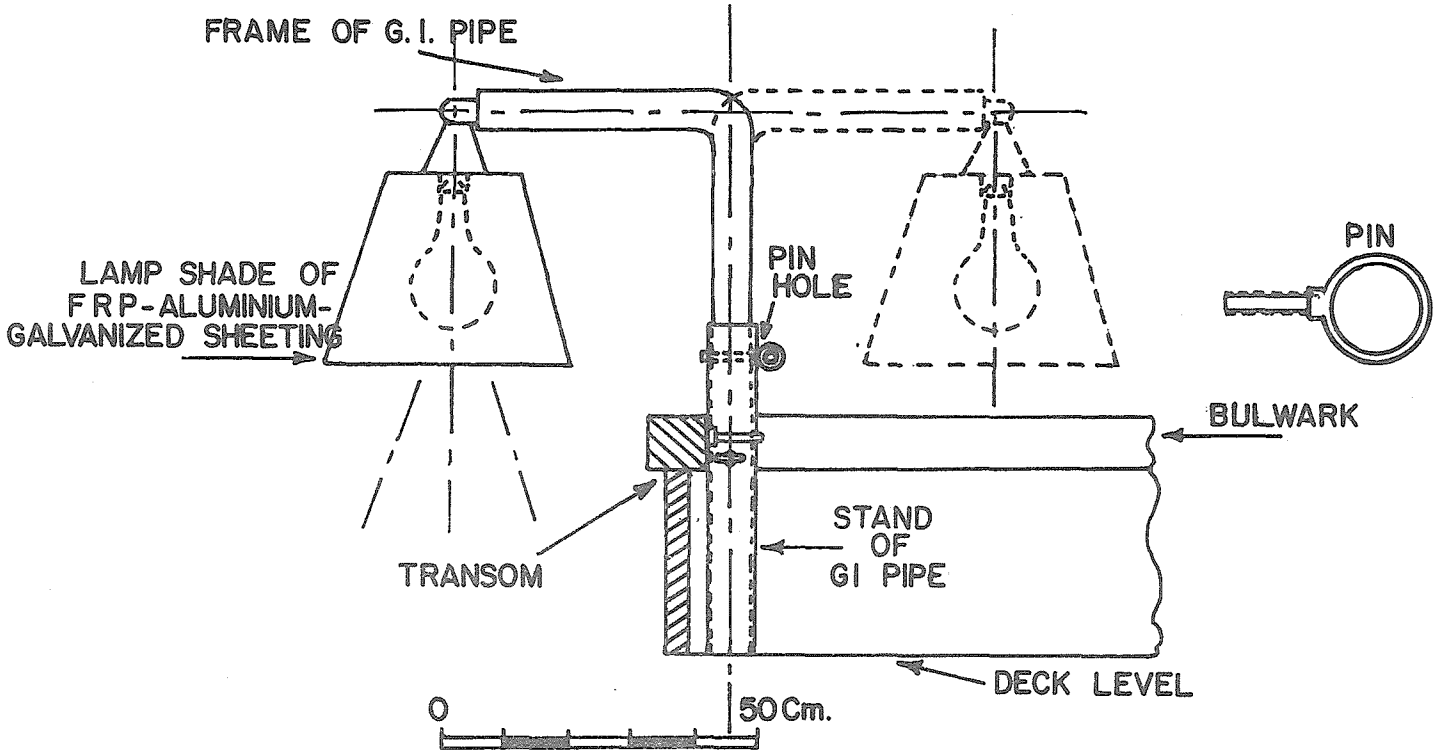


Figure 10 General arrangement of light skiff for Purse seining.

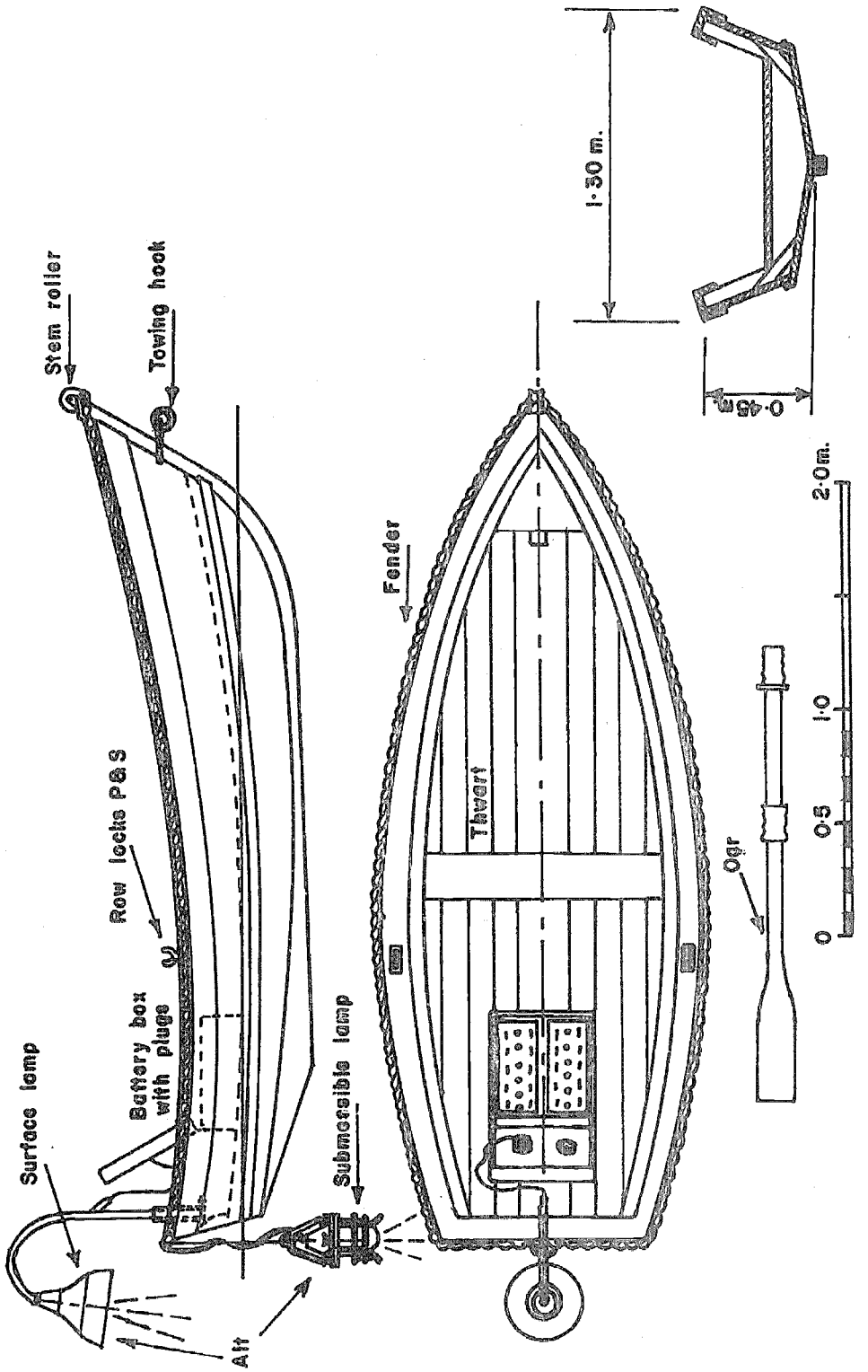


Figure 11

GENERAL ARRANGEMENT OF AUXILIARY LIGHT BOAT.

