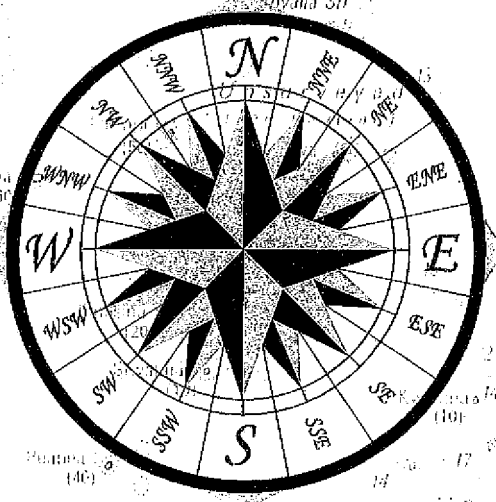
Pacific Island
Qualified Fishing Deckhand



MODULE 2

Names and Functions of Parts of a Fishing Boat

Coastal Fisheries Program
Training Section

South Pacific Commission

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Module 2

Names and Functions of Parts of a Fishing Boat.

OBJECTIVES

By completion of this module the student shall be able to:

List the principal structural components of steel, GRP and wooden fishing vessels.

Describe the layout of fishing vessels designed for purse seine, long-line, gillnetting and trolling operations and identify the areas and deck equipment used with these methods.

Identify and name the parts of fishing gear and equipment for purse seining, long lining, gillnetting and trolling.

CONTENTS

Introduction

- Two important factors that affect the safe and economic operation of fishing vessels are the construction materials used and the vessel's design and layout.
- Commercial fishing vessels operating in the Pacific are, depending on their size, mostly made from steel or glass reinforced plastic (GRP). Smaller inshore boats are also made from planked wood (carvel construction), plywood or, to a much lesser extent, aluminium or ferro cement.
- All maritime countries have regulations covering the construction and strength of larger fishing vessels. These regulations ensure the vessel's construction is strong enough for the work it does and the area in which it fishes. They also ensure the vessel and equipment is maintained in a safe condition. This is usually achieved by the regulatory authorities conducting an annual survey of the vessel.
- Each fishing operation is different, and a boat that is suitable for one type of fishing is often not suitable for a different type of fishing. Naval architects, in conjunction with fishermen, design boats which are specially suited to a particular fishing method and as well as the actual catching process, include considerations such as, how long the boat must stay at sea and how the catch will be processed and stored after being caught. The design should also keep the crew safe and in relative comfort for the time they are on board. Because of these varying criteria an oceanic long-liner looks quite different from a purse seiner and would be uneconomic in this role.

Fishing Vessel Construction

STEEL CONSTRUCTION METHOD

- From the range of materials used, steel is the strongest and this makes it the most suitable for building the larger fishing vessels. The most common steel construction method uses transverse (across) framing. In this method, a framework of steel deck beams, side frames and floors are covered with sheets of steel plating and all are welded together. The system of beams, brackets, frames and floors gives the vessel strength against the forces of the sea . The welded plating makes the vessel watertight as well as giving additional strength.
- Figure 2.1 shows a typical arrangement for a smaller, hard chine, steel boat while Figure 2.2 shows the arrangement for a larger vessel with a working or shelter deck. Note, in the smaller vessel, fuel tanks are built-in at the sides of the vessel, as part of the structure, while in the larger vessel fuel will be carried in double bottom tanks. Should the larger vessel run aground and open the bottom the vessel should still float on the inner floor.

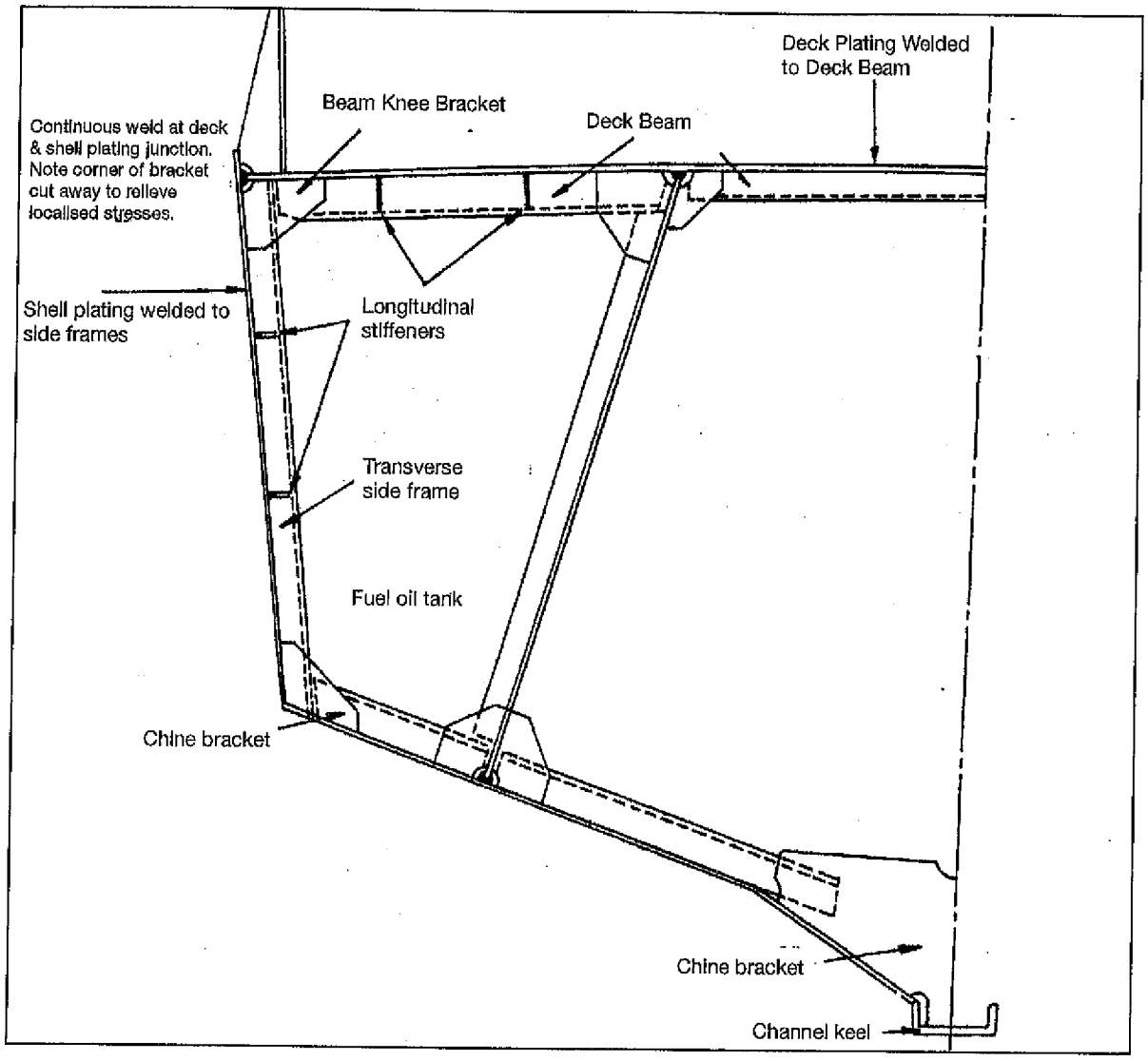


Fig 2.1 Steel Hull Construction of Small Hard Chine Boat

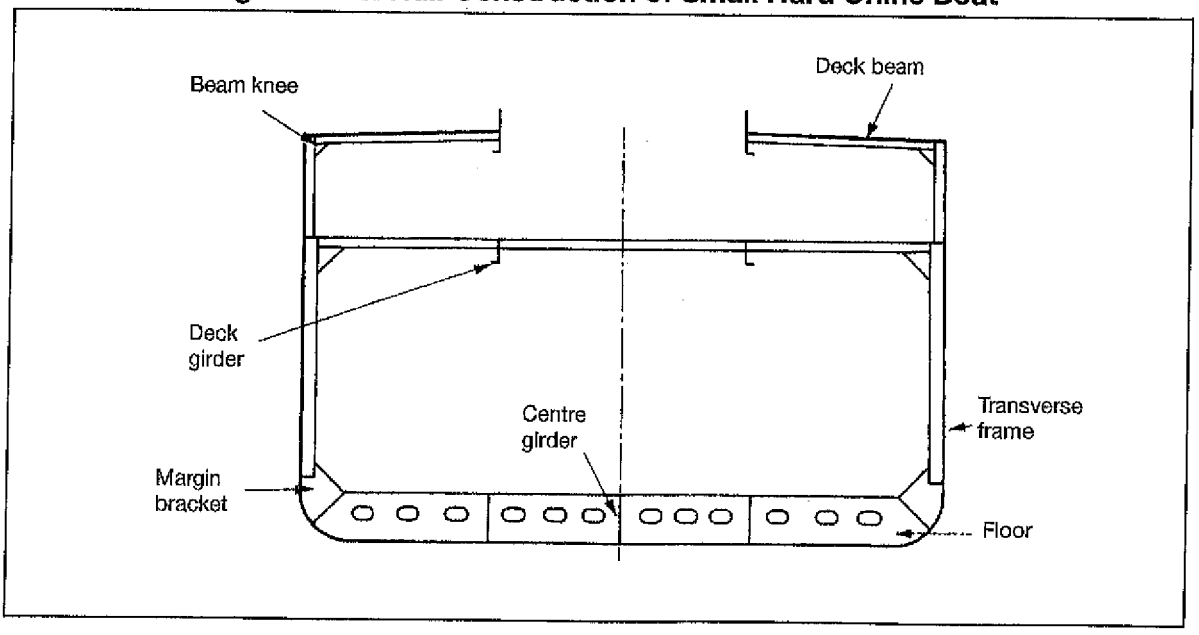


Fig 2.2 Steel Hull Construction of larger steel vessel

FIBREGLASS CONSTRUCTION METHOD

- The material known under the general term, glass reinforced plastic (GRP), is a composite of two different materials which combine together chemically to give complementary strong physical characteristics.
- The reinforcing material is glass fibre filament, woven into a cloth or matt. This is soaked with a chemical setting resin, which when set, is hard and brittle. The glass fibre gives the strength while the resin makes the finished substance watertight. Fibreglass is not strong enough for really large boats and it has the additional disadvantage in that it can burn with a heat similar to plywood.
- Fibreglass hulls are not strong enough by themselves for other than small boats and, similar to steel boats, fibreglass hulls have to be strengthened with frames, beams, knees and floors. These are usually made of GRP or of foam sandwich construction and are incorporated as an integral part of the hull when it is being "laid up" with layers of cloth and resin in the mould.
- Figure 2.3 shows a typical construction method for a fibreglass hull

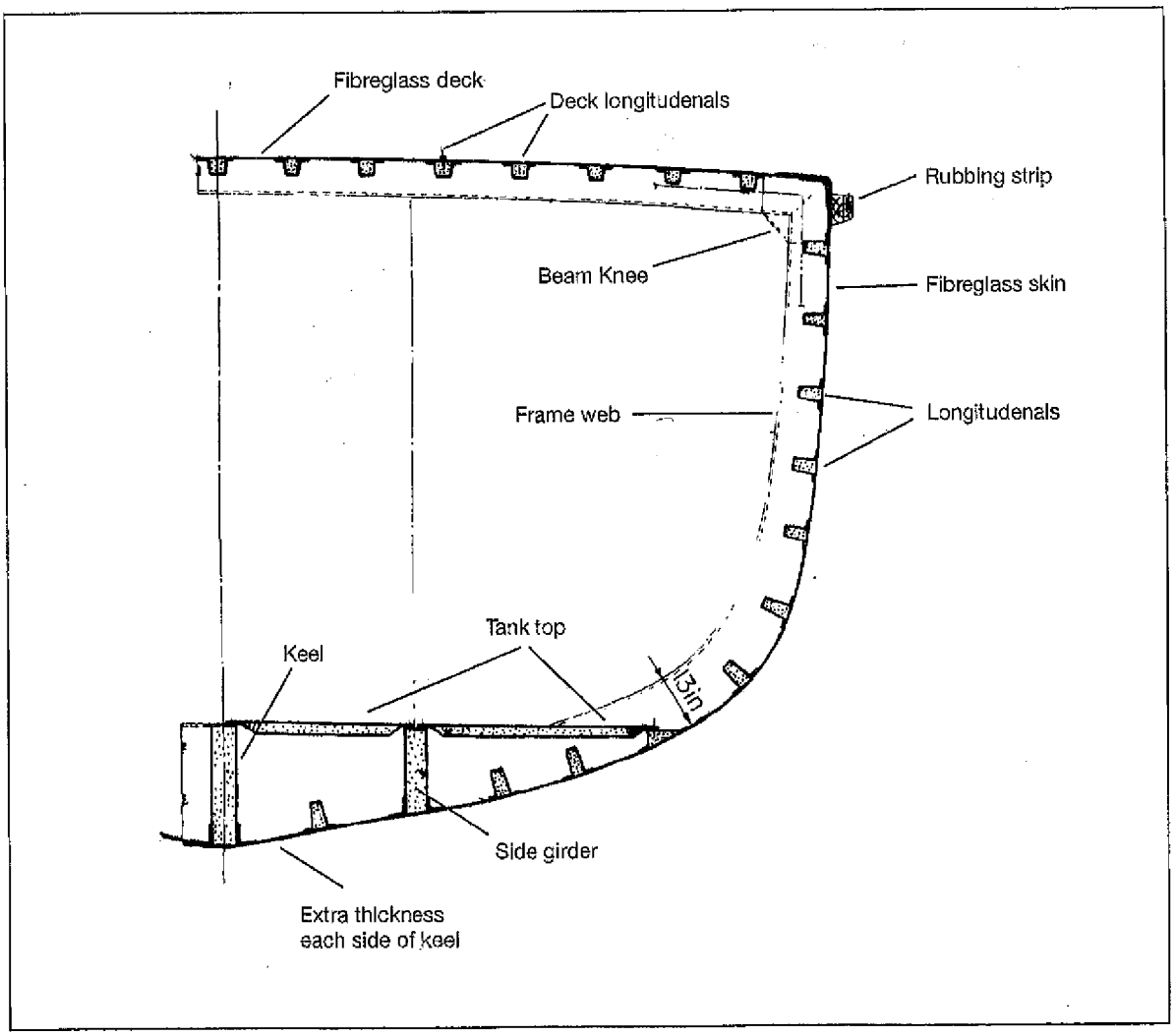


Fig 2.3 Fibreglass Hull Construction

WOODEN CONSTRUCTION

- Although small fibreglass boats are becoming more popular, wood continues to be used for small inshore fishing boats around the Pacific because of the availability of materials, the relatively lower price and ease of repair. Wood is not as strong as the other materials, also it is subject to rot, marine borer attack and leaking but despite this, it still has a place as a construction method.
- Figure 2.4 shows a round bilge carvel planked construction and Figure 2.5 shows a typical hard chine plywood construction for wooden fishing vessels. While many of the parts are similar to steel and fibreglass construction, the ways of joining and fastening the wooden parts require specialist knowledge.