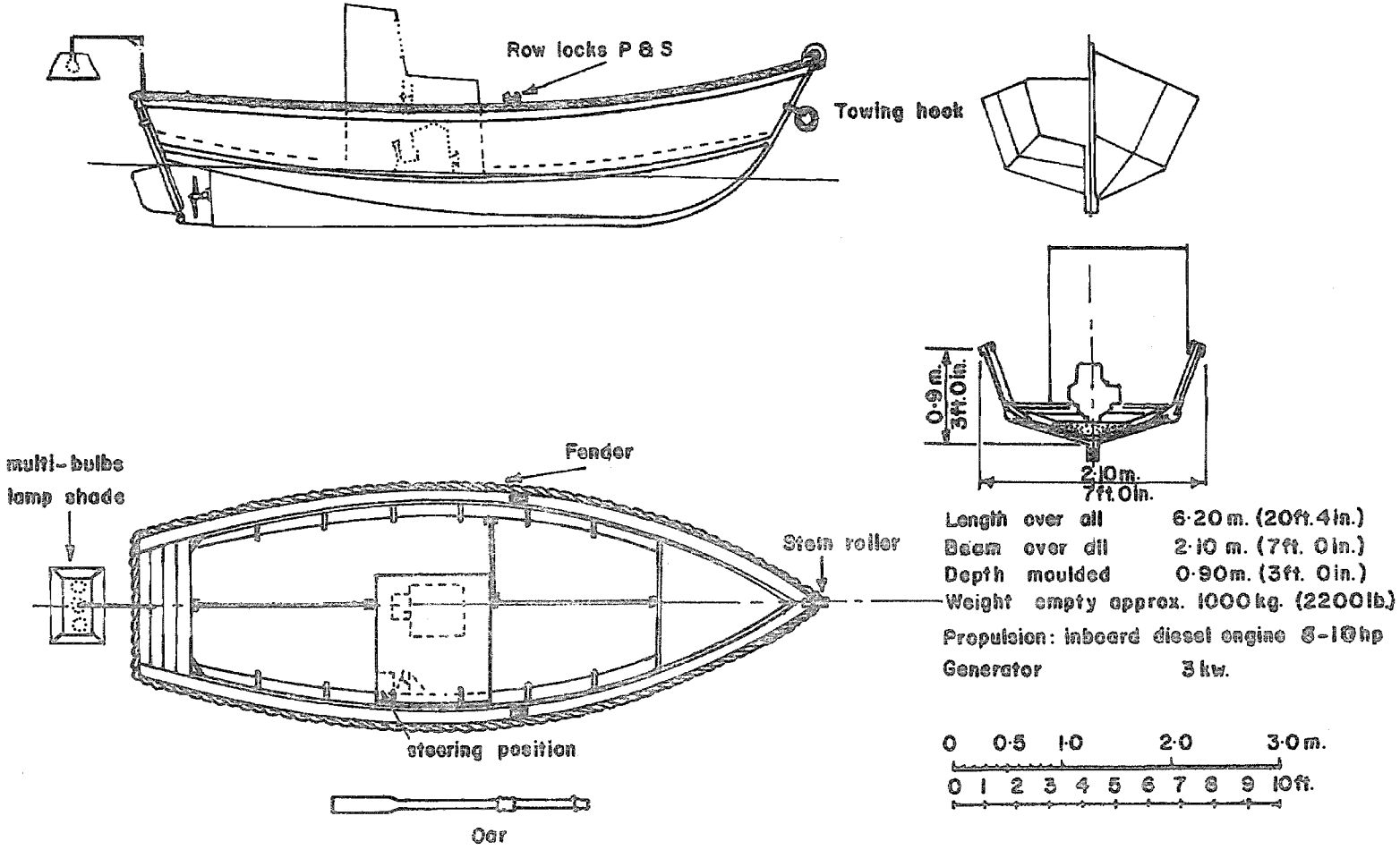
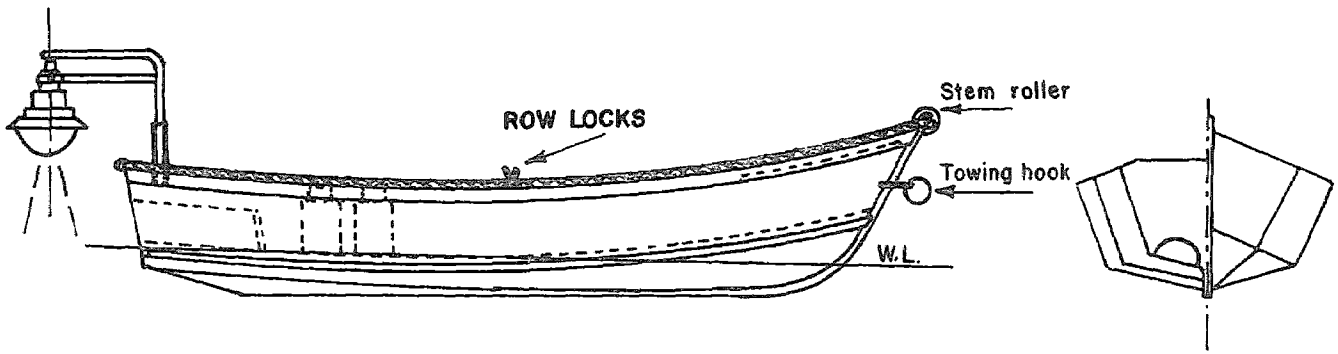
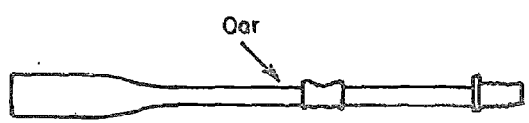
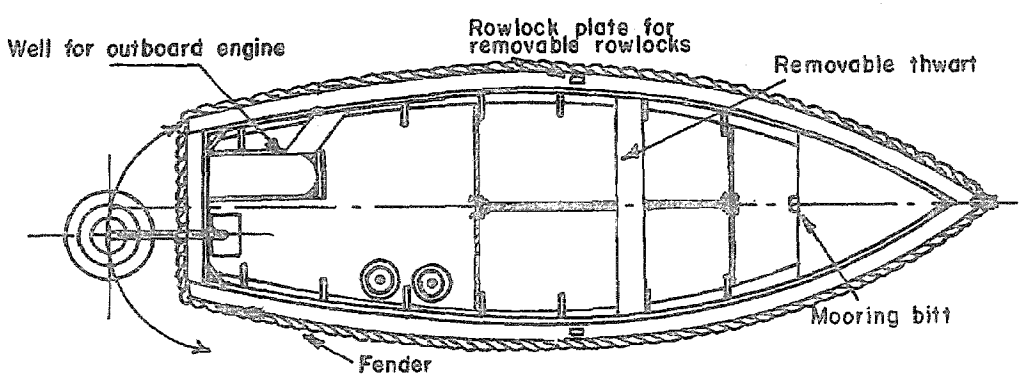