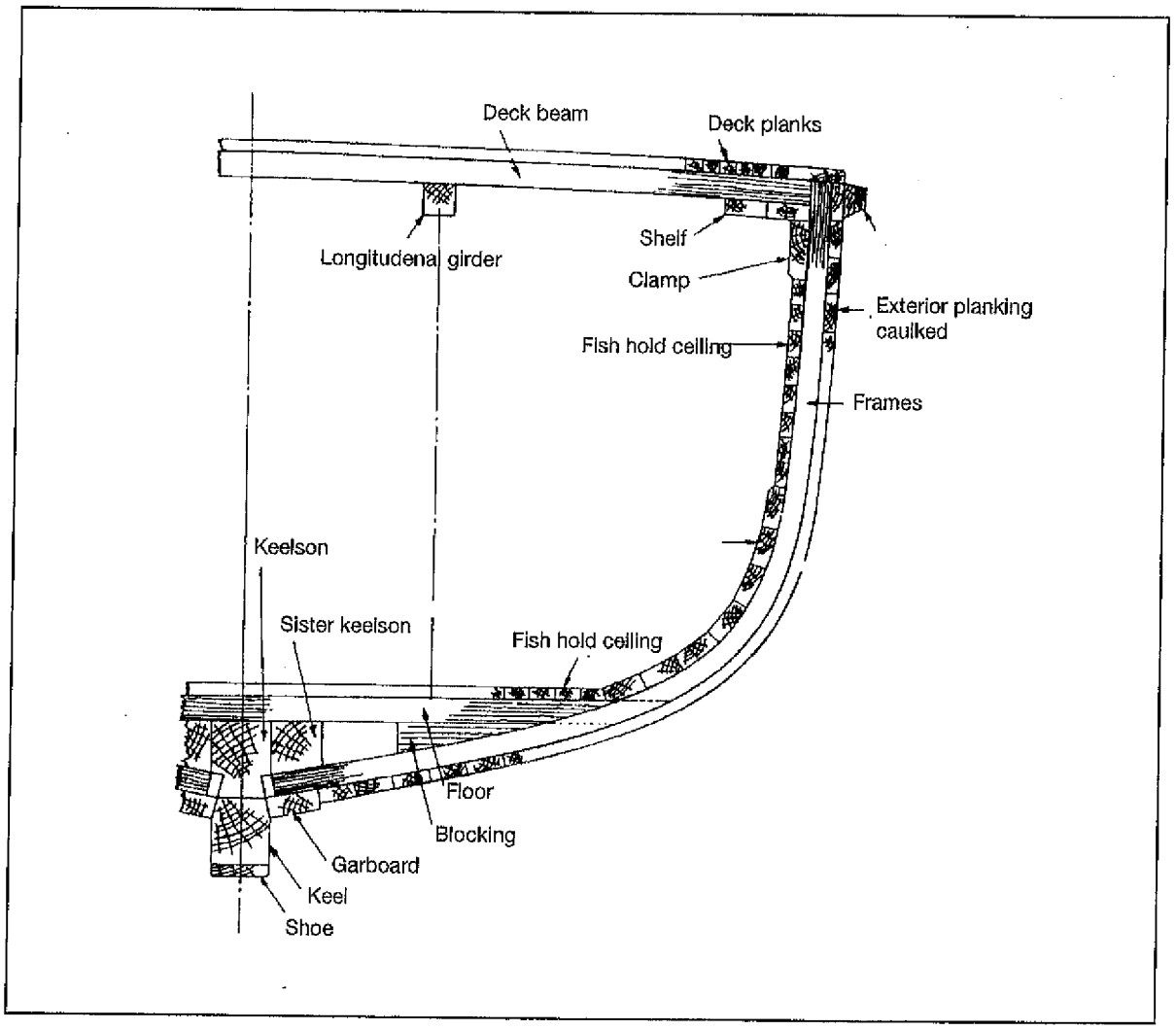


Fig 2.4 Carvel Planked Wooden Construction

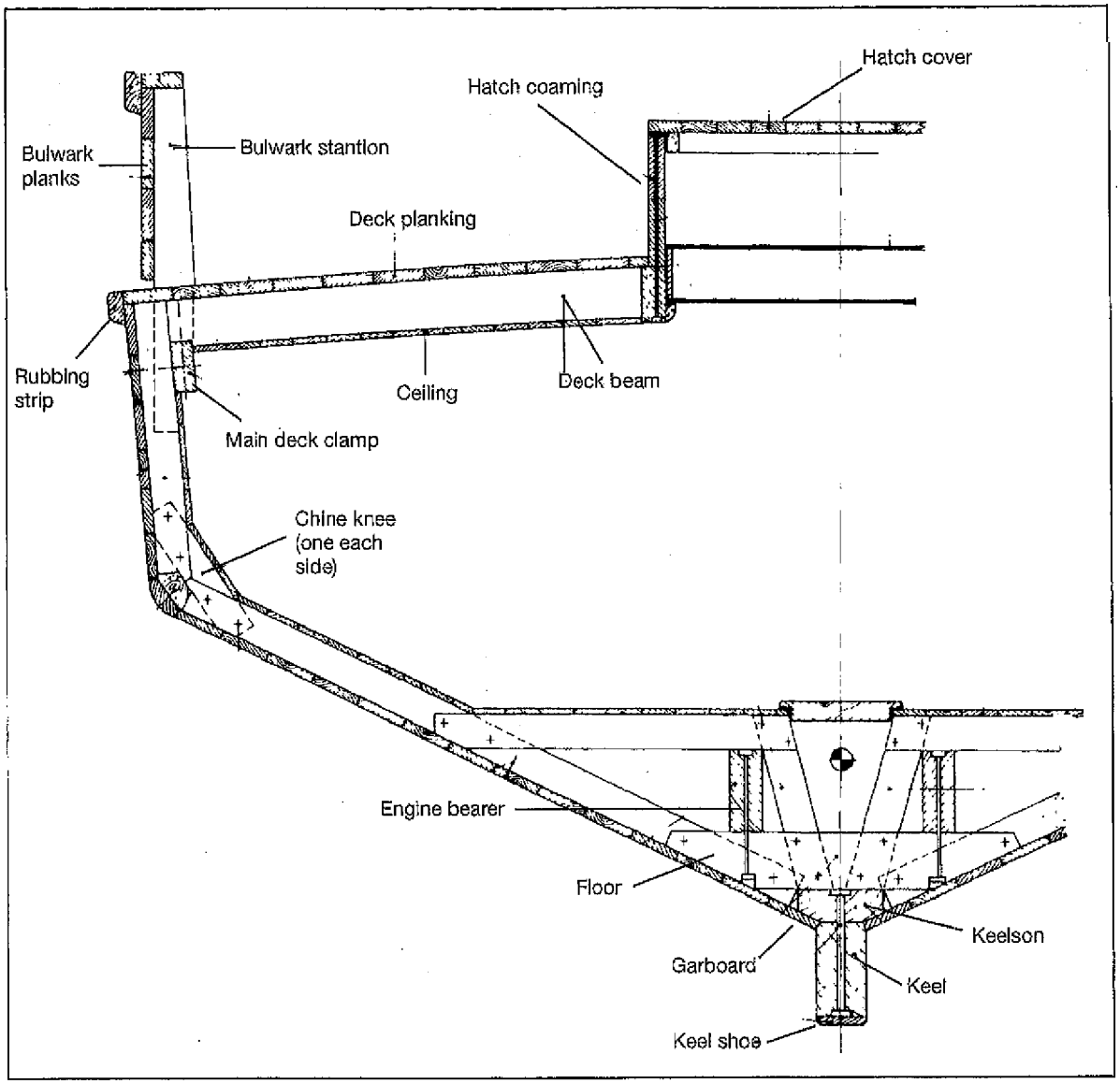


Fig 2.5 Hard Chine Wooden Construction

NAMES AND USES OF HULL COMPONENTS

By comparing the drawings of the different construction methods, it will be seen, the parts are named in a similar way. With reference to Figures 2.1 and 2.2 the main parts of the steel vessel construction are:

Deck Plating — Steel plates on the deck, welded together and welded to the deck beams below.

Deck Beams — Steel angle iron beams crossing from side to side, to support the deck and provide athwartship strength.

Beam Knees — Brackets joining the deck beams to the transverse frames (ribs) to provide strength at the corners.

Frames (Ribs) — Angle irons running vertically from deck to bilge.

Stringers — Horizontal angle irons fitted on top of the frames to give longitudinal stiffening.

Margin Bracket — Bracket at the turn of the bilge joining the frames to the floors. Note the difference between the small ship and large ship constructions, where the small ship has chine brackets and keel brackets.

Floors — Large transverse girders, which separate the inner and outer bottom plating. This allows a space for the double bottom and the girders have holes in them for lightness and to allow the flow of the liquid.

Shell Plating — The steel plating which covers the side and bottom of the vessel, making it watertight.

Centre Girder — Large girder, similar to floors, which runs fore and aft, often separating port and starboard double bottom tanks.

Keel — The centre of the bottom of the vessel. Shown as a channel iron in figure 2.1 and as a plate below the centre girder in figure 2.2.

Sheer Strake — The first line of plating below deck level.

Garboard Strake — The first line of plating either side of the keel.

Bulkhead — The vertical divisions in the ship's structure (in all materials) are called bulkheads. The fitting of a bulkhead is shown in Figure 2.6. As well as dividing the ship into compartments, bulkheads also provide structural strength, support the decks and resist sideways deformation of the ship. Some bulkheads are made watertight so that, should one

compartment become flooded, the water will not flow to another, sinking the ship. A special, strong, collision bulkhead is fitted in the fore part of the vessel and watertight bulkheads are fitted either side of the engine room and at the after end to enclose the stern tube and rudder trunk in a watertight compartment.

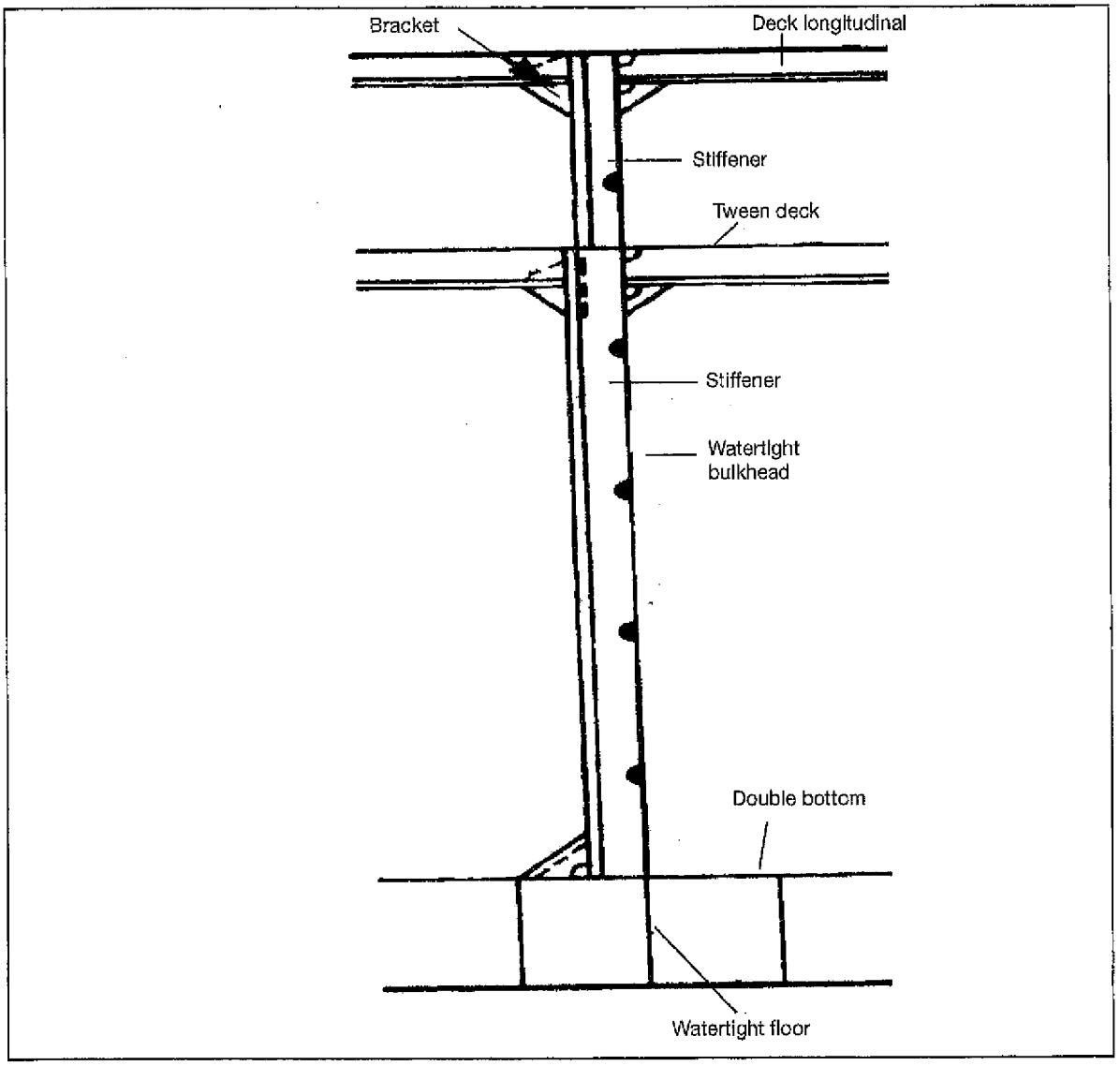


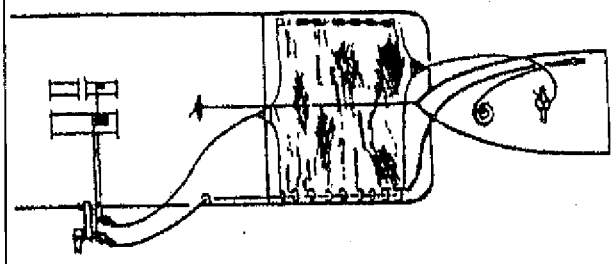
Fig 2.6 Bulkhead Construction

Fishing Vessel Layout and Gear

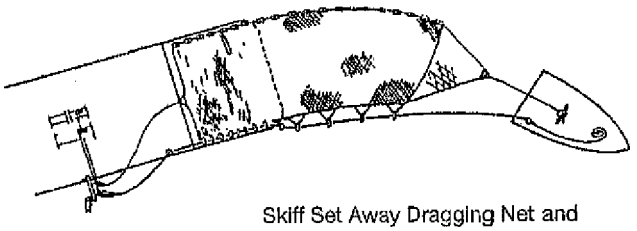
THE PURSE SEINE OPERATION AND GEAR.

- To understand the layout on a purse seine vessel it is best to first understand the purse seine fishing process.
- Figures 2.7 and 2.8 show the purse seine process used for setting and pursing the net on the larger US purse seiners which work in Pacific waters. With reference to these figures the procedure is: -

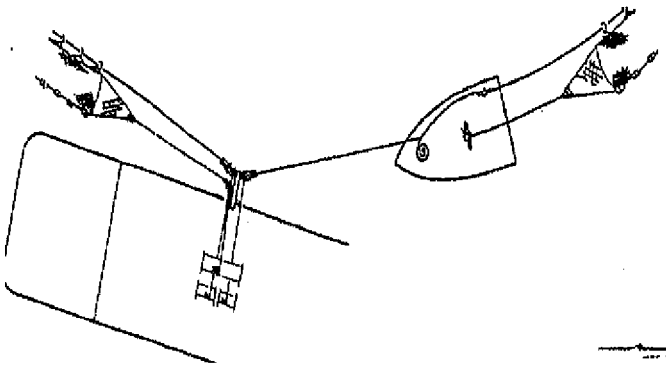
  - Locate the school of fish using visual aids, binoculars, bird radar or the use of floating aggregators.
  - The skipper manoeuvres the vessel from the crow's nest.
  - When the boat is in a position to circle the school, the slip on the wire holding the heavy skiff is knocked loose. The skiff slides down the stern ramp dragging one end of the net with it.
  - The vessel circles the school and the purse seine net is dragged from where it is stacked in a pile on the after deck.
  - When the circle is complete, the skiff passes its end of the net and pursing wire, back to the purse seine vessel.
  - The purse seine vessel uses a very powerful and high speed winch to pull in the wire which goes around the bottom of the purse seine net through rings, from both ends at once.
  - While the bottom of the net is being dragged under the school of fish (pursed) the skiff holds the vessel clear of the net. The crew of the purse seine vessel bang on the sides of the boat and throw tuna bombs to scare the fish away from the still open net.
  - When the bottom of the net is pulled to the side of the ship and the fish cannot escape, the crew stacks the net on the after deck, ready for the next set. They do this by using a puretic power block on top of the derrick.
  - At the same time as the net is being stacked the purse wire is taken out from the rings which are arranged in sequence on a rack beside the stacked net, also ready for the next set. This is done by a device called a "cherry picker".
  - When the net is reduced to its minimum size and the fish confined in a small part of the net the fish are then brailed out and emptied into the fish tanks using a large circular dip-net on a pole and hoop.



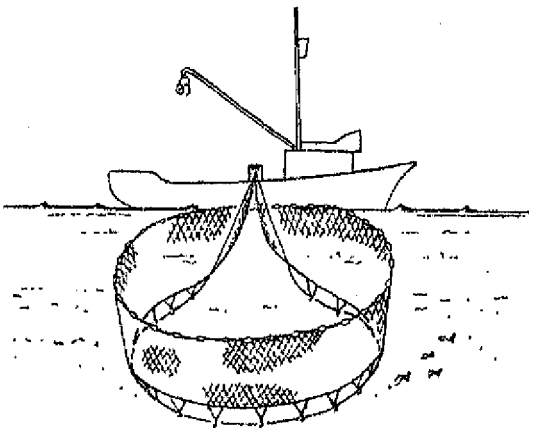
Skiff Going Away
(Purse wire through purse rings)



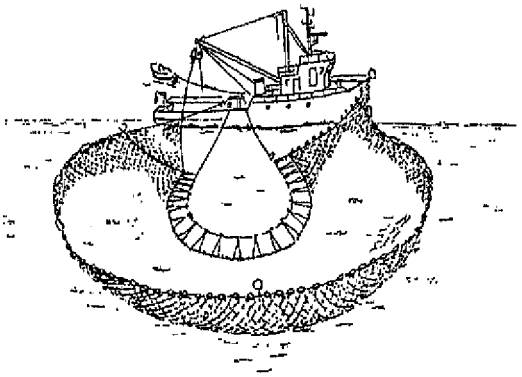
Skiff Set Away Dragging Net and
Purse Line



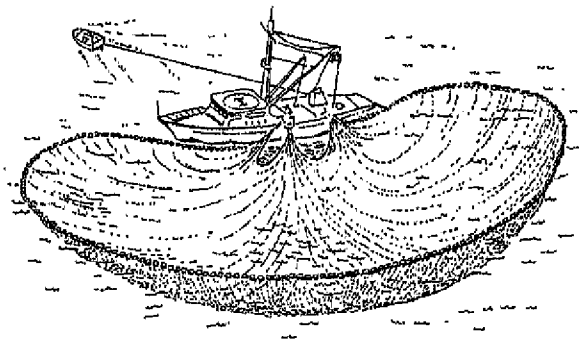
Circle Almost Made - Transferring
End of Net and Purse Line. Winch
will Purse from Both Ends



The Net Closed and Hauling Purse Lines



The Net Half Pursed



The Net Fully Pursed

Fig 2.7 The Purse Seine Operation 1

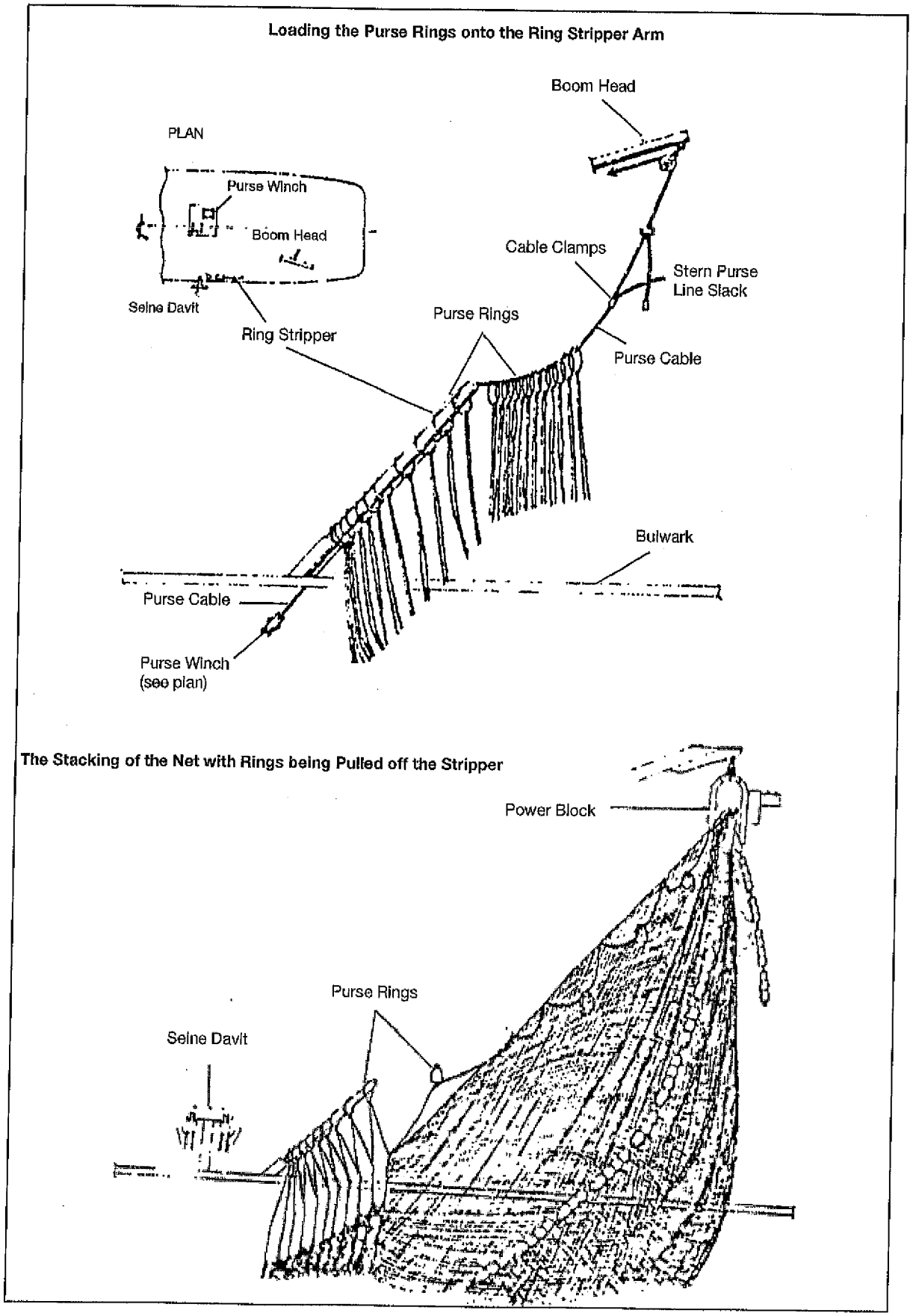


Fig 2.8 The Purse Seine Operation 2

- The process is obviously much more complicated than is described above and requires a lot of skill from all involved.
- Figure 2.9 shows the deck layout of a large tuna purse seiner showing the various parts of deck equipment used in the fishing operation.