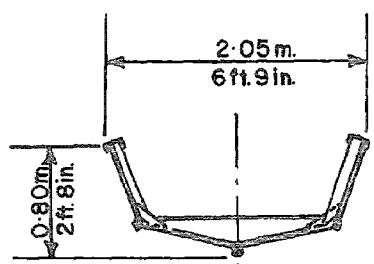
Figure 12

GENERAL ARRANGEMENT OF AUXILIARY GAS LAMP BOAT









MAIN PARTICULARS

Length over all	6·20m. (20ft. 4in.)
Beam over all	2·05m. (6ft. 9in.)
Depth moulded	0·80m. (2ft 8in.)
Weight empty approx.	550 kg. (1200 lb.)
Propulsion:	outboard engine 6 - 8 hp long shaft (optional)

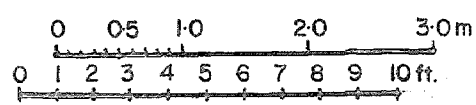


Figure 13

SWITCHES - PLUGS BOARD ASSEMBLY

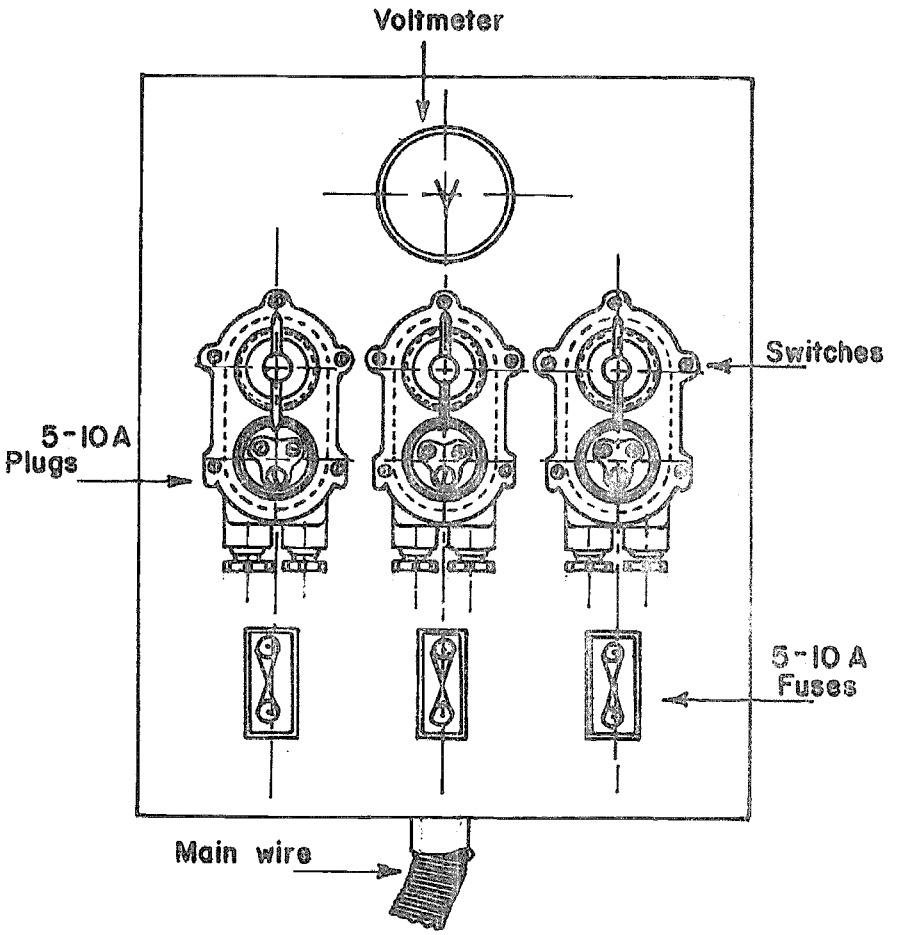


Figure 14

SURFACE LAMP FOR LIGHT SKIFF

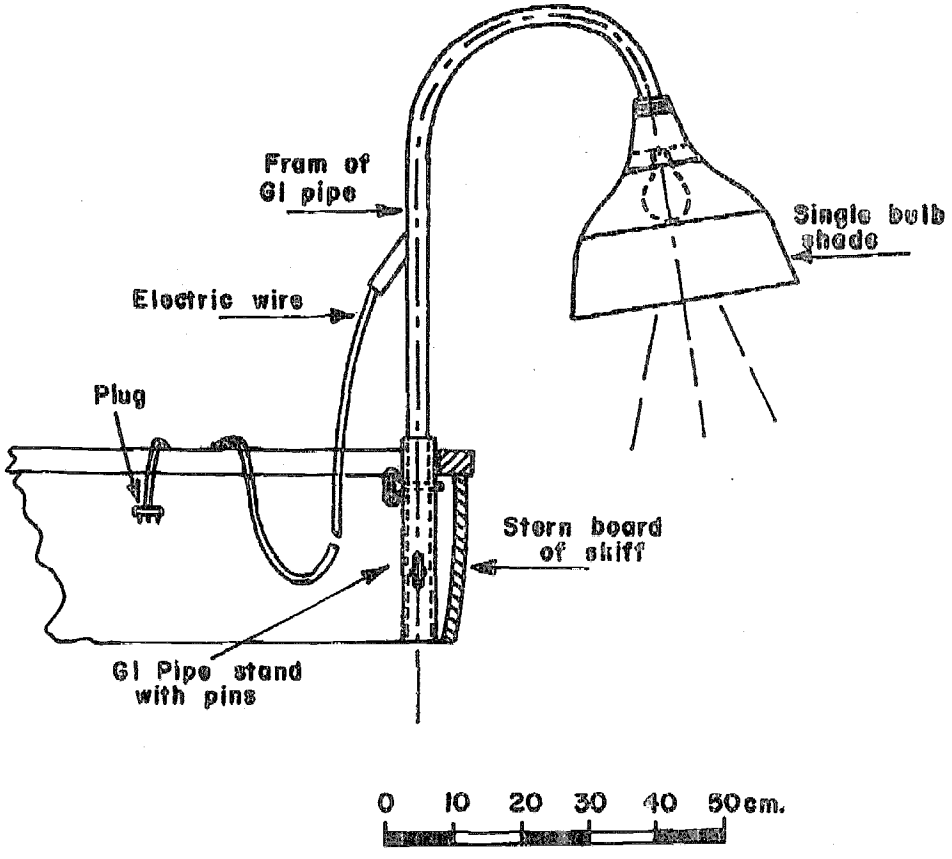


Figure 15

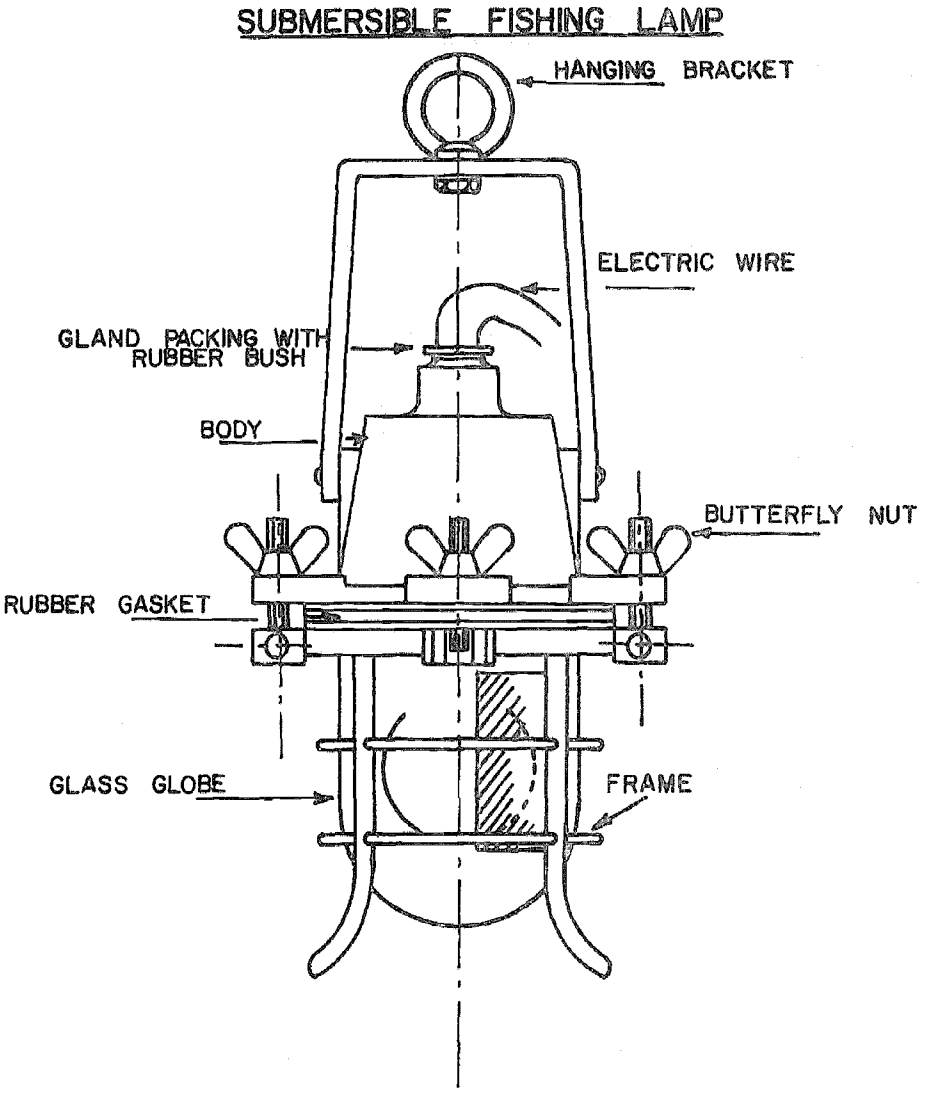

SUBMERSIBLE FISHING LAMP
HANGING BRACKET
ELECTRIC WIRE
GLAND PACKING WITH RUBBER BUSH
BODY
BUTTERFLY NUT
RUBBER GASKET
GLASS GLOBE
FRAME

Figure 16

GAS LAMP ASSEMBLY

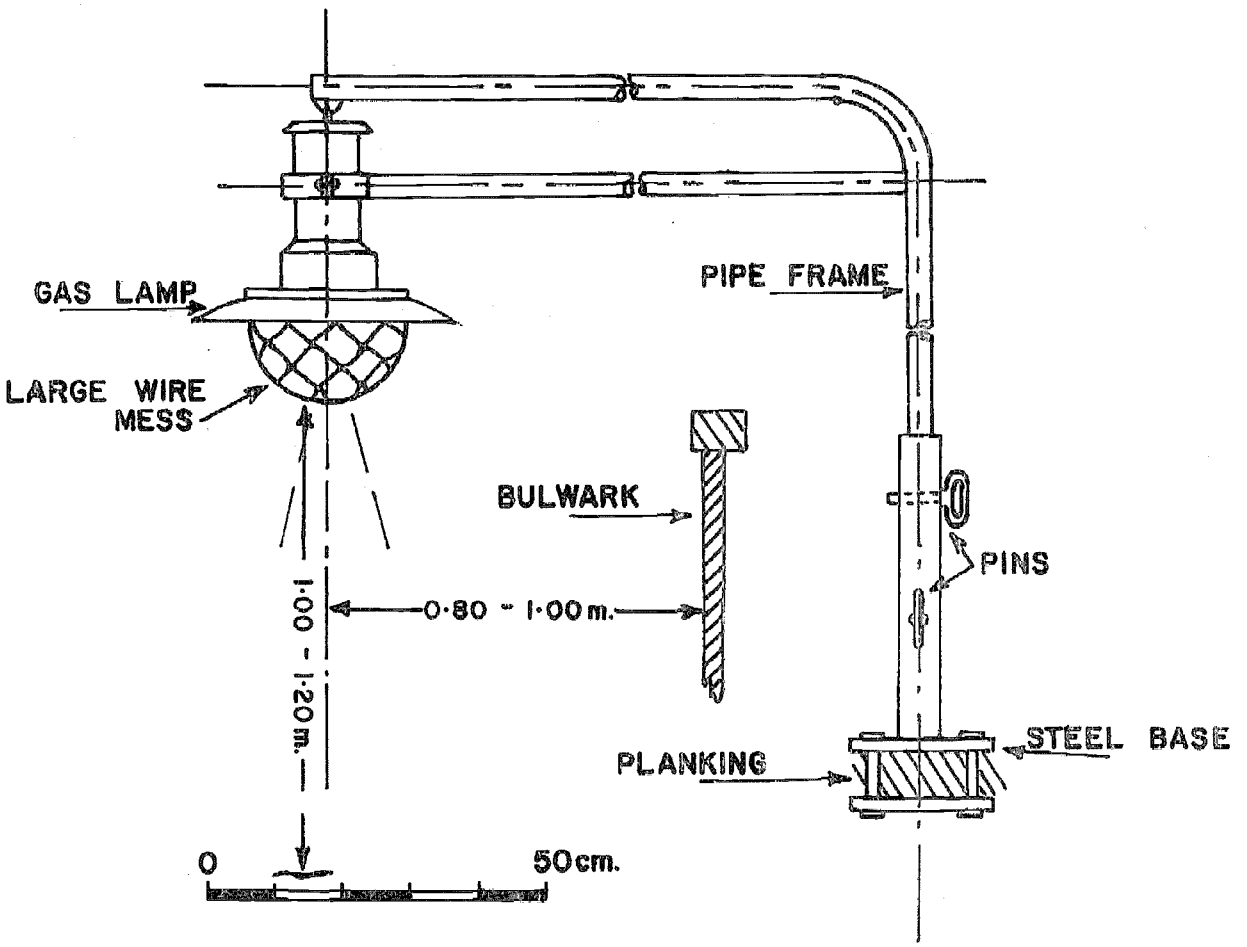


Figure 17

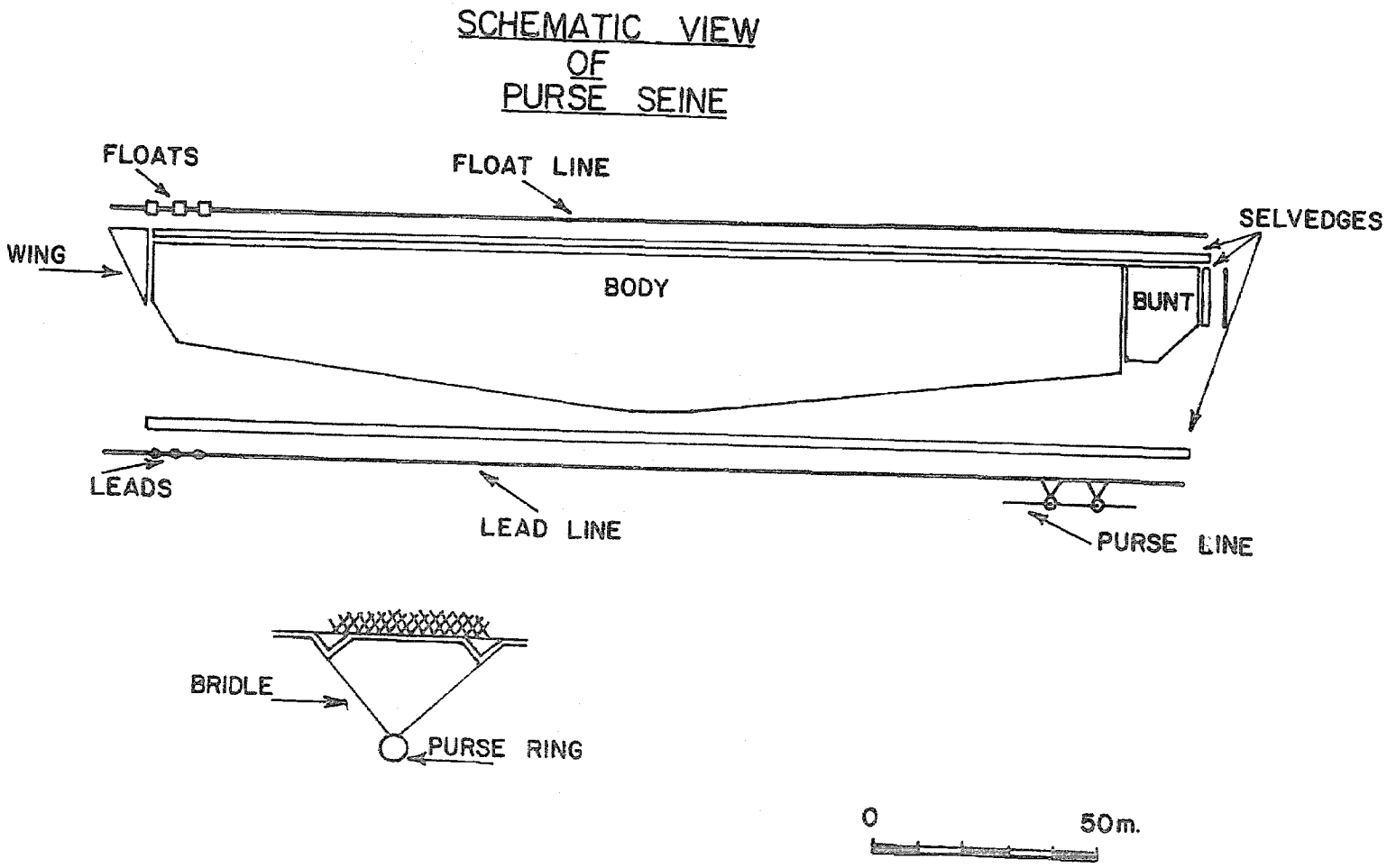

SCHEMATIC VIEW
OF
PURSE SEINE
FLOATS
FLOAT LINE
SELVEDGES
WING
BODY
BUNT
LEADS
LEAD LINE
PURSE LINE
BRIDLE
PURSE RING
0
50m.