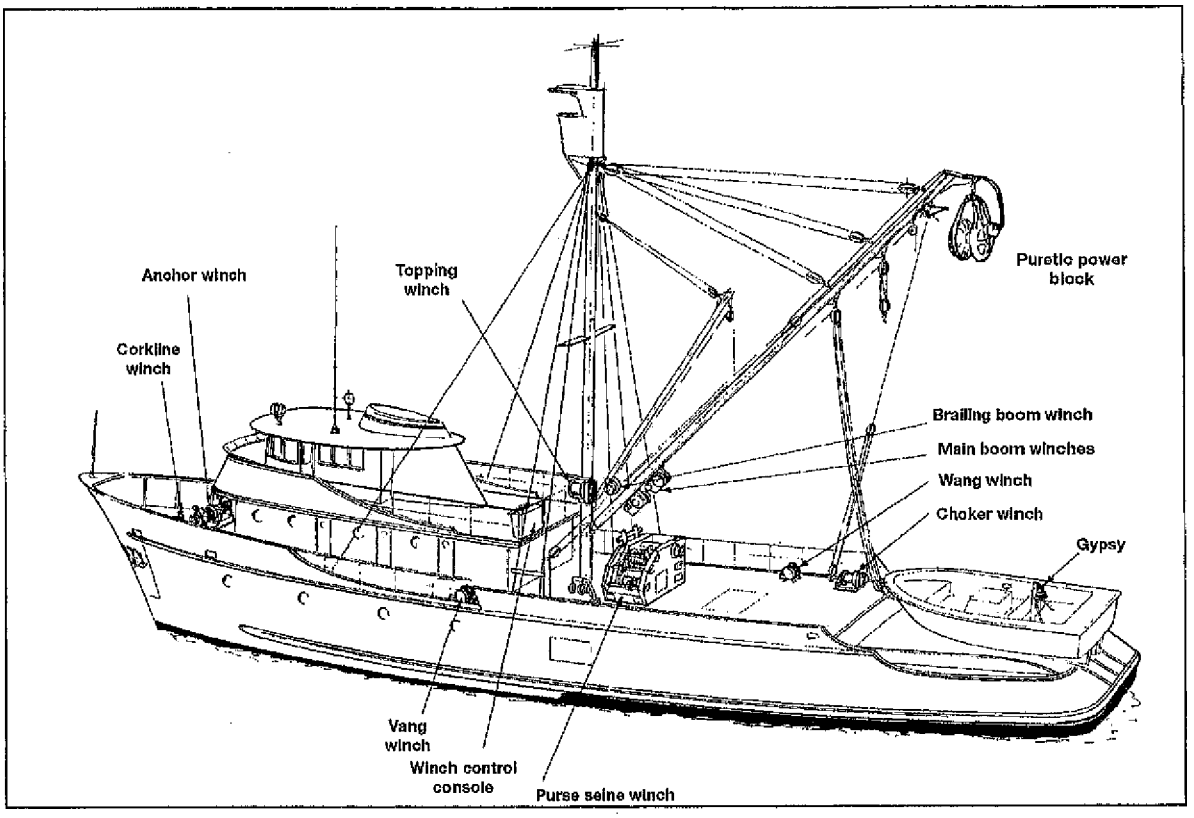


Fig 2.9 Deck Layout of a Large Purse Seine Operation

THE PURSE SEINE NET

Figure 2.10 shows a plan of a purse seine net. From this it can be seen that the net is made in panels, with the net being much deeper in the central area. This gives a shape which allows the bottom of the net to be more easily pursed under the fish and gives a pocket, or bunt, where the fish can be held for broiling after the net has been pursed.

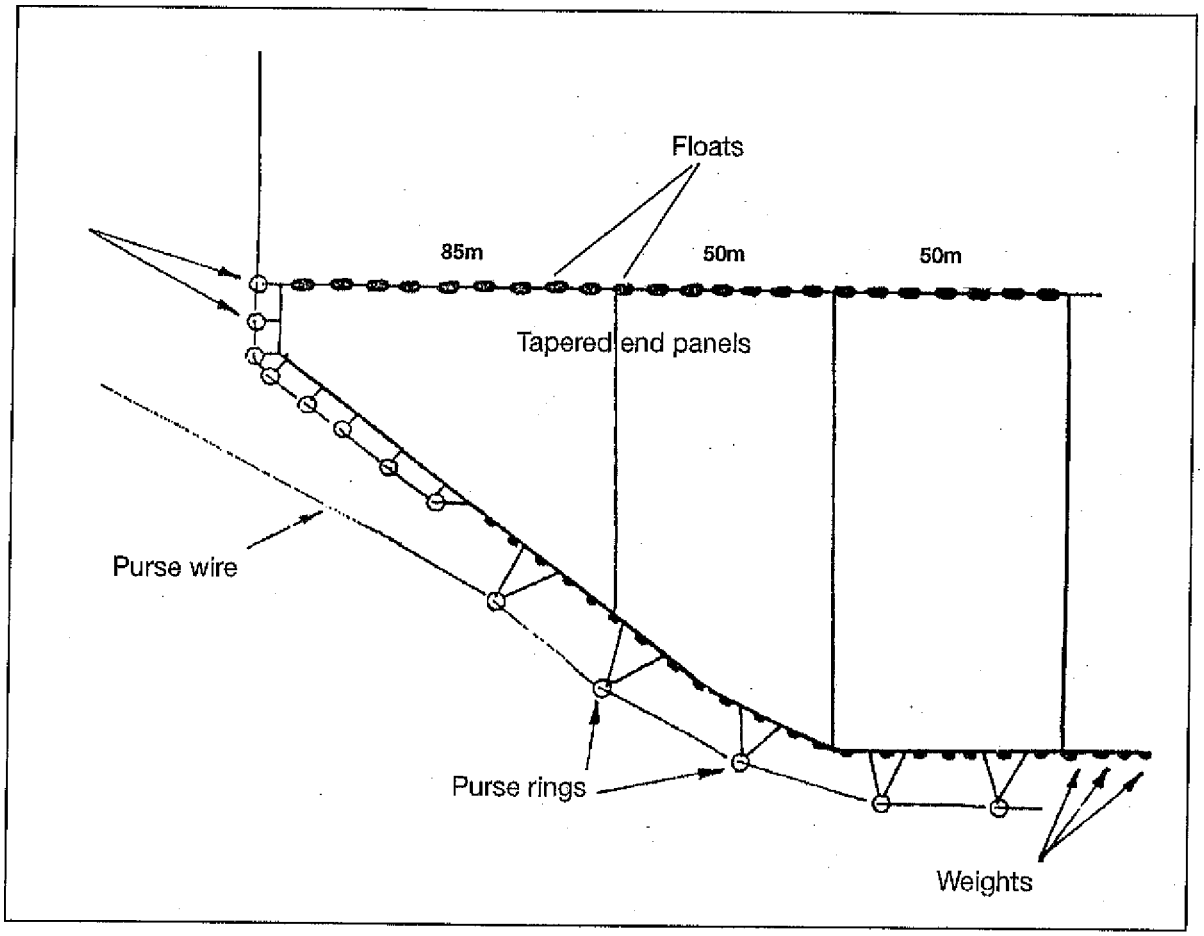


Fig 2.10 Purse Seine Net 1

The top of the purse seine net is kept floating with floats closely spaced all around it and the bottom has an arrangement of rings for the purse wire to run through. The net is strengthened by having smaller mesh on a "selvage" top and bottom. The parts of a net are shown in figure 2.11

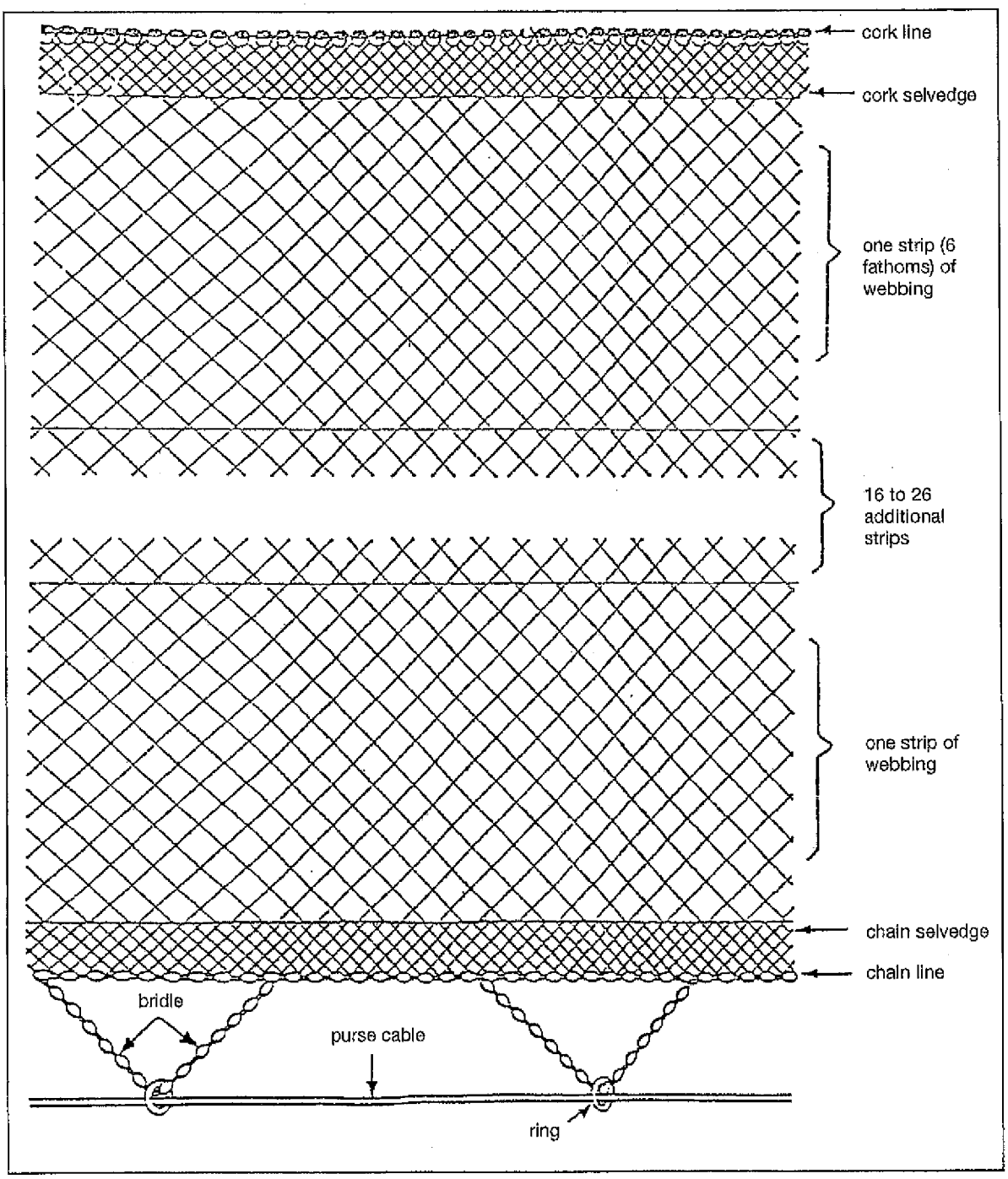


Fig 2.11 Purse Seine Net 2

TUNA LONG-LINING, OPERATION AND GEAR

The layout of a long-liner may be better understood if the long-line method is simply described. Figures 2.12 and 2.13 show the shooting and hauling procedures most often used on a Japanese or Taiwanese long-line operation.

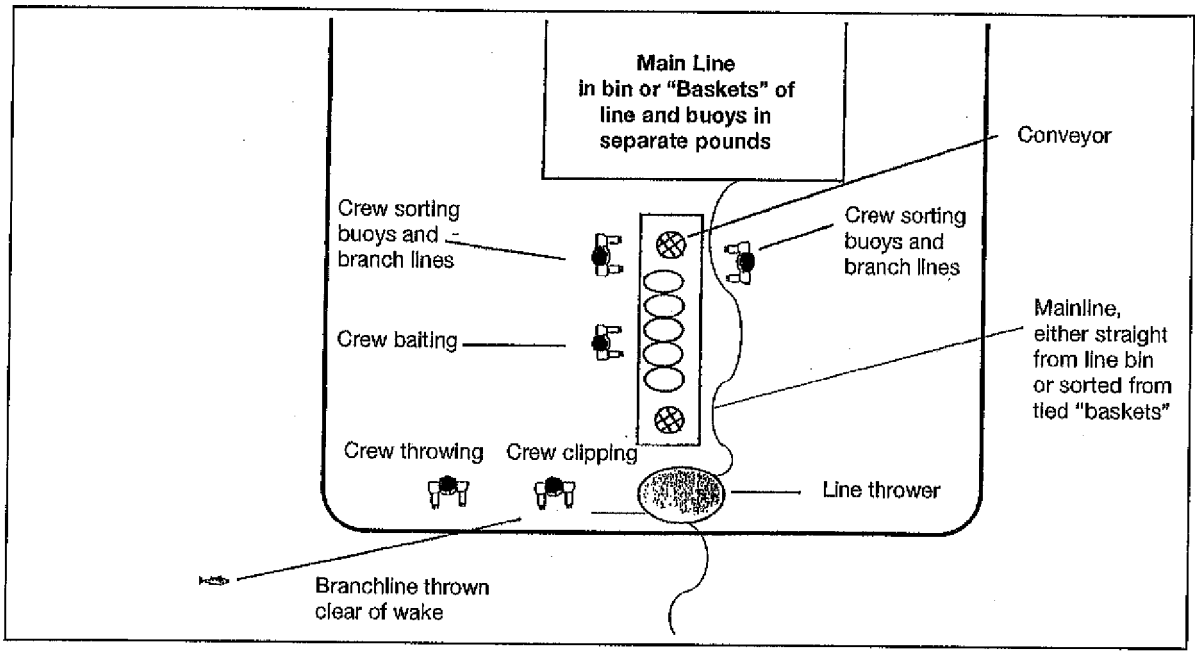


Fig 2.12 Shooting a Tuna Long-Line

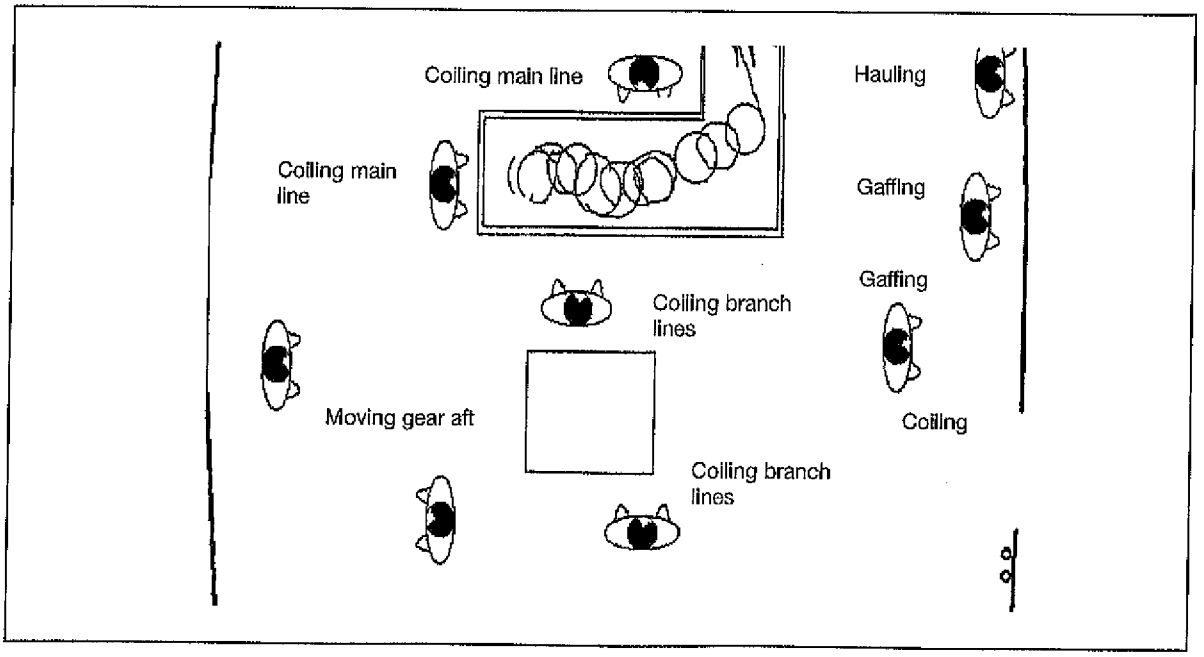


Fig 2.13 Hauling a Tuna Long-Line

SHOOTING THE LONG-LINE.

- In the Japanese method the long-line is set over the stern of the vessel from the after deck. Setting takes around five to six hours at a speed of ten knots. The line is around 110 kilometres long with an average of 3,000 hooks. The procedure for setting is to pass the main line through a line thrower or shooter and tie on the float line with a radio beacon. The purpose of the thrower is to throw the main line out faster than the speed of the boat. The resulting slack in the line will allow the line to sink deeper in the water. The master fisherman on board will decide what depths he wishes the hooks to end up in and adjust the speed of the hauler to get this result.
- As the main line is paid out branch lines, with hooks and baits, and float lines, with buoys, are clipped on to it at regular intervals. The most usual arrangement is to have six branch lines between each dropper. This length of line is often called a "basket". A picture of an oceanic tuna long-line is shown in Figure 2. 14.