Figure 18. A 250 m PURSE SEINE FOR SMALL PELAGIC FISH

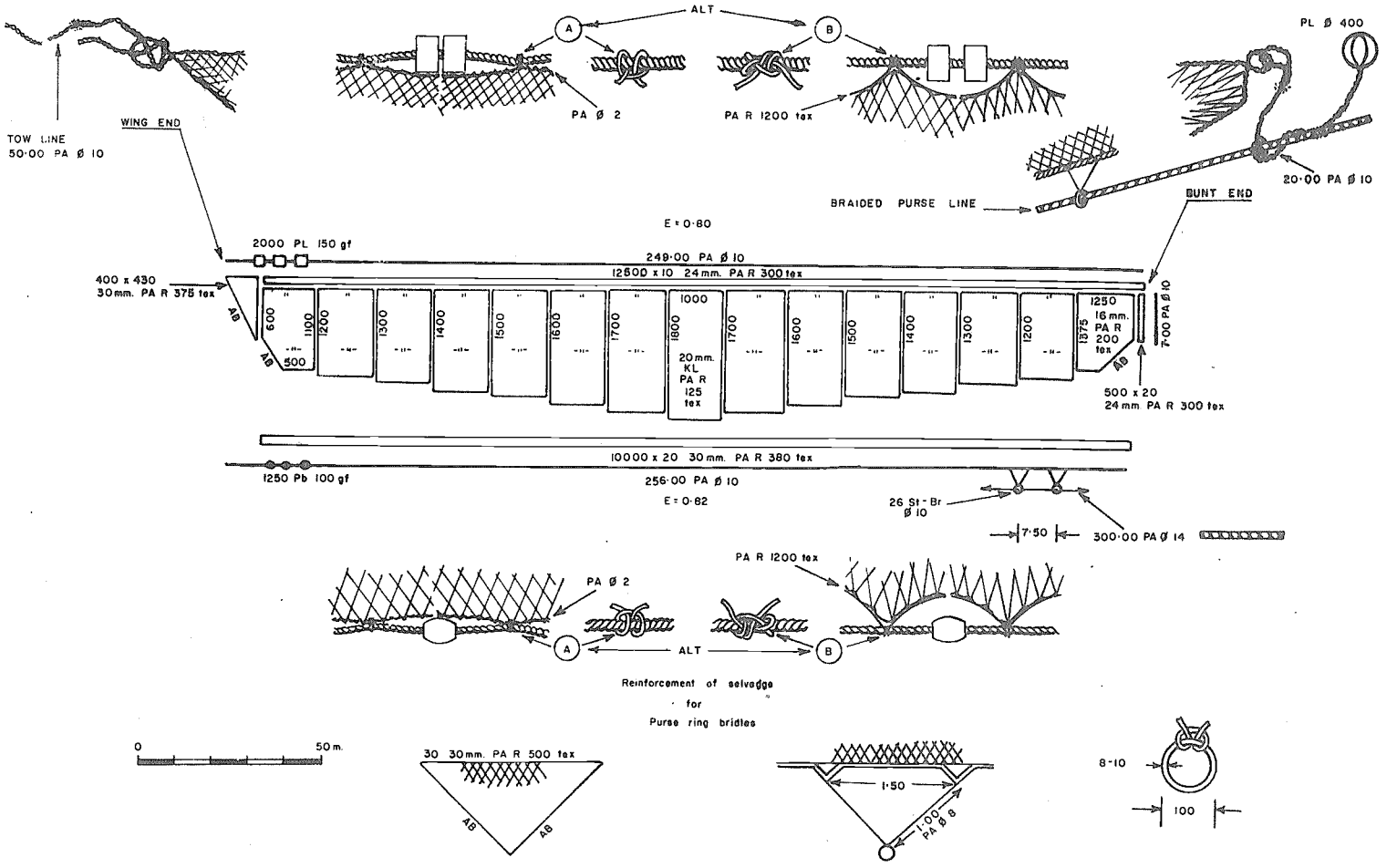


Figure 19. A 225 m PURSE SEINE FOR LIVE BAIT AND OTHER VERY SMALL FISH

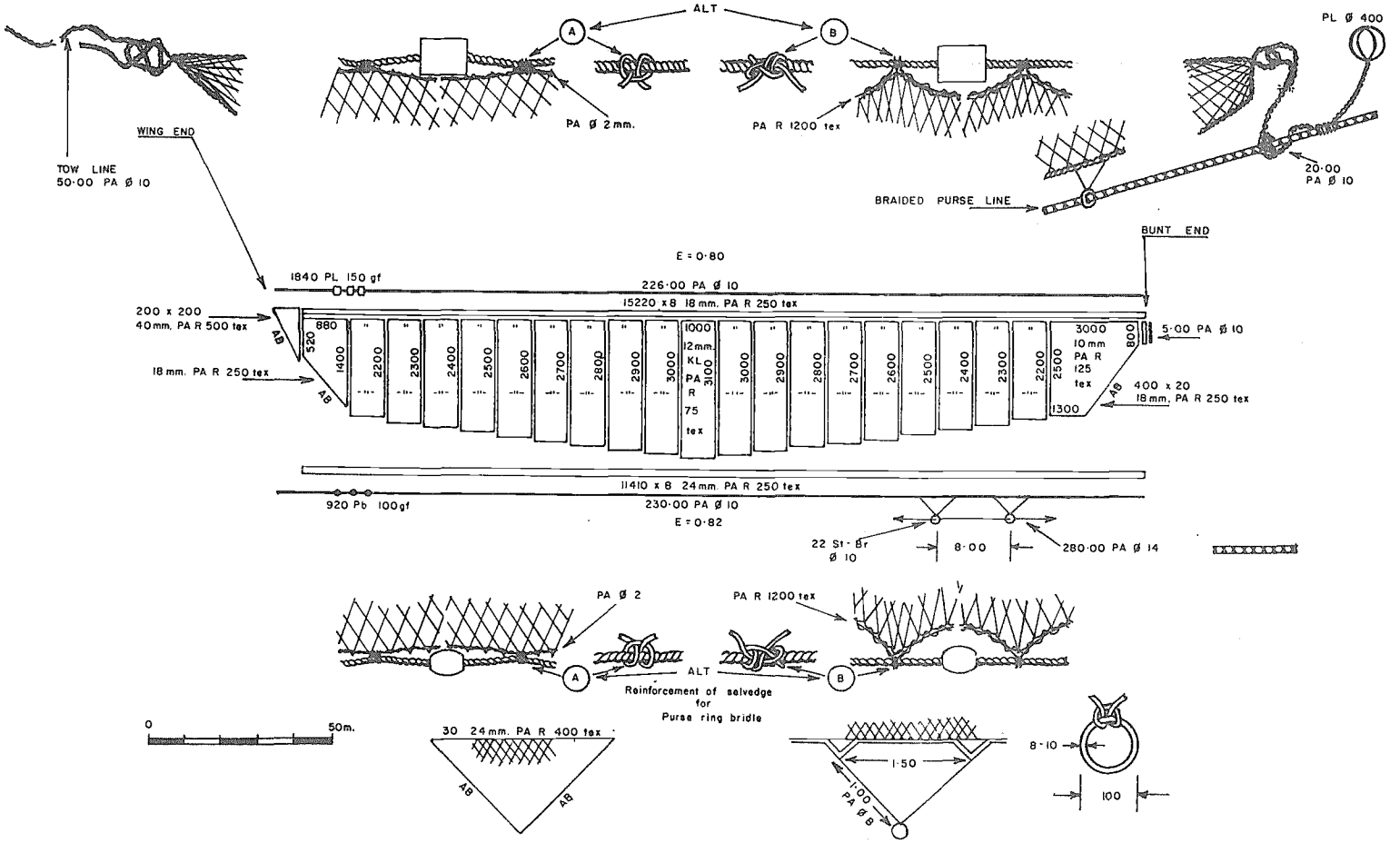


Figure 20

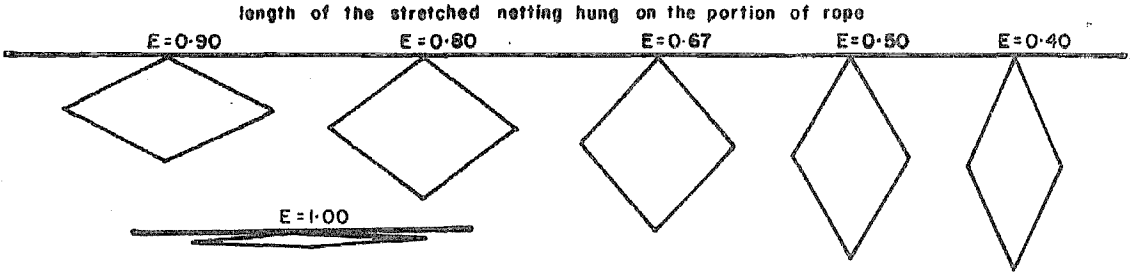
ABBREVIATIONS AND SYMBOLS USED FOR PURSE SEINE DESIGNS

AB = All bar

ALT = Alternative

BR = Brass

E = Hanging ratio: Ratio between the length of a given portion of mounting rope and the length of the stretched netting hung on the portion of rope



gf = Unit for mass - Weight (Buoyancy, Ballast)

PA = Polyamide (Nylon)

Pb = Lead

PL = Plastic (Float)

R tex = Mass (g) of finished netting yarn per 1000m.