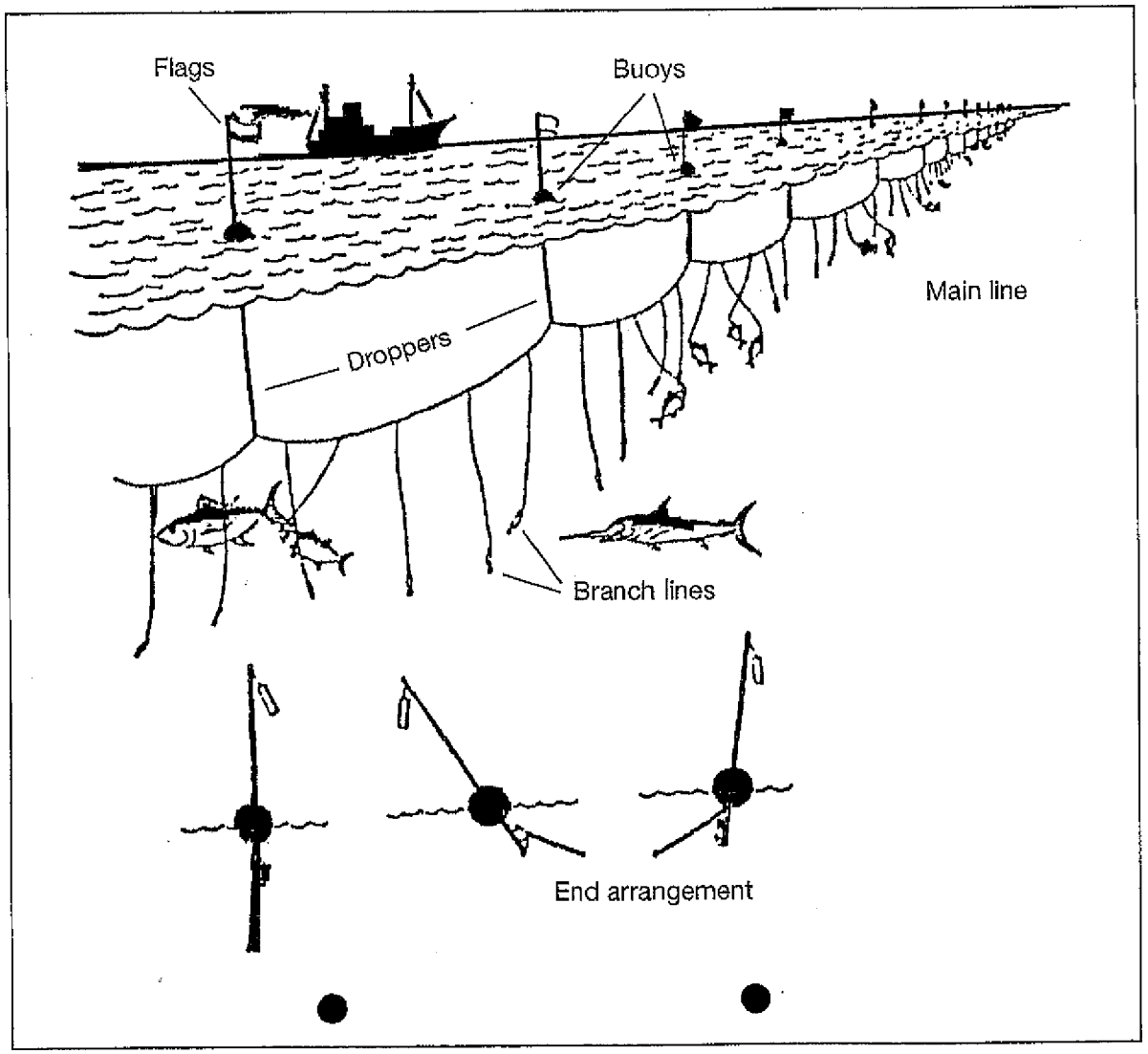


Fig 2.14 A Tuna Long-Line

HAULING THE LONG-LINE

- The line is usually allowed to soak from one to three hours. Hauling starts from the last end set and follows a routine procedure. Hauling is done with a hydraulic line hauler situated on the starboard shoulder. Having the hauler in this position allows the skipper to manoeuvre the vessel along the line as the hauler pulls in the slack. As each branch line comes up it is unclipped and coiled on a coiler, or hand coiled on smaller boats. When there is a fish on the line, this is pulled in carefully, gaffed by one or more persons and brought on board for treatment and freezing. The main line is transferred, through a tube, to a rope bin aft and the coiled branch and float lines moved aft on a conveyor ready for the next set.
- The general arrangement of a Japanese Tuna long-liner is shown on Figure 2.15

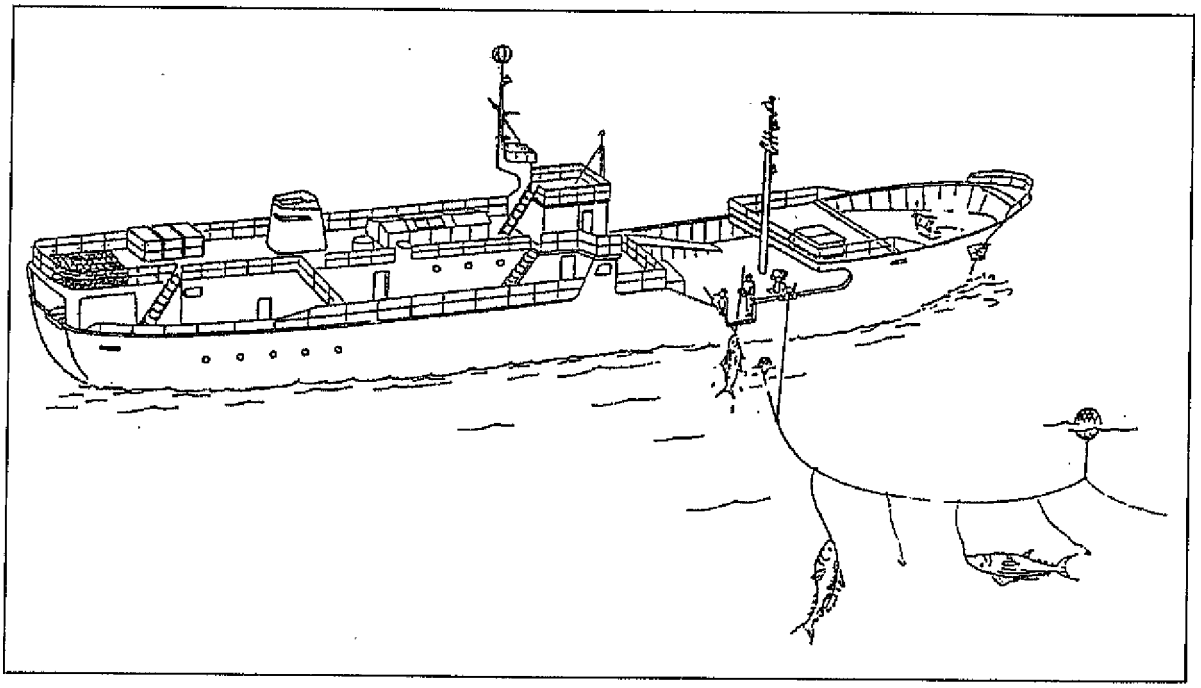


Fig 2.15 General Arrangement of a Tuna Long-Liner

Figure 2.16 shows the most common set up of the long-line that is used on Japanese boats and Figure 2.17 shows the construction of the branch lines.

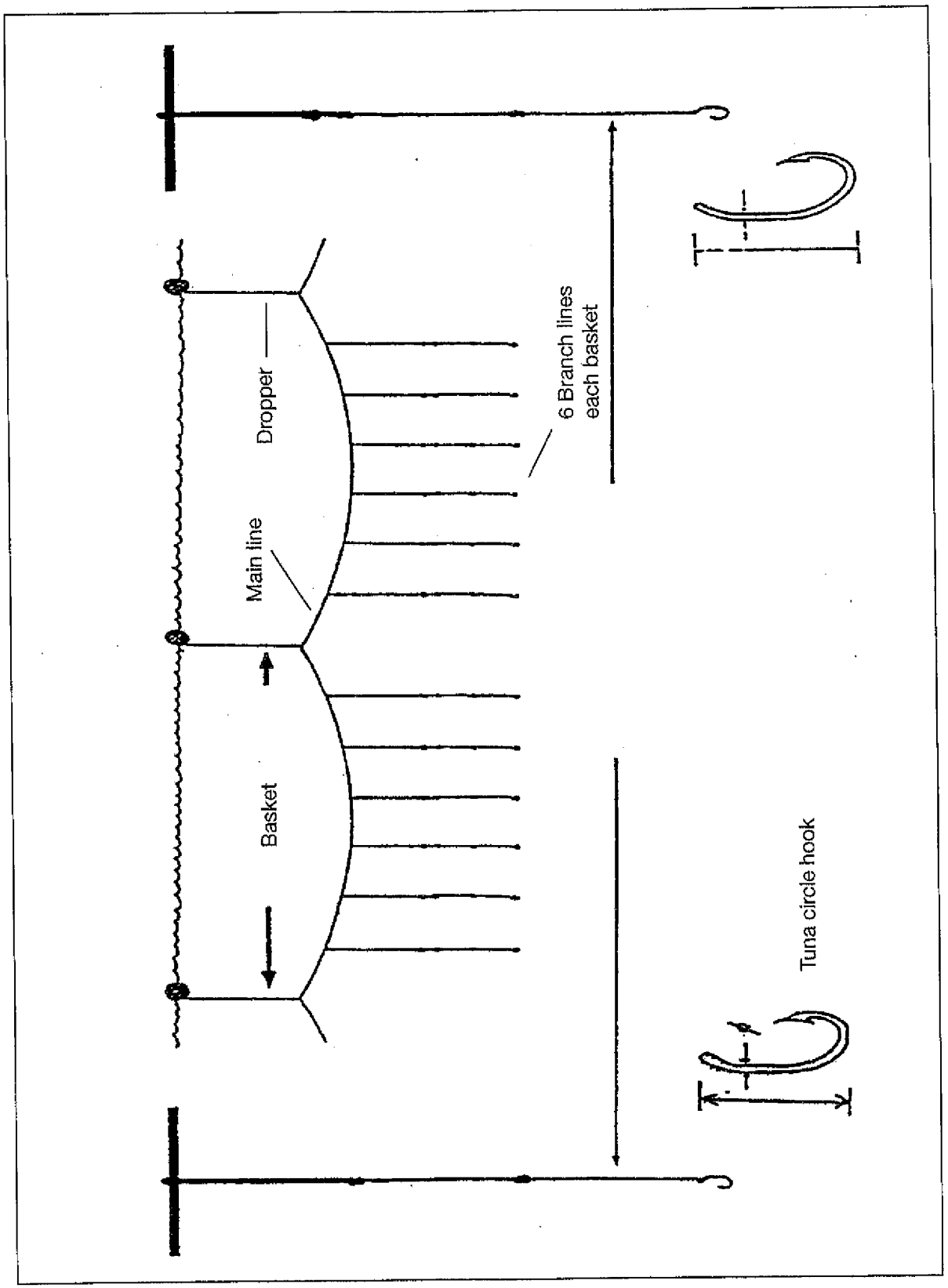


Fig 2.16 Long-Line Set Up

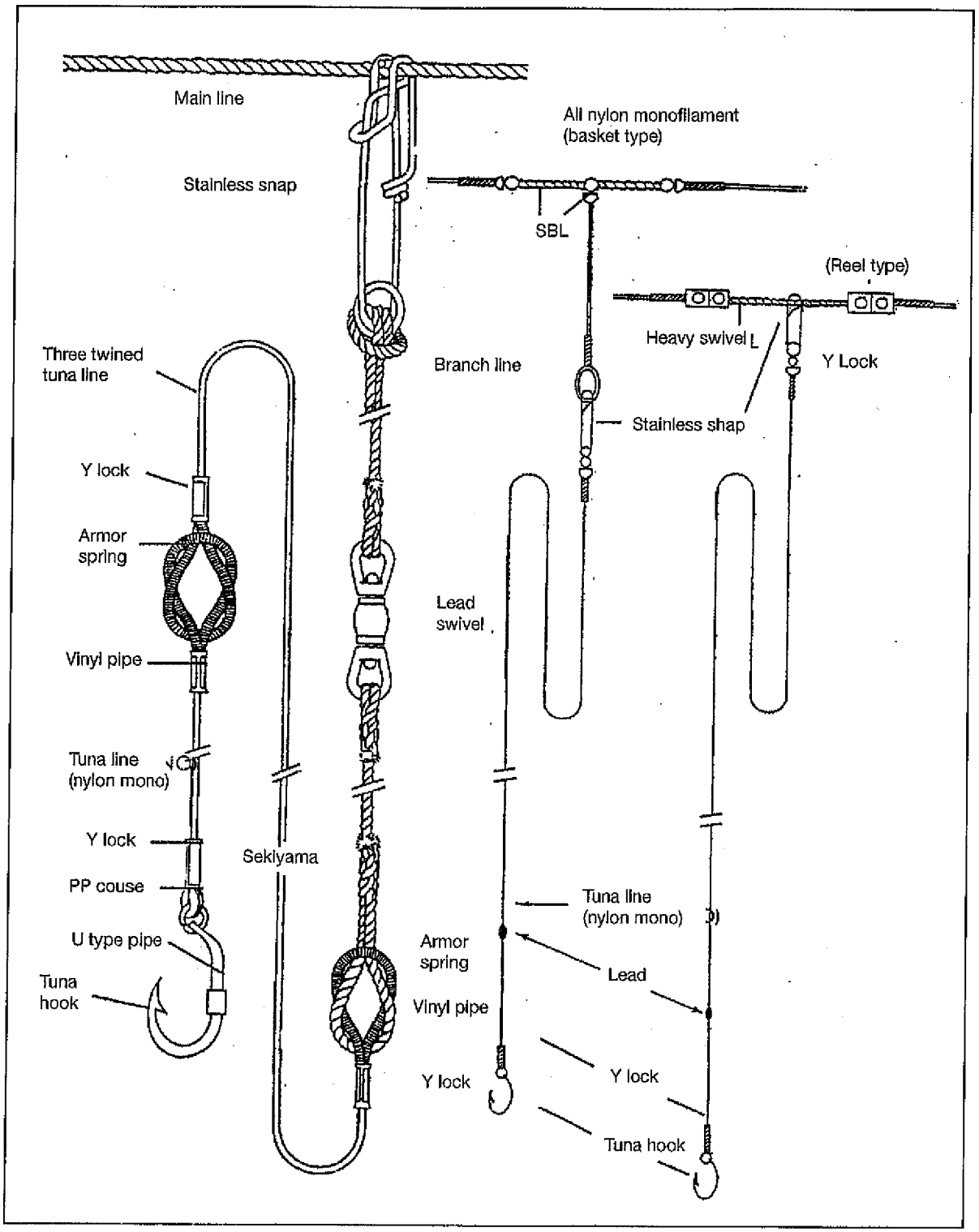


Fig 2.17 Construction of Long-Line Branch Lines

THE GILLNET OPERATION AND GEAR

While there are still large scale oceanic gillnetting operations for tuna in the Pacific the method is not favoured because it is indiscriminate in the size and species it catches. It also has been found that the escape of damaged fish, from oceanic operations, is very high. This has led the media to label oceanic gillnetting as "The Wall of Death". Gillnetting is used in many forms around the Pacific such as the gillnetting for Baramundi in Papua New Guinea and gill netting for turtle in other countries as well as many types of encircling operations within the reef, which might better be termed seines rather than gill nets.

Figures 2. 18 and 2.19 show gillnet arrangements for smaller power operations. Although such layouts are found in Australia and New Zealand, they are not common in the tropical Pacific where gillnets are usually hand set and hauled from smaller boats.

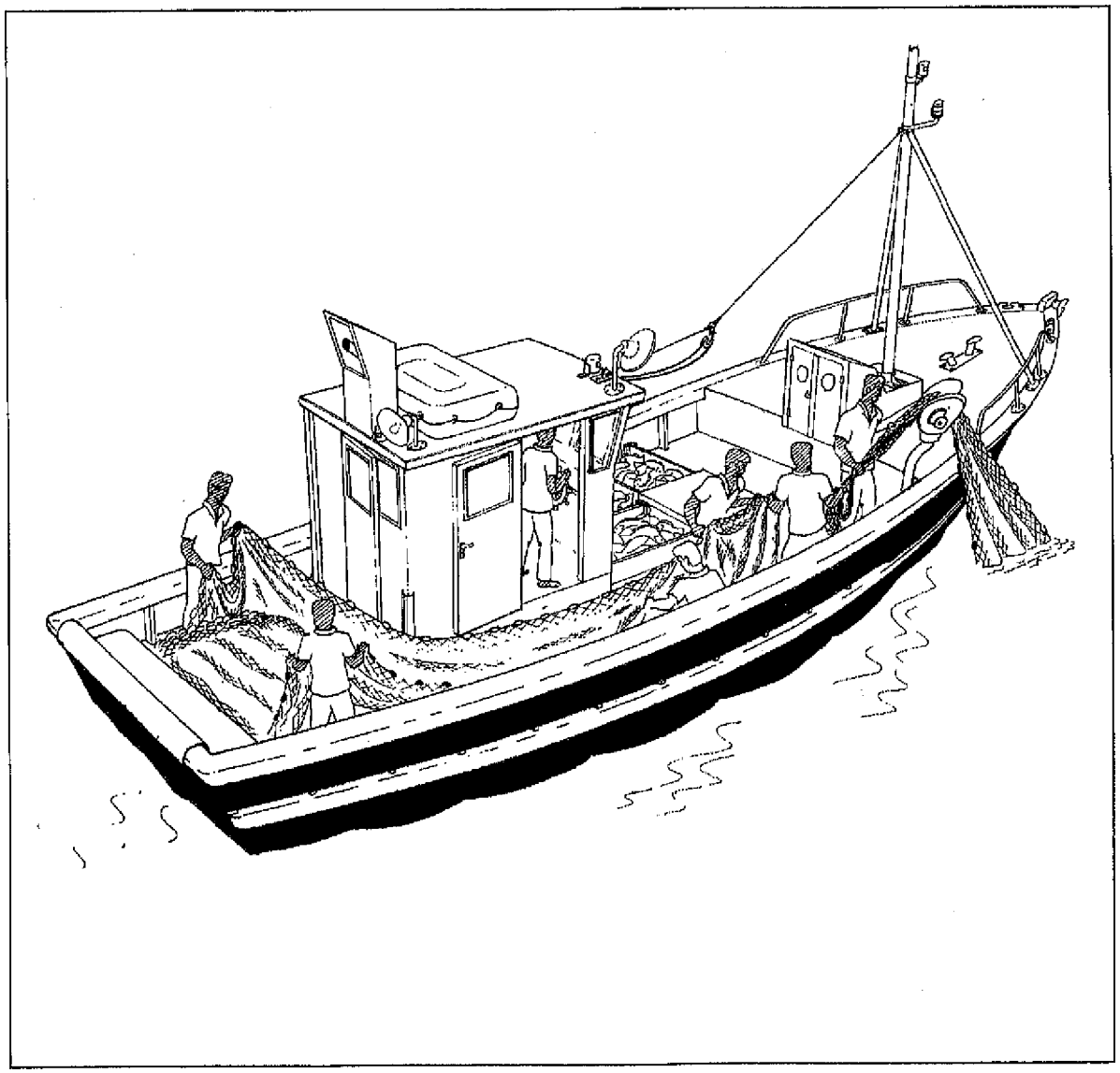


Fig 2.18 Small Gillnet Boat Layout 1

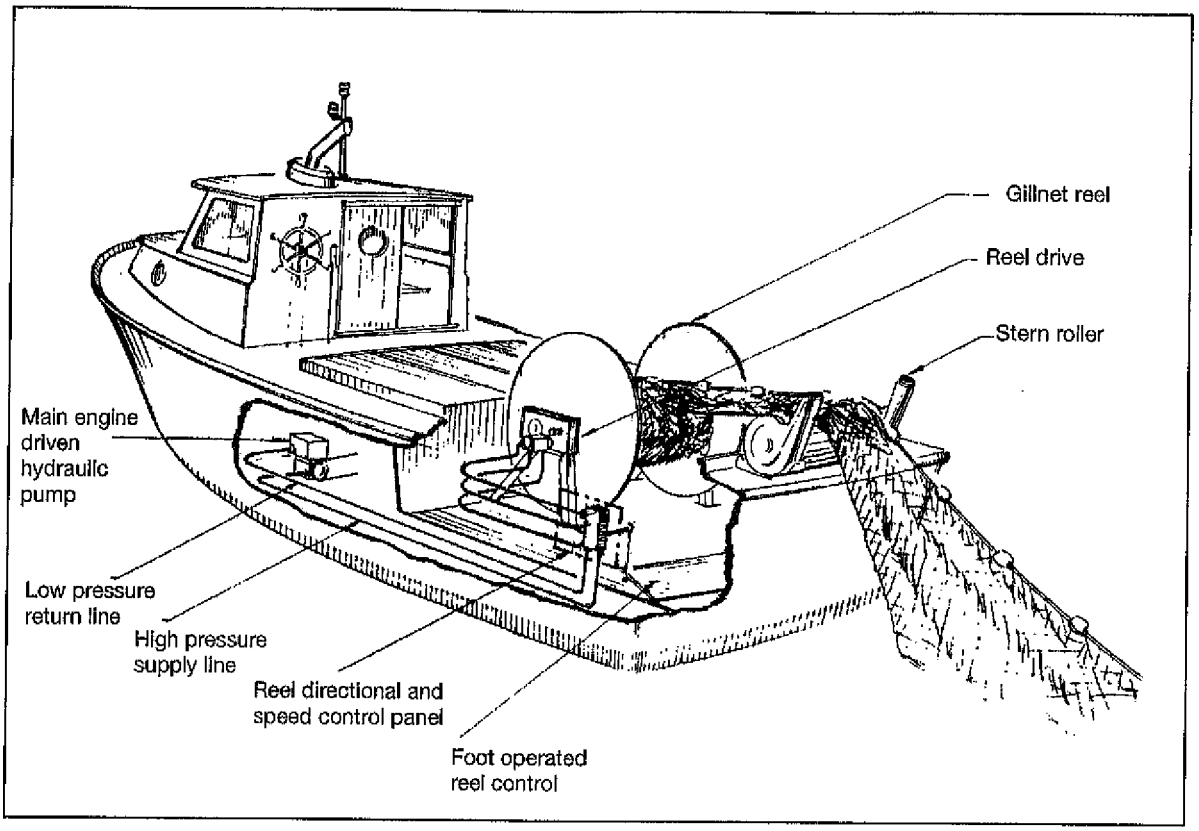


Fig 2.19 Small Gillnet Boat Layout 2

Gillnets can be either floating or bottom set. In floating gillnets the buoyancy of the floats is enough to support the net and leadline and keep it floating. In the bottom set the leadline is heavy enough to sink the net and floats to the bottom. Bottom set gillnets can also be secured from moving by having anchors or grapnels at each end.

Figure 2.20 shows the construction of a typical gill net. The design and size of gill nets vary, depending on the targeted species and the circumstance of the operation.

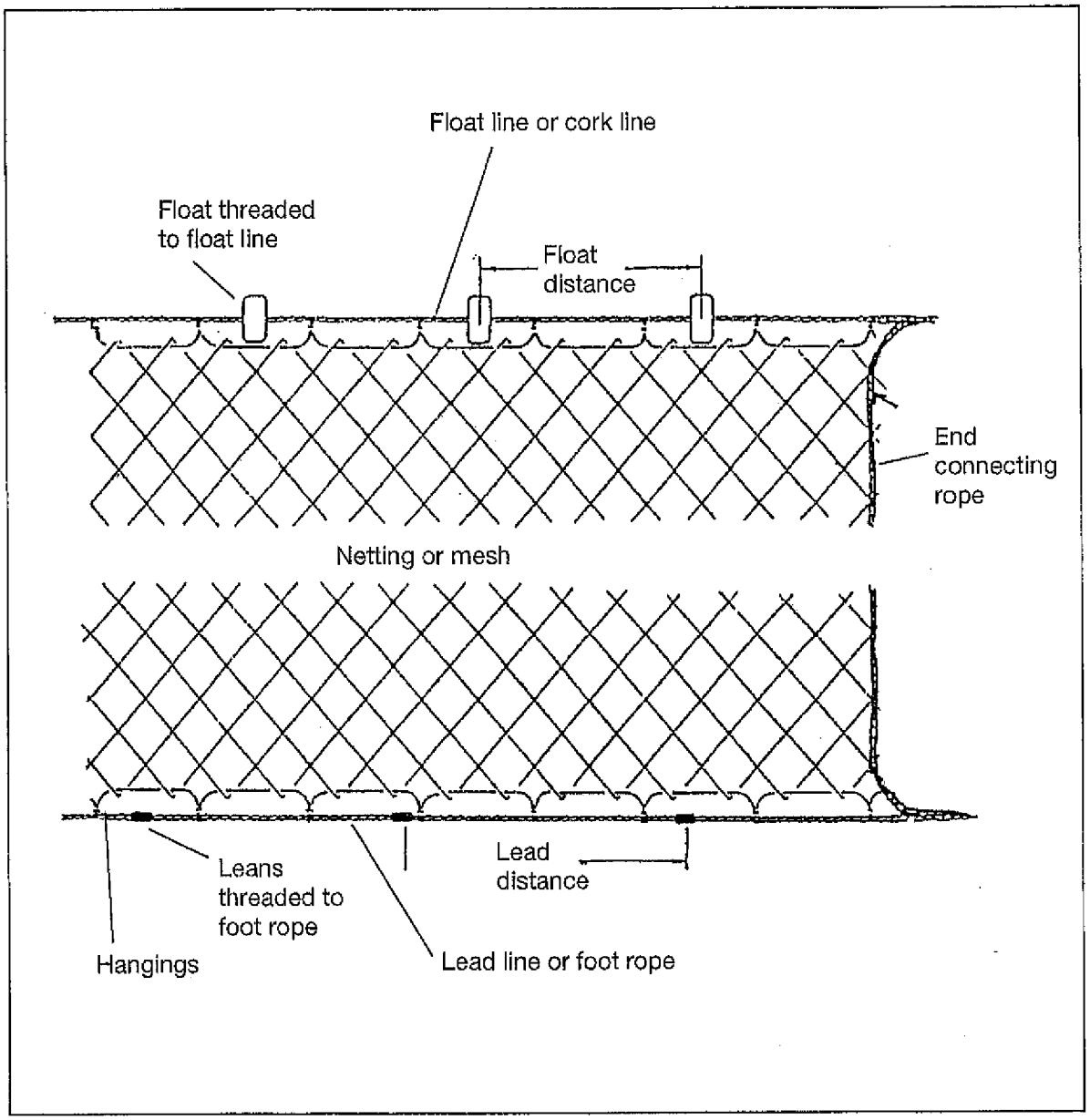


Fig 2.20 Parts of a Gillnet

THE TROLLING OPERATION AND GEAR

Trolling is carried out extensively around the Pacific from boats of all shapes and sizes and the methodology can vary considerably between countries and species targeted. The SPC has produced a trolling manual. This book gives a complete guide to trolling in the Pacific and should be used as a reference for those wishing to find out more about this method. In this module we will consider only the most common layout and gear.

Figure 2.21 shows an eight-metre boat, which is set up to tow four lines using the FAO wooden hand reels and monofilament lines. Other countries use systems where thirteen or more lines are towed, these are mostly for school fish such as albacore where a relatively standard size of fish is being caught. For small boats in the Pacific, where fish of varying size and species are being caught in the same day, it has been found easier to use and handle only four lines.

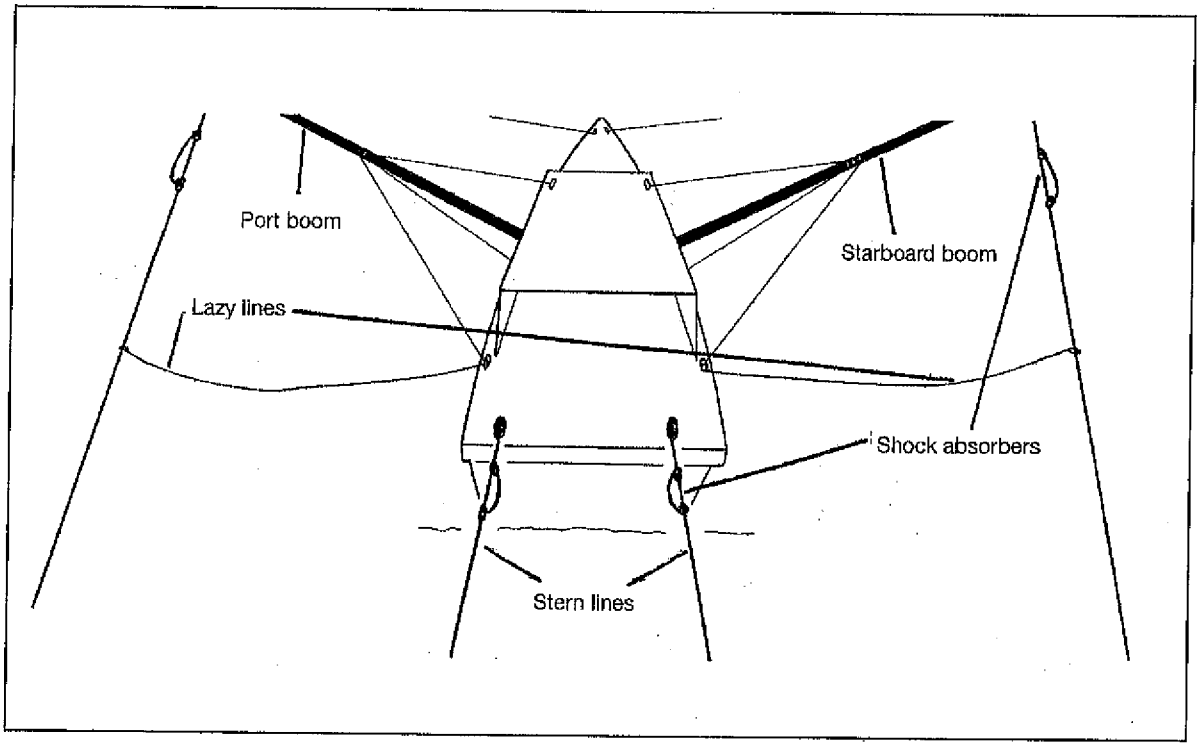


Fig 2.21 Small Boat Set Up for Trolling

Using the wooden reels and all monofilament lines, which stretch a lot, allows larger fish to be played. Also, having a corkscrew or other type of snap at the end of the line makes it easy to quickly change the lure or the trace from monofilament to wire where this is needed for species with sharp teeth. Figure 2.22 shows the make up of a standard monofilament trolling line.

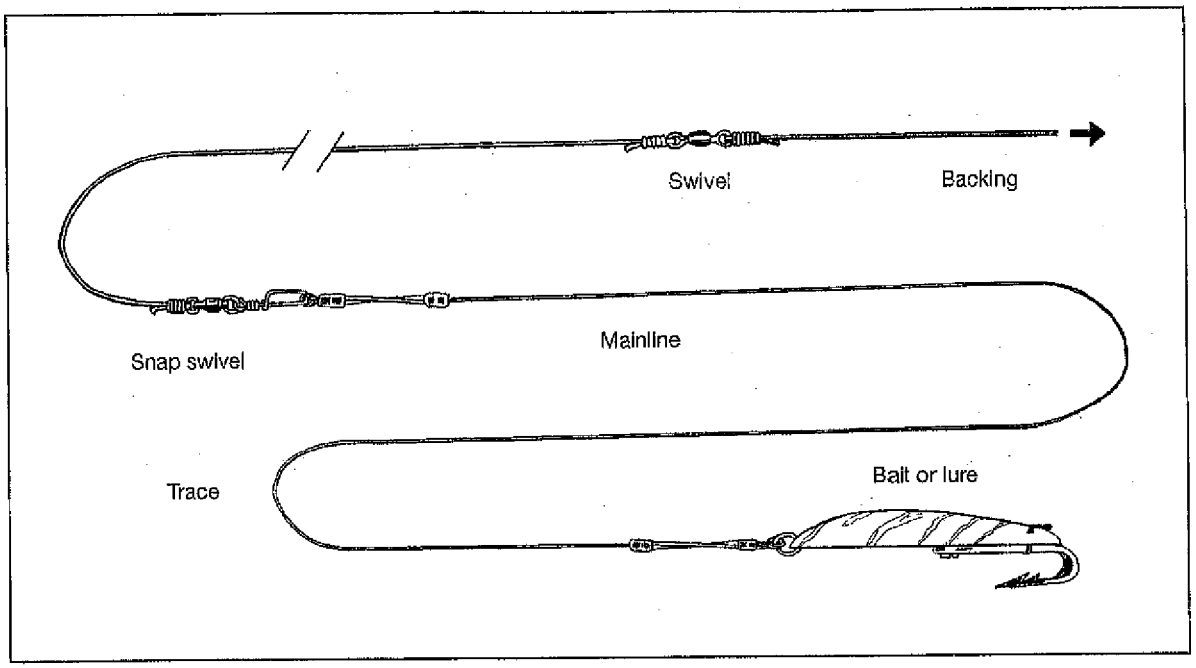


Fig 2.22 Monofilament Troll Lines

A large variety of lures are available. The choice of lure is governed by the size and species of the fish but most of all by practise and experience. Using a variety of fresh bait, such as small pilchards or ocean piper, can also be very successful. Figure 2.23 shows a variety of the types of lure which are available.

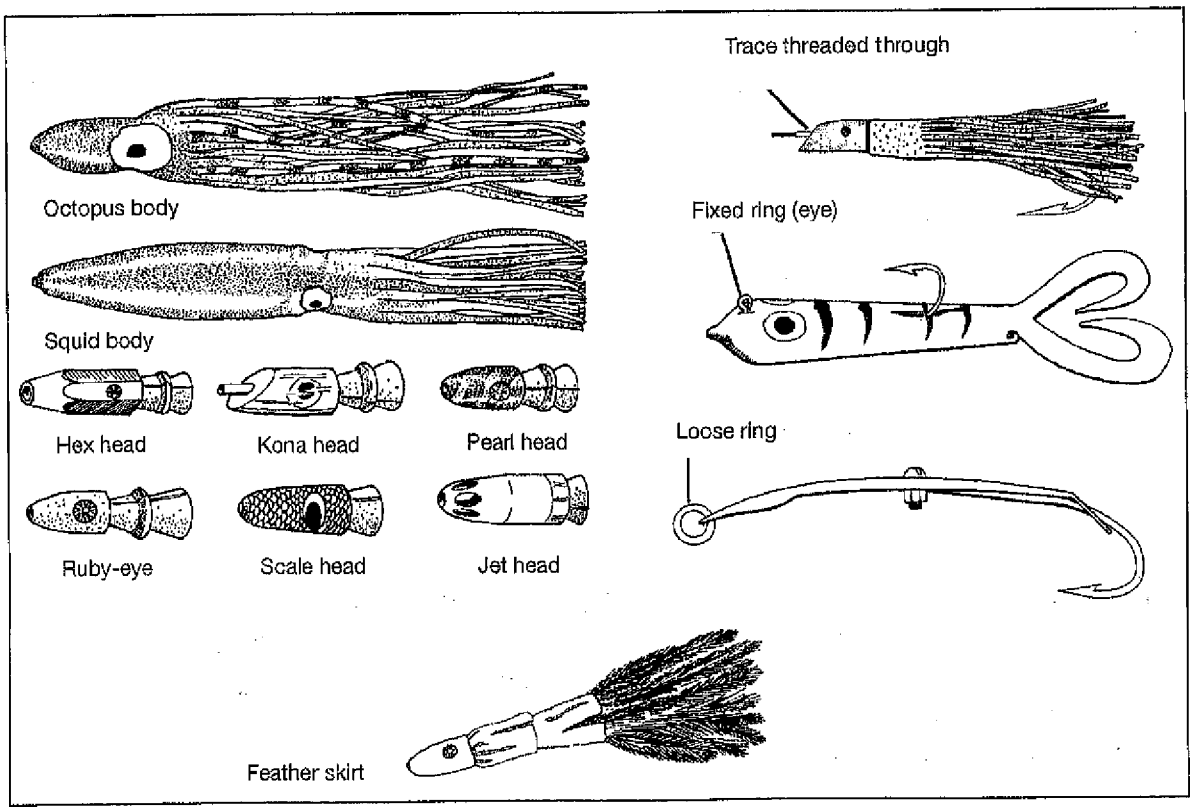


Fig 2.23 Types of Troll Lures

Teaching Notes

MATERIALS

- White Board
- OHP Projector
- Video showing the purse seine operation.
- Video showing the long-line operation.
- Parts of gear as available or OHPs as listed.

  Note. Videos on gear methods are available from the Fisheries Training Section of SPC.

LESSON PLAN

This can be done in two sessions of one and a half-hours, or pushed into one longer session of possibly 2 hours. For students who have no experience, it will take considerably longer as more boat visits or fishing trips will have to be incorporated.