(R 25 tex = ~ 1 ply)

ST = Steel

Ø = Diameter

 = Thickness

 = Purse ring

 = Braided line

~ = Approximately

 = Twisted line

KL = Knotless

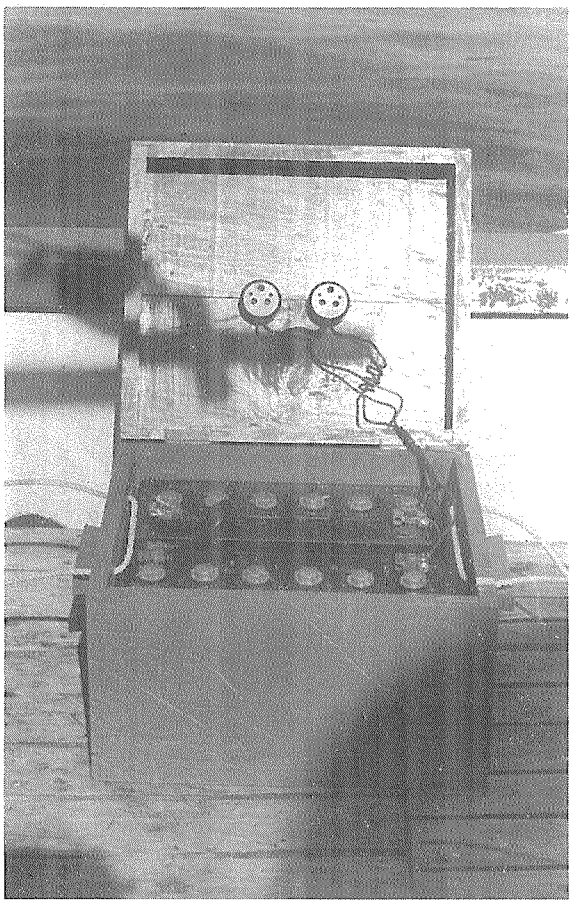
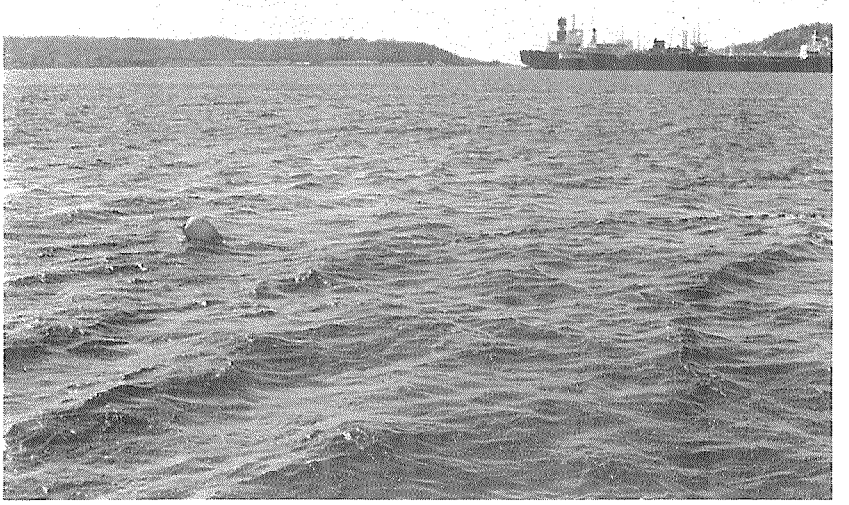


Plate 1. Battery box assembly

Plate 2. Beach landing of a catch



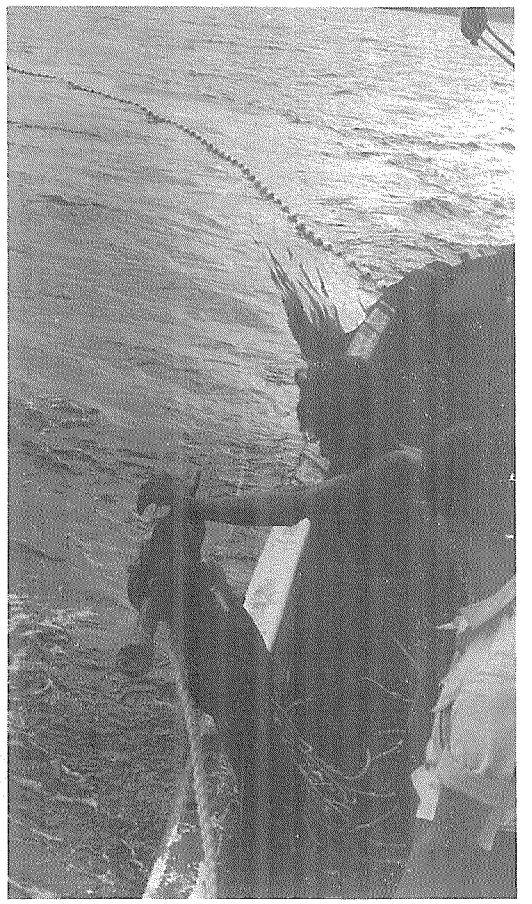


Plate 3. Different phases of the fishing operation

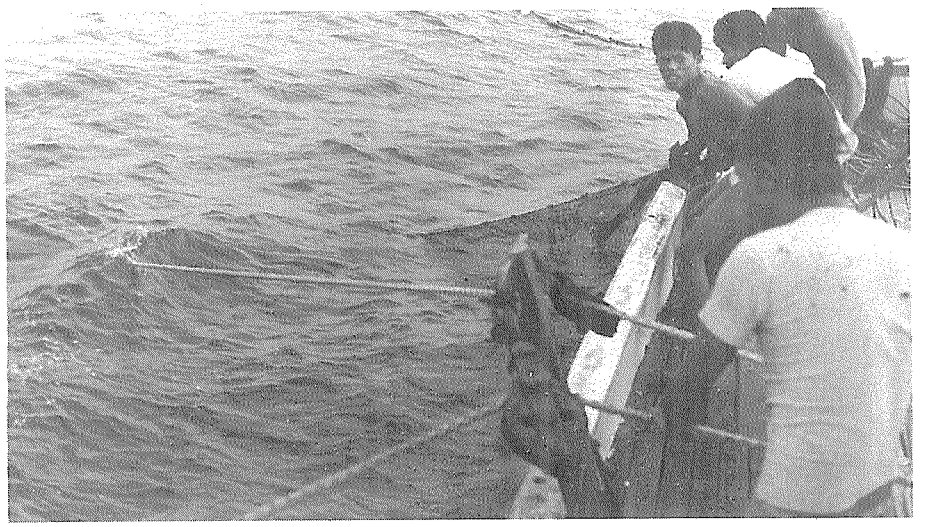
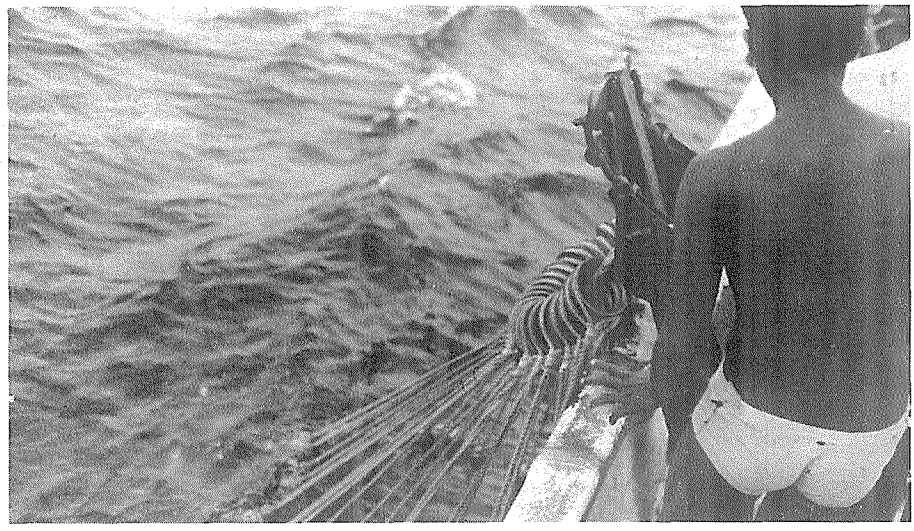


Plate 3 (cont.). Different phases of the fishing operations



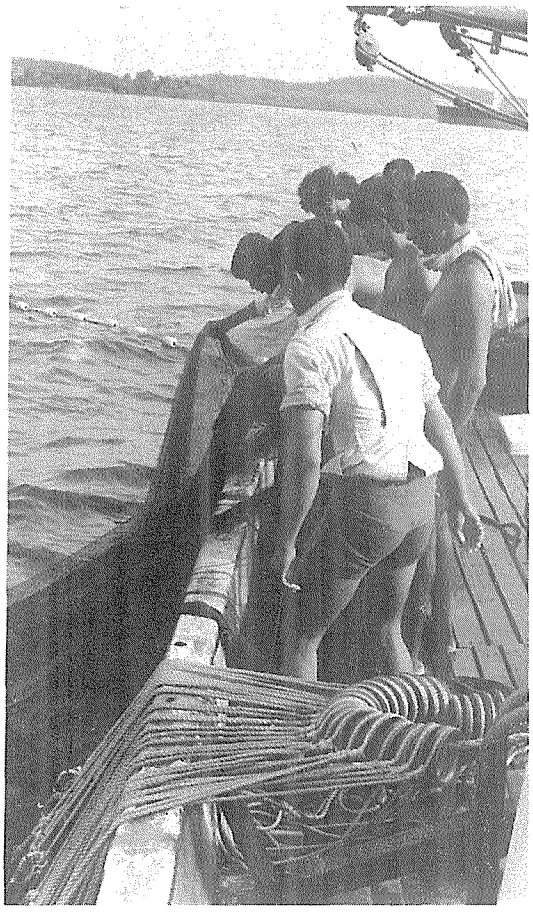
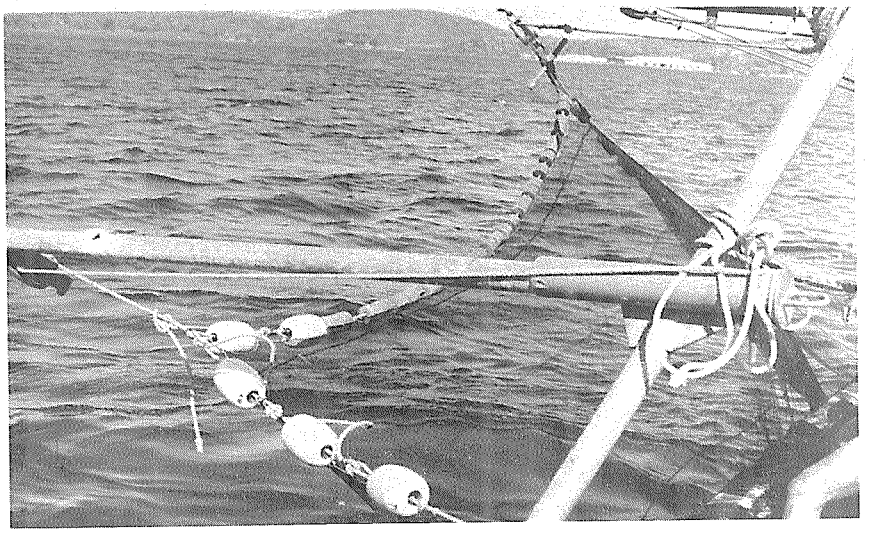


Plate 3 (cont.). Different phases of the fishing operation



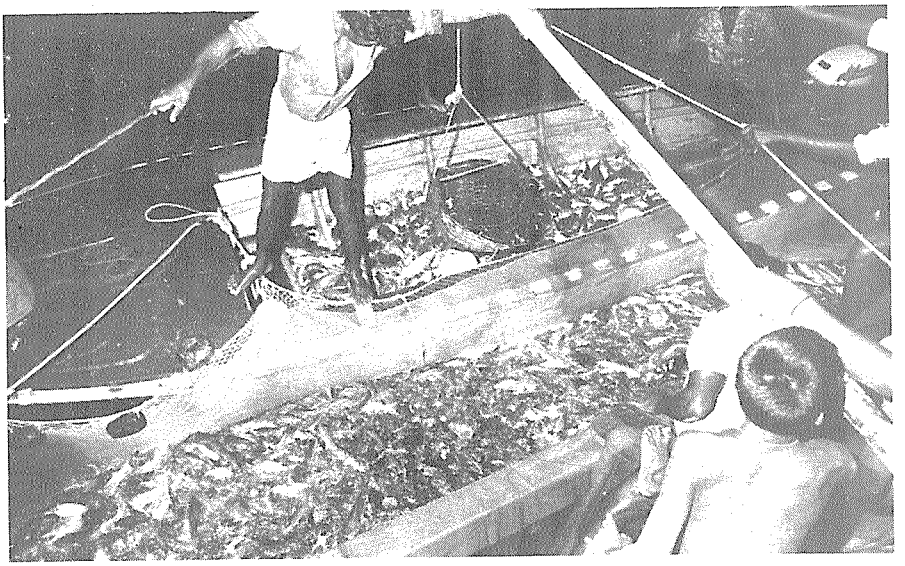


Plate 3 (contd.). Different phases of the fishing operation

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2. Pêcherie de Crevettes - Rapport au Gouvernement de la Republique Malgache. Labon, A., IOP/TECH/75/2 (not published).

3. Fisheries Development Possibilities in the Republic of Kenya. Labon, A., IOP/TECH/75/3.

4. A Report on the Building-up of a Statistical System for the Collection of Marine Fisheries Statistics in the United Arab Emirates. Banerji, S.K., IOP/TECH/75/4.

5. Report to the Ministry of Agriculture and Fisheries - United Arab Emirates. Labon, A., IOP/TECH/75/5.

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16. Markets for Fish Meal in the Near East Region. Naylor, J., IOP/TECH/78/16.

17. Development of Fisheries in the Exclusive Economic Zone of Sri Lanka. Campleman, G., IOP/TECH/78/17 (restricted).

18. Implications of the Extended Zones of Maritime Jurisdiction for the Fishing Industry of Thailand. Labon, A., J. Carroz and J. Gulland, IOP/TECH/78/18 (restricted).

19. Report of a Mission to Examine the Implications of the New Ocean Regime for Fisheries Development in Somalia, Silva, L.I.J., R.L. Payne, J.J. Kambona and G.F.K. Moore, IOP/TECH/78/19 (restricted).

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21. Small-scale One-boat Purse Seining in Sri Lanka, Pajot, G. IOP/TECH/78/21.