- As described in the student notes, explain the main construction materials that are used to build commercial fishing boats in the Pacific. (Steel, and fibreglass for larger boats, wood for smaller)
- Point out, although some foreign boats might be old and second hand, that all should follow a set of rules governing their construction. Also, that each should be surveyed once a year to be sure they are fit to go to sea. The survey also checks that they have the proper safety gear on board.
- Use OHPs 2.1 and 2.2 to show the most common construction method for steel hulls, naming the parts and what each part does. Then use OHPs 2.3, 2.4 and 2.5 to show fibreglass and wooden boat constructions, illustrating the similarities and naming parts.
- Summarise by showing a blank OHP of the steel boat construction and ask the names and functions of parts around the class, or alternatively, have them draw the construction of a steel hull naming the parts and submit these to you for correcting.
- Use OHP 2.6 to show a bulkhead and explain the need for watertight bulkheads
- Have a break.
- Ask students to tell you why fishing vessels are different from one place or fishery to another. Use their comments to illustrate the reasons and go on to explain we will now have a look at a few of the more common methods and boats which are in use around the Pacific.

- **PURSE SEINING.** Show the video to let the students get a picture of what is happening on board. Use the OHP s 2.7 and 2.8 to explain the sequence step by step. Ask the class if anyone has sailed on a purse seiner and involve those who have in the description.
- Show OHP 2.9, Parts of a Purse Seiner and go over the various parts of the deck equipment and vessel explaining what each is used for.
- Show OHPs 2.10 and 2.11 to show how the net is constructed and name parts.
- Have a break.
- **LONG-LINING.** Show the video to let the students get a picture of what is happening on board during setting and hauling. Use OHPs 2.12 and 2.13 and 2.14 to explain the sequence step by step. Ask the class if anyone has sailed on a long-liner and involve those who have in the description. Point out where each operation occurs, who does what and how the fish is handled. Especially mention the hauling winch and shooter.
- Use OHP 2. 15 to show and name the parts of a long-liner.
- Use OHP 2. 16 to show the parts of the long-line and OHP 2.17 to show how branch lines are constructed.
- Have a break.
- **GILLNETTING AND TROLLING.** With reference to the student notes, explain how gillnets are used around the Pacific.
- Use OHPs 2.18 and 2.19 to show two types of small boats specifically set up for gillnetting, using power blocks.
- Use OHP 2.20 to explain the parts of a gillnet.
- Use OHP 2.21 to explain a simple way of setting up a small boat for trolling in the Pacific. ñ Mention multi-line trolling as is used elsewhere and explain why this is not so successful in the Pacific.
- Use OHPs 2.22 and 2.33 to show the line set up and a variety of lures
- Have the students complete assignments on layout and gear.

STUDENT ASSIGNMENTS

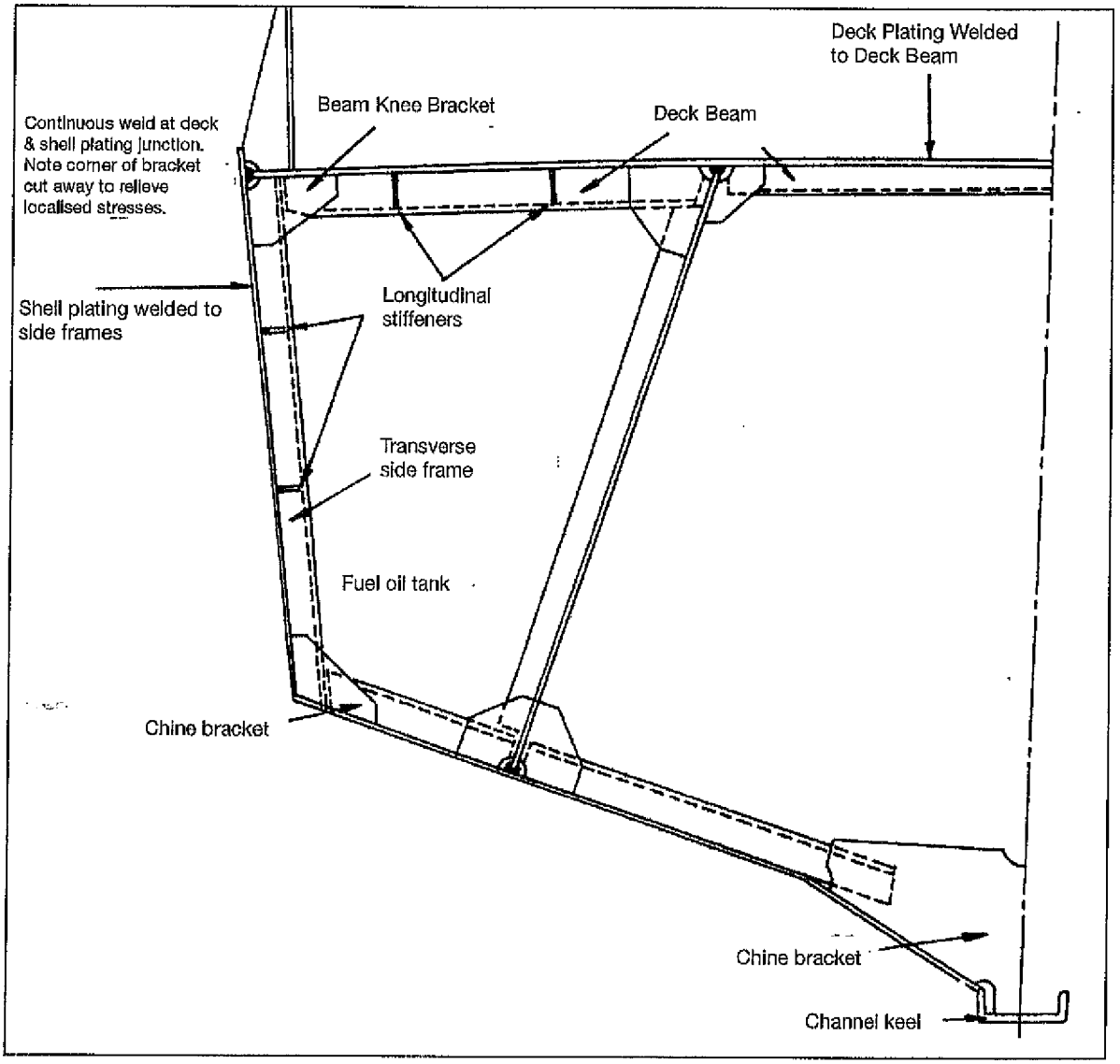
Student assignments can be given as evening homework. They can either take the form of giving the students a blank diagram of the particular piece of equipment or vessel type and asking them to name the parts, or asking them to sketch the equipment or part. Revision can be done in small groups or by asking questions around the class.

Where possible the students should be taken on ship visits to view the different types of fishing vessel, emphasising why each has to be different. This is particularly important where the group does not have much experience.

List of OHPs

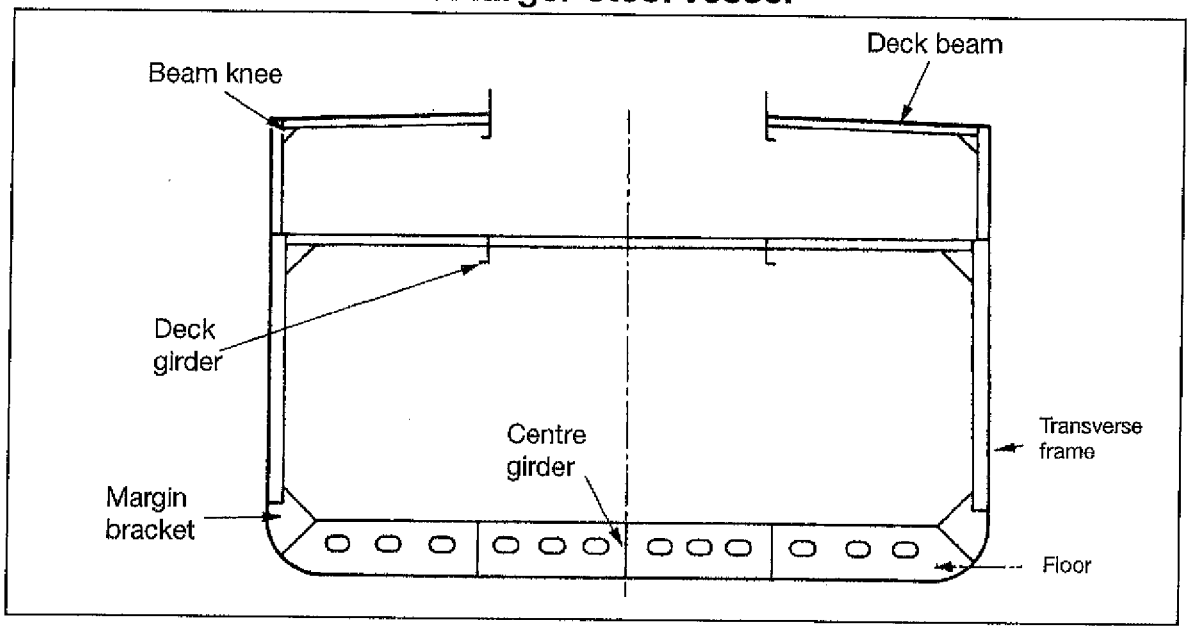
OHP Figure 2.1

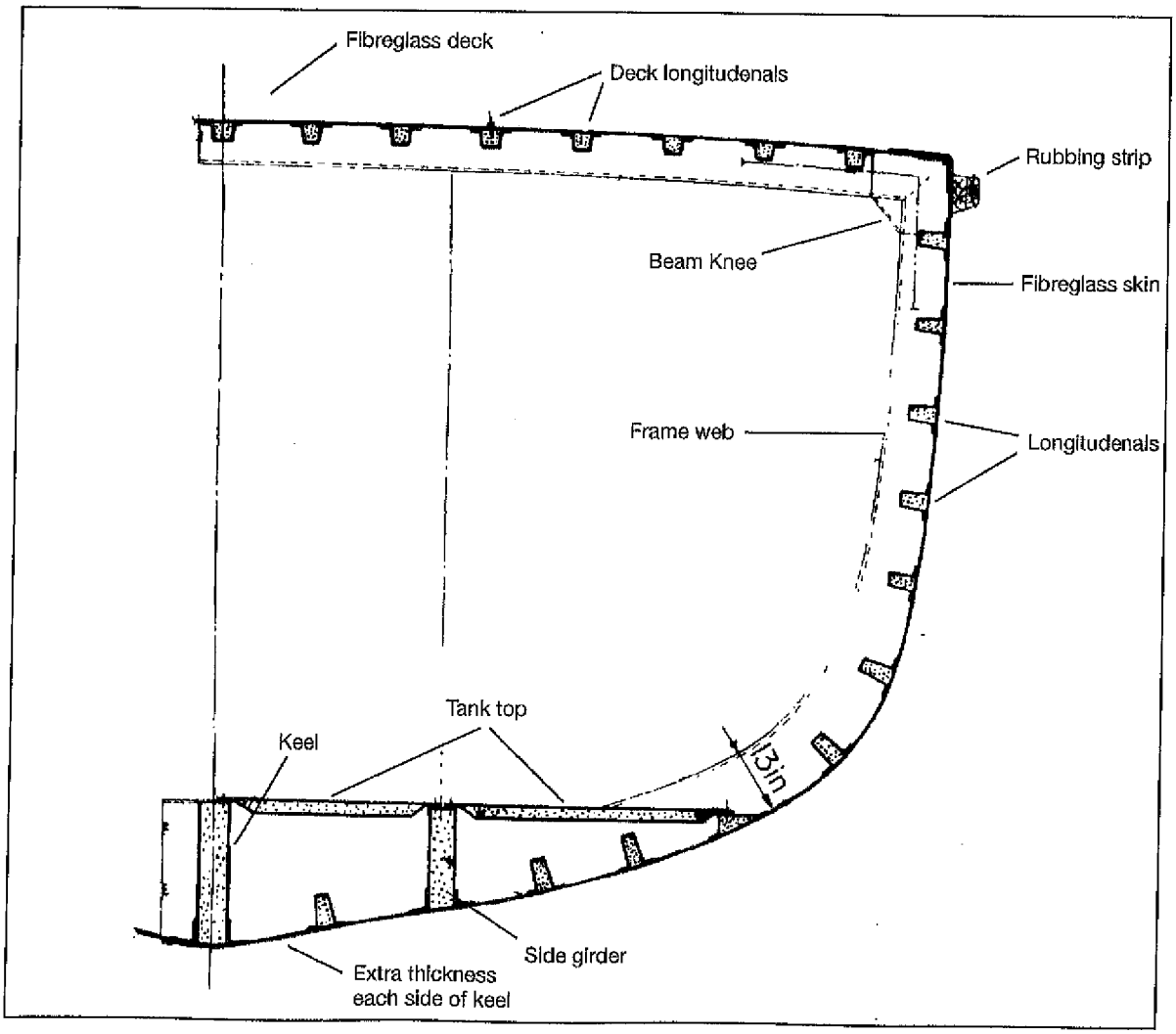
Steel hull construction of small hard chine boat



OHP Figure 2.2/3

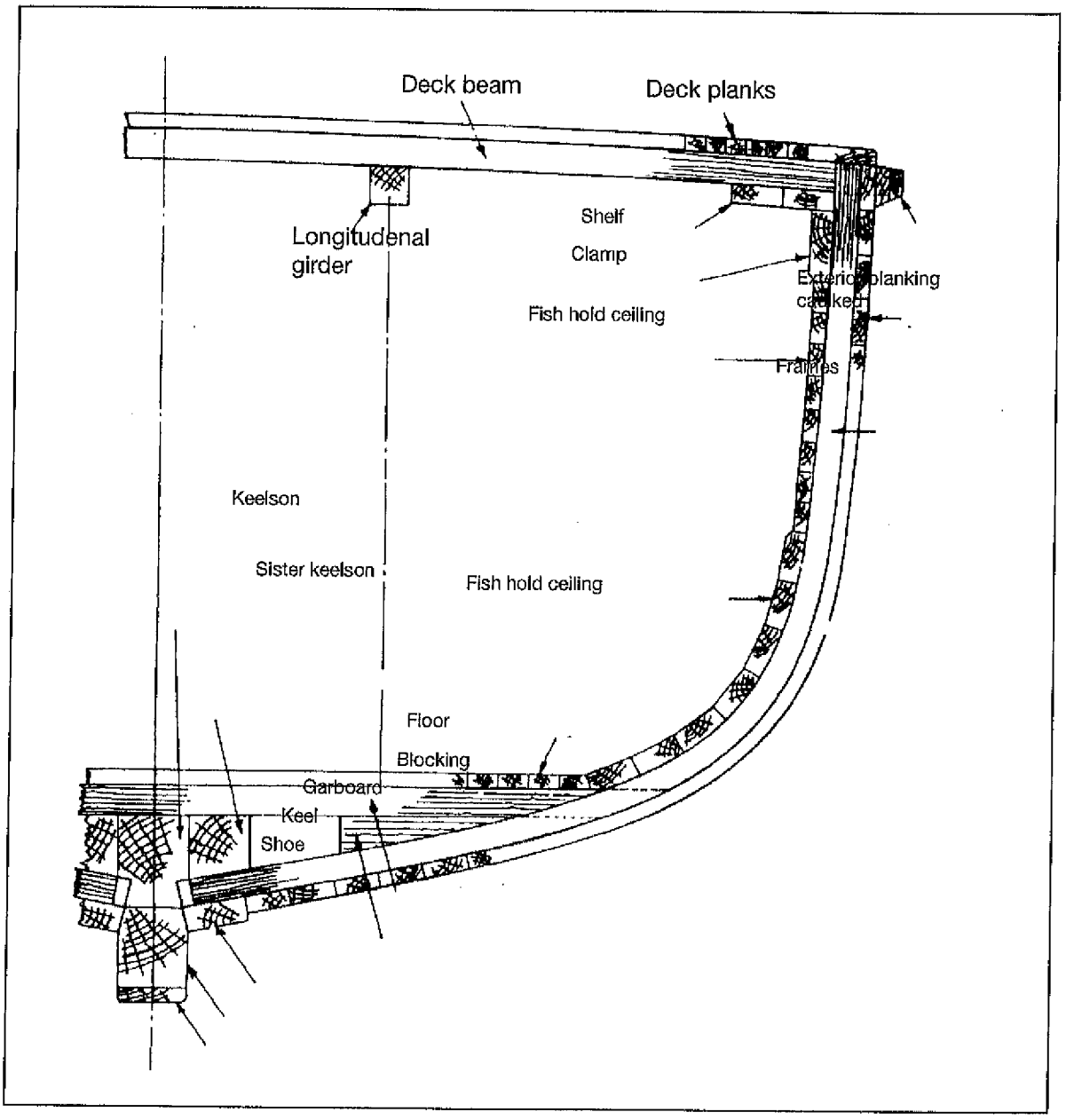
Steel hull construction of larger steel vessel





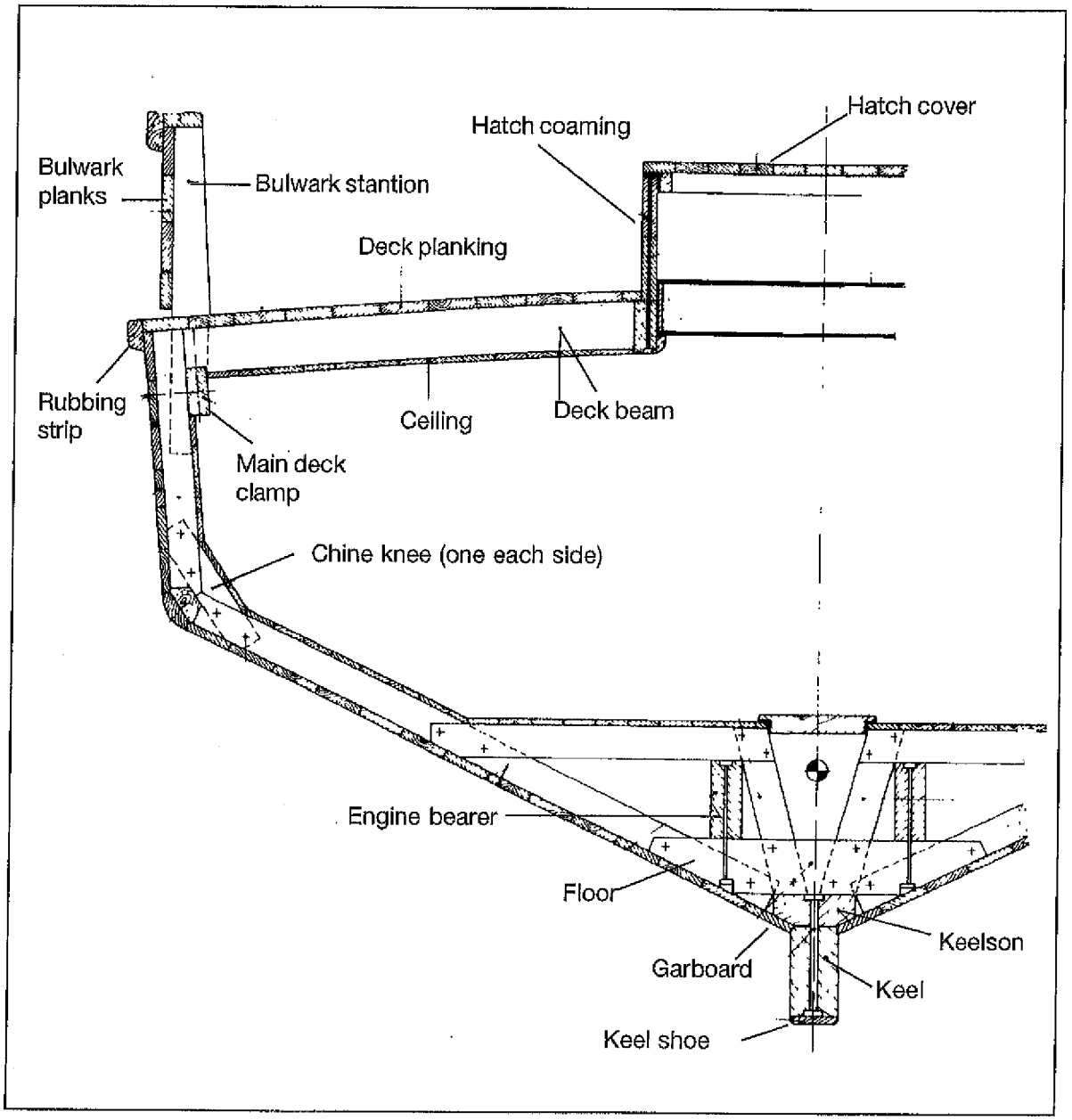
OHP Figure 2.4

Carvel Planked Wooden Construction



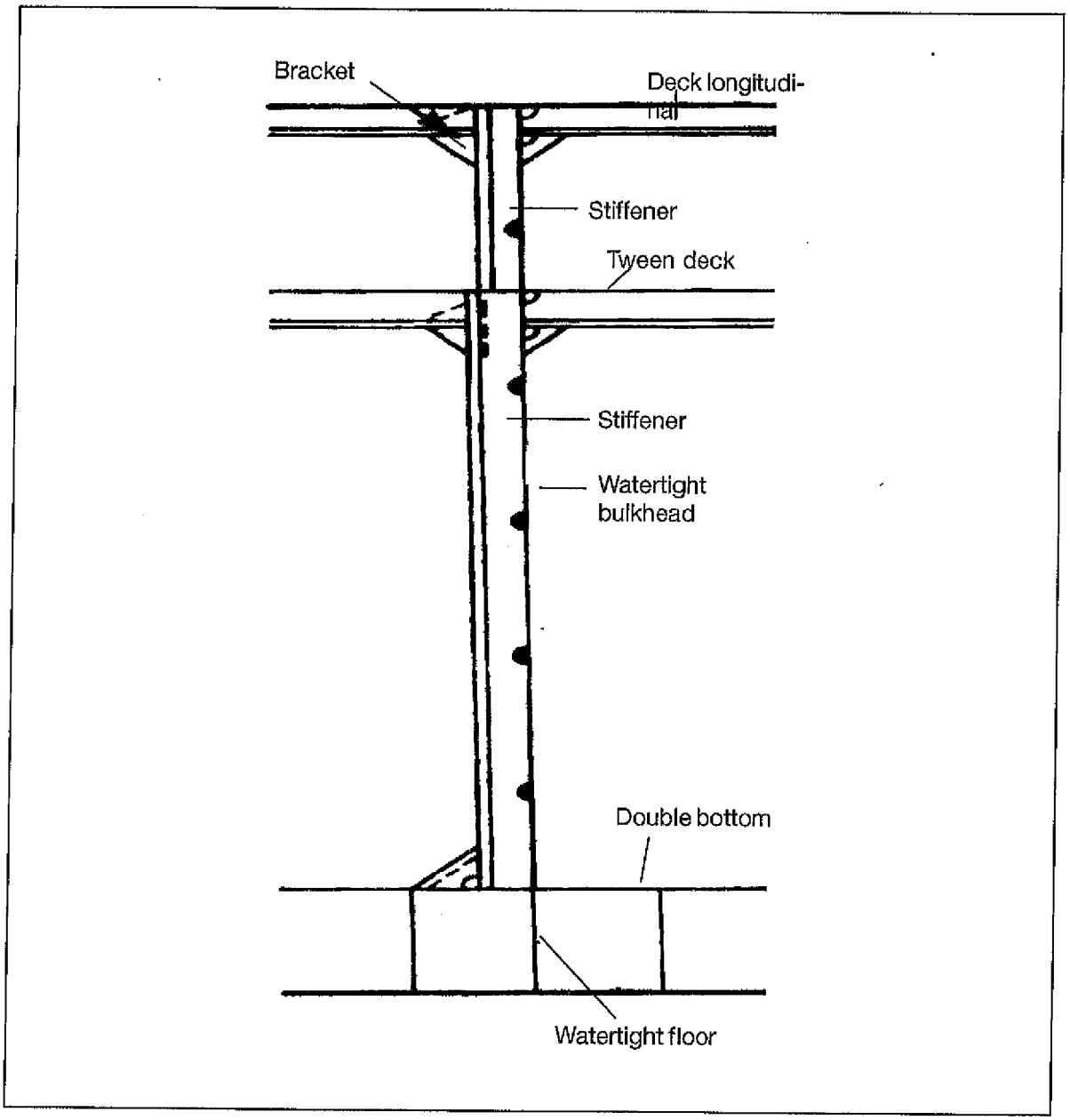
OHP Figure 2.5

Hard Chine Wooden Construction



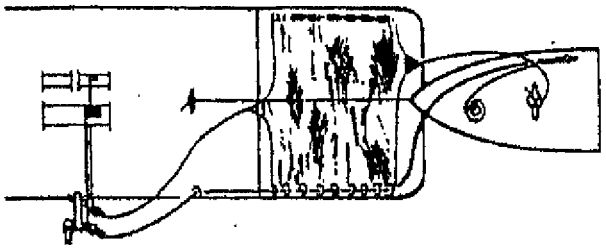
OHP Figure 2.6

Bulkhead Construction

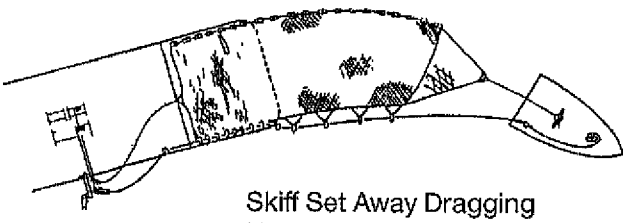


OHP Figure 2.7

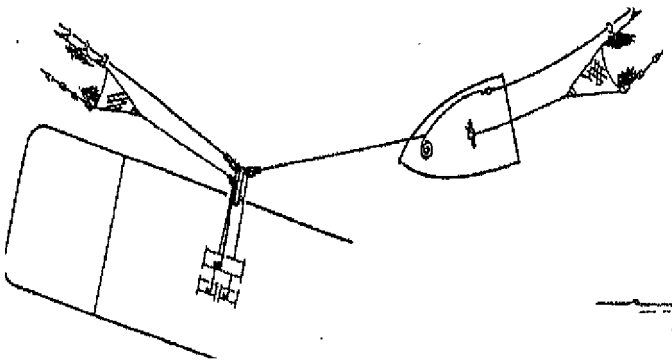
The Purse Seine Operation



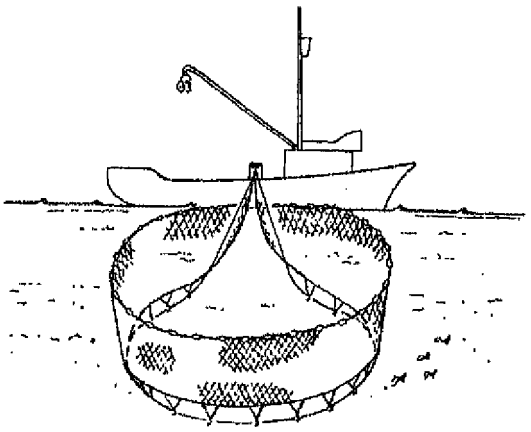
Skiff Going Away-(Purse wire through purse rings)



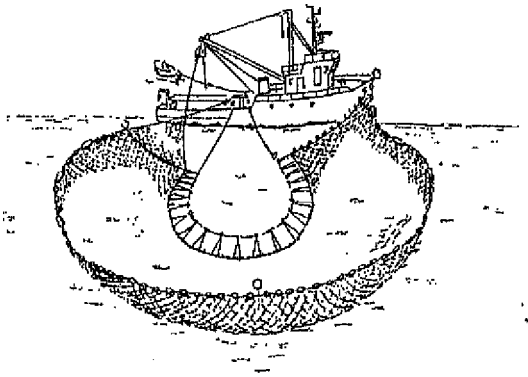
Skiff Set Away Dragging Net and Purse Line



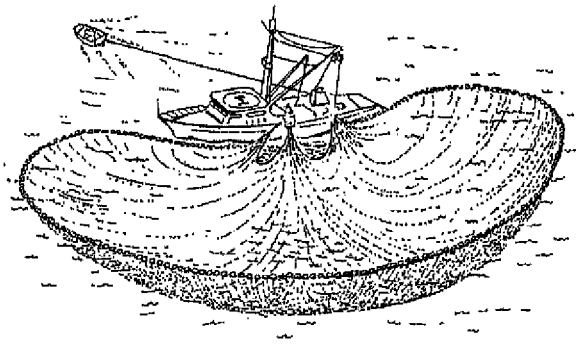
Circle Almost Made - Transfer-ring End of Net and Purse Line.



The Net Closed and Hauling Purse Lines



The Net Half Pursed

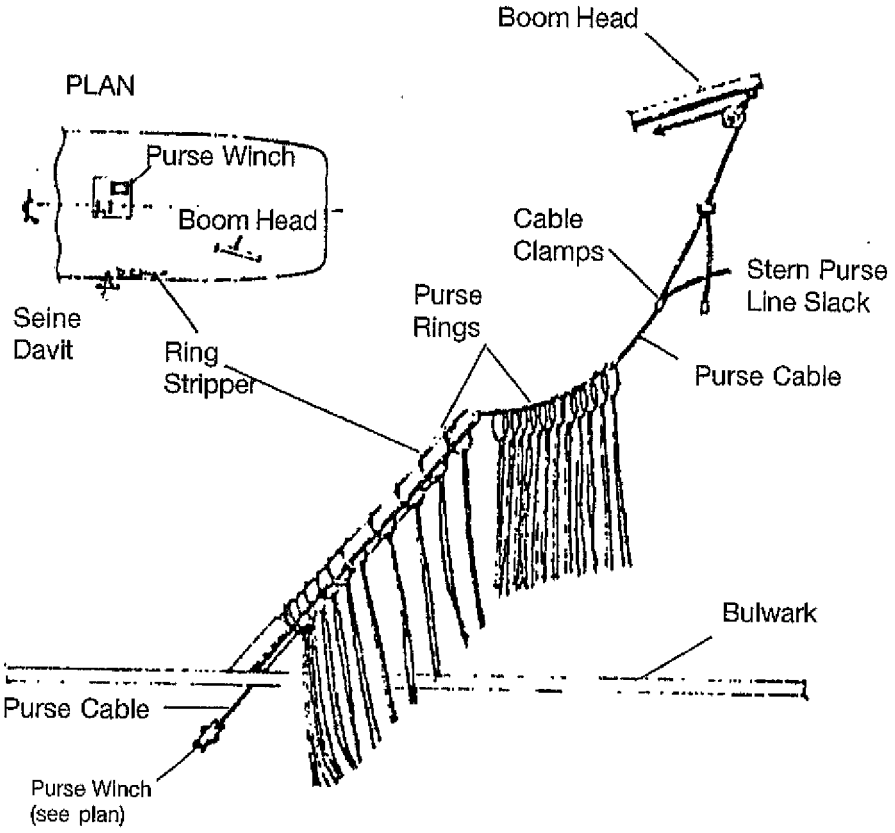


The Net Fully Pursed

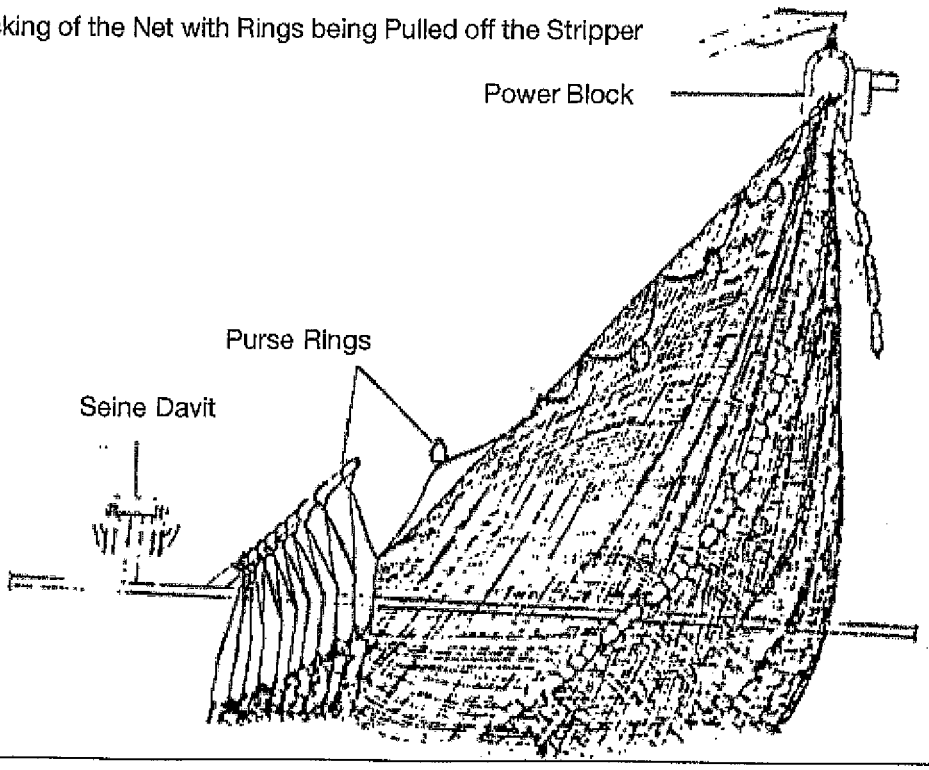
OHP Figure 2.8

The Purse Seine Operation 2

Loading the Purse Rings onto the Ring Stripper Arm

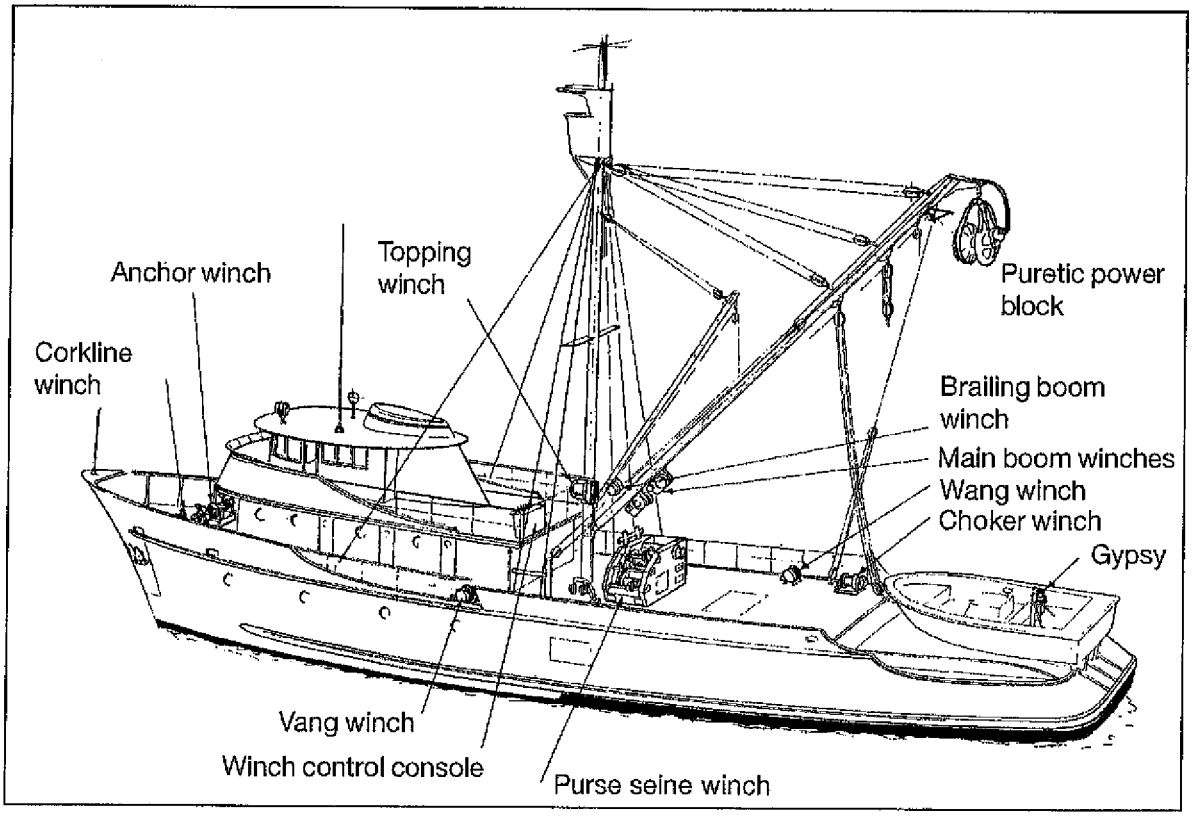


The Stacking of the Net with Rings being Pulled off the Stripper

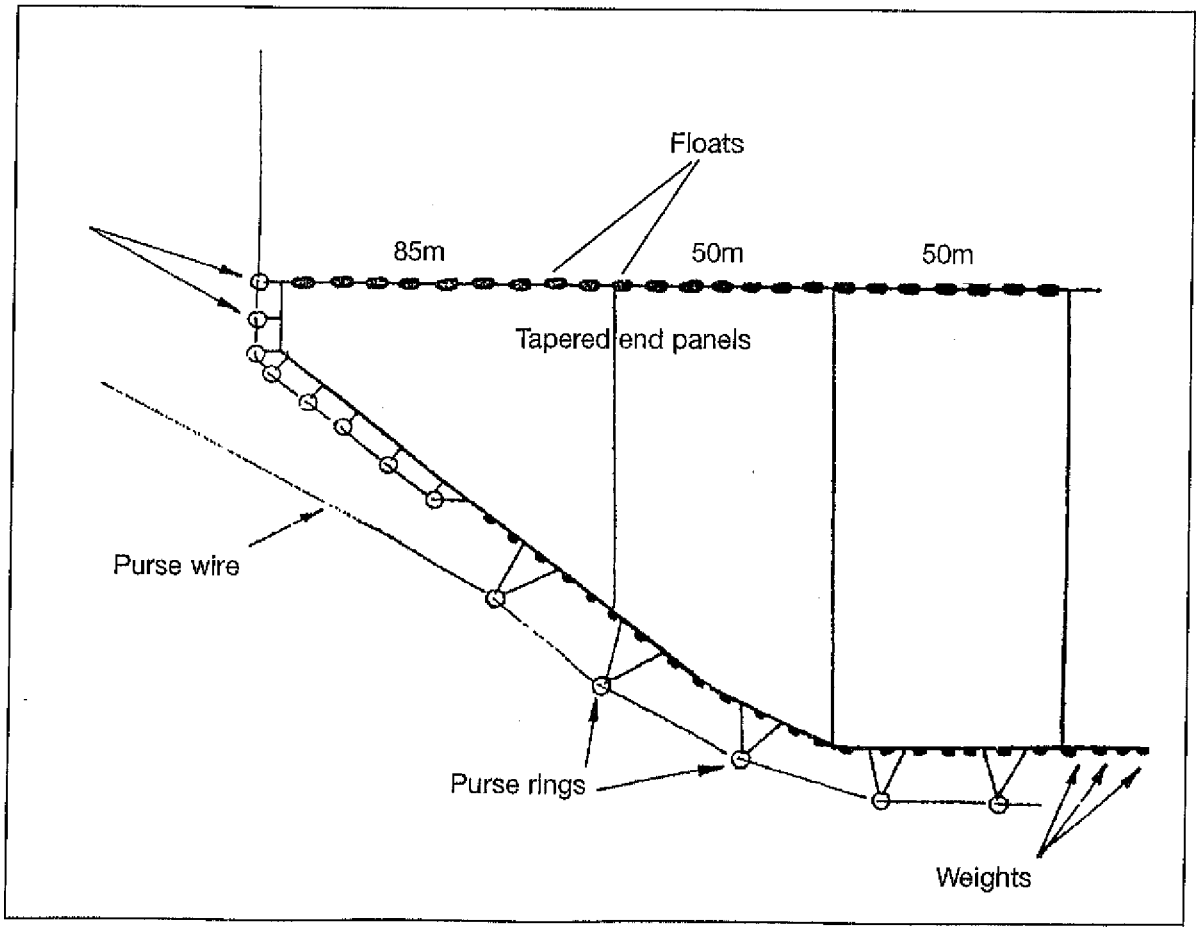


OHP Figure 2.9/10

Deck Layout of a Large Purse Seine Operation

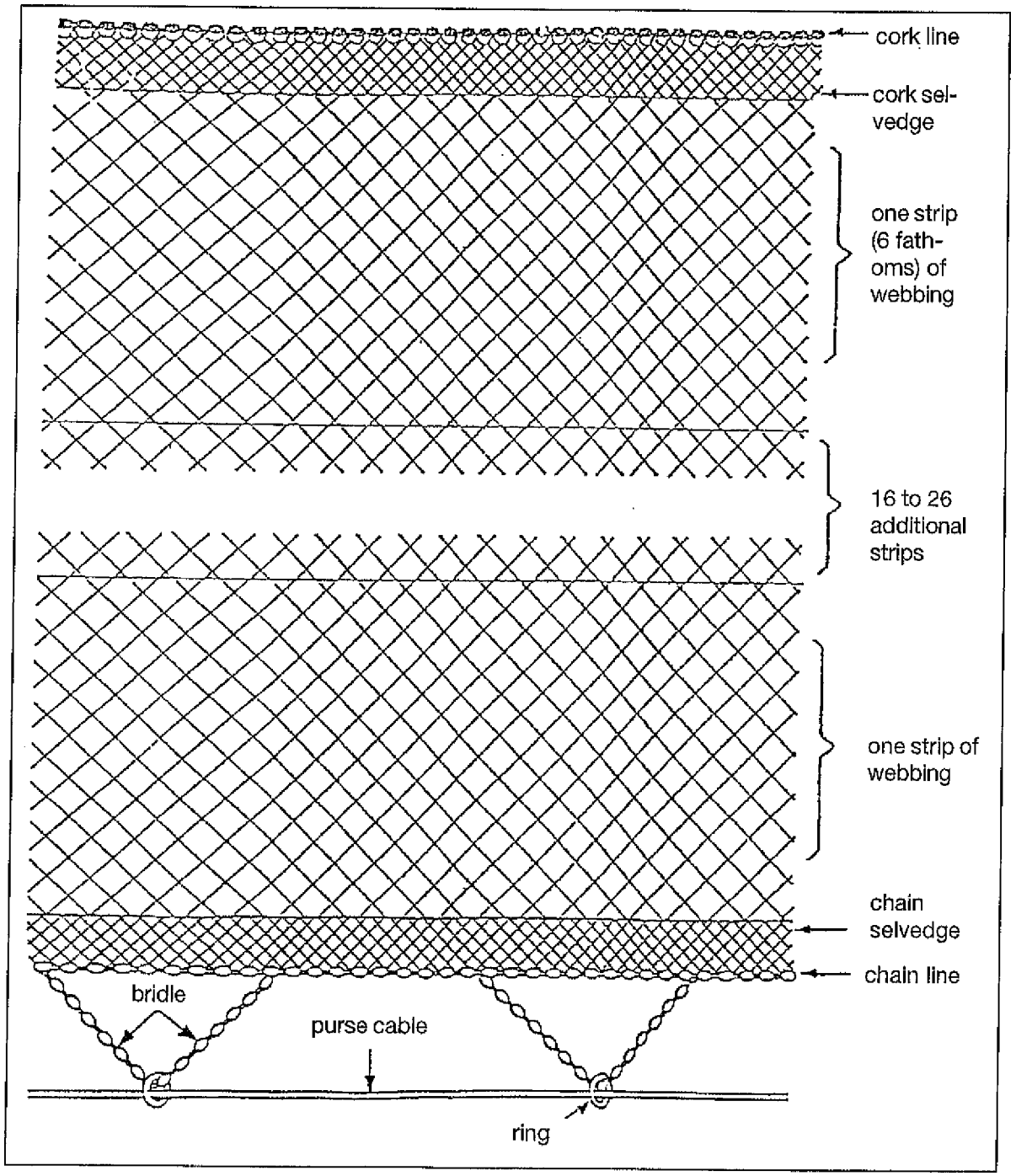


Purse Seine Net 1



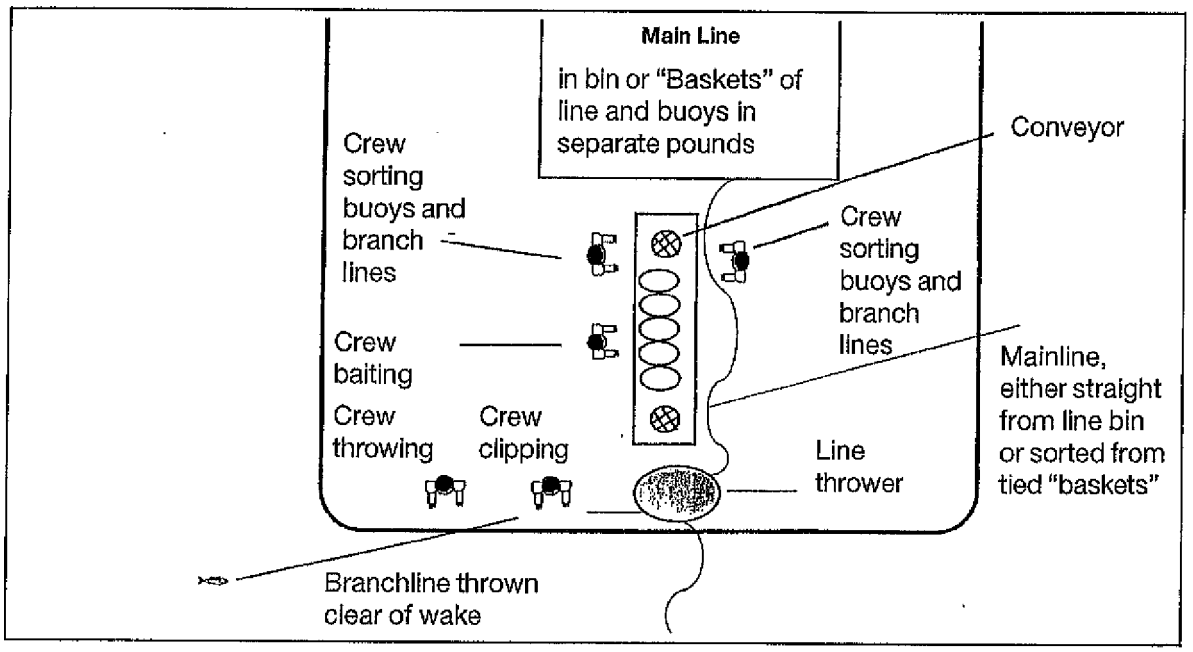
OHP Figure 2.11

Purse Seine Net 2

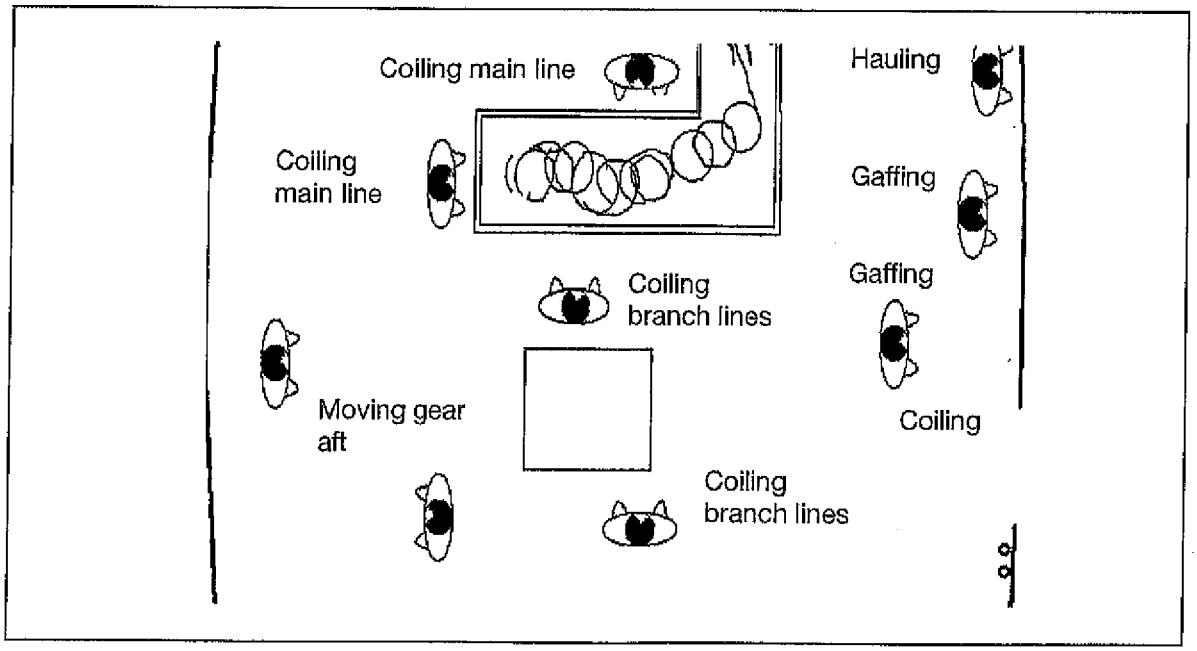


OHP Figure 2.12/13

Shooting a Tuna Long-Line

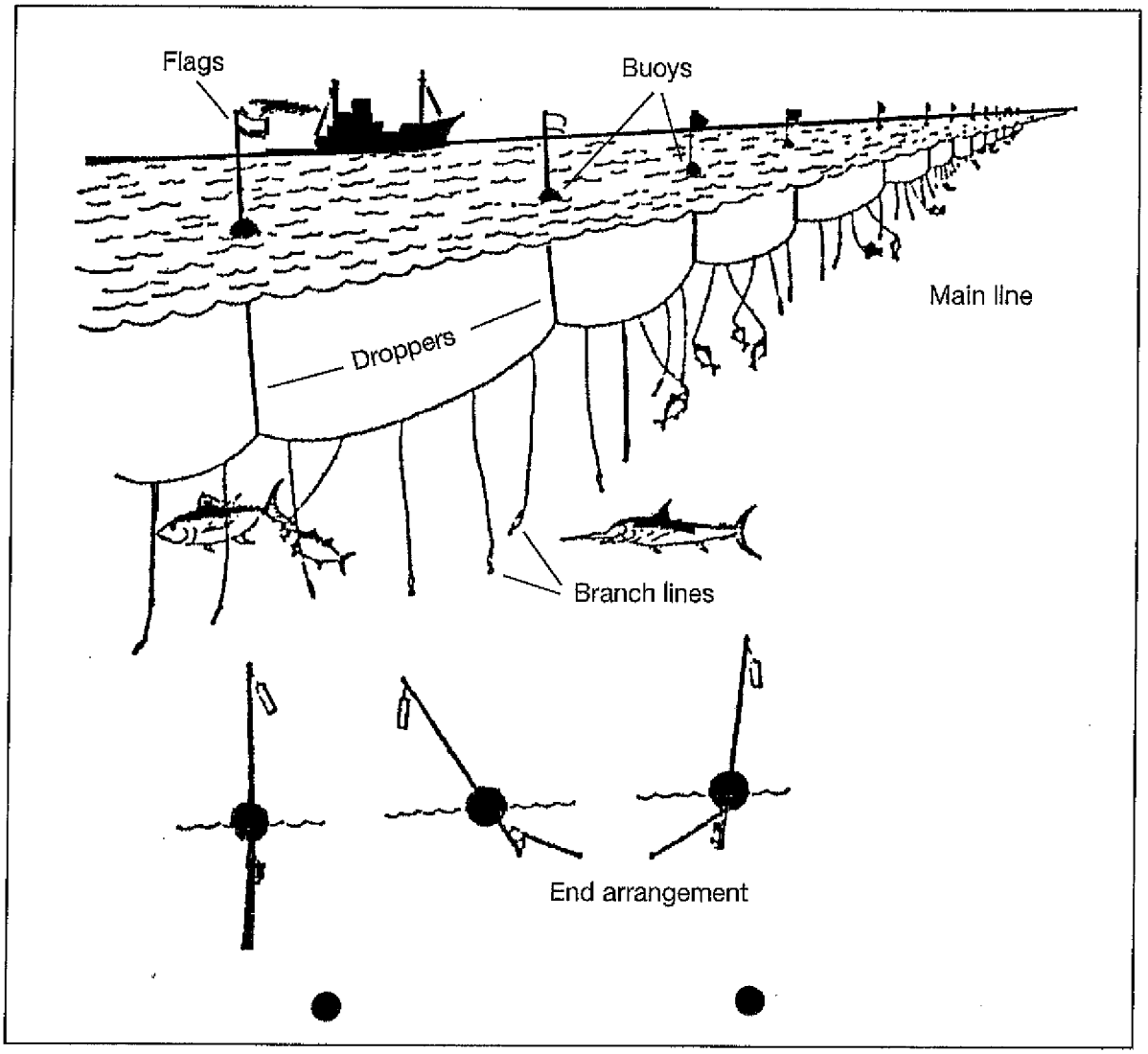


Hauling a Tuna Long-Line

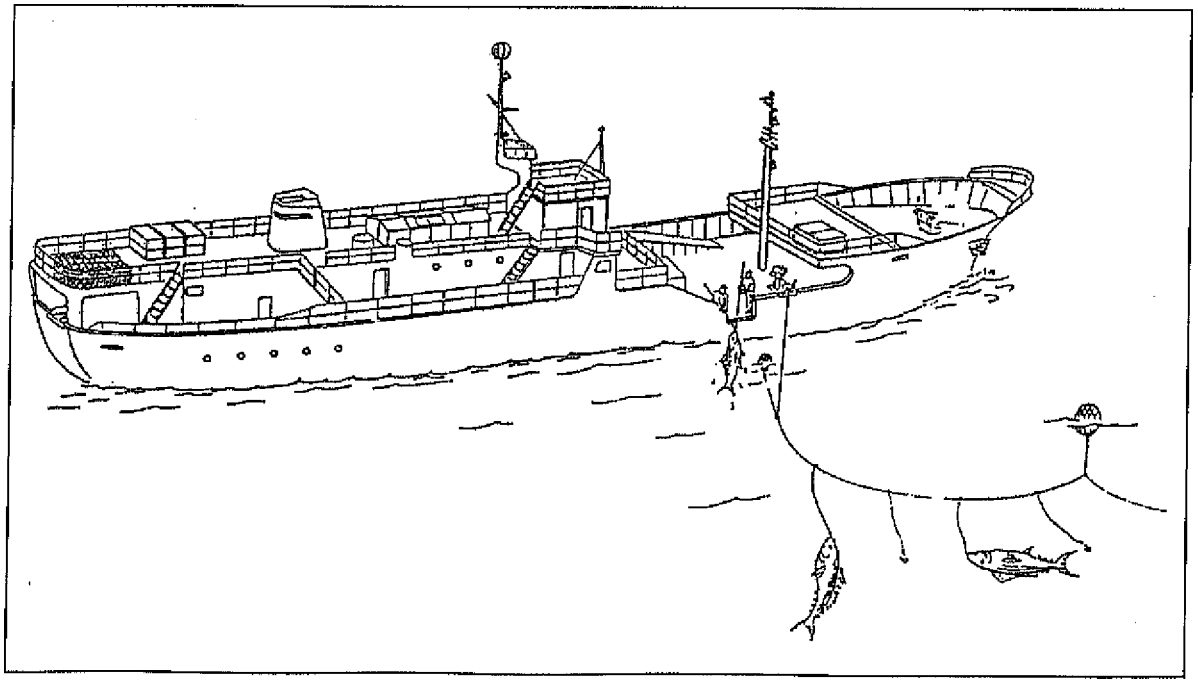


OHP Figure 2.14/15

A Tuna Long-Line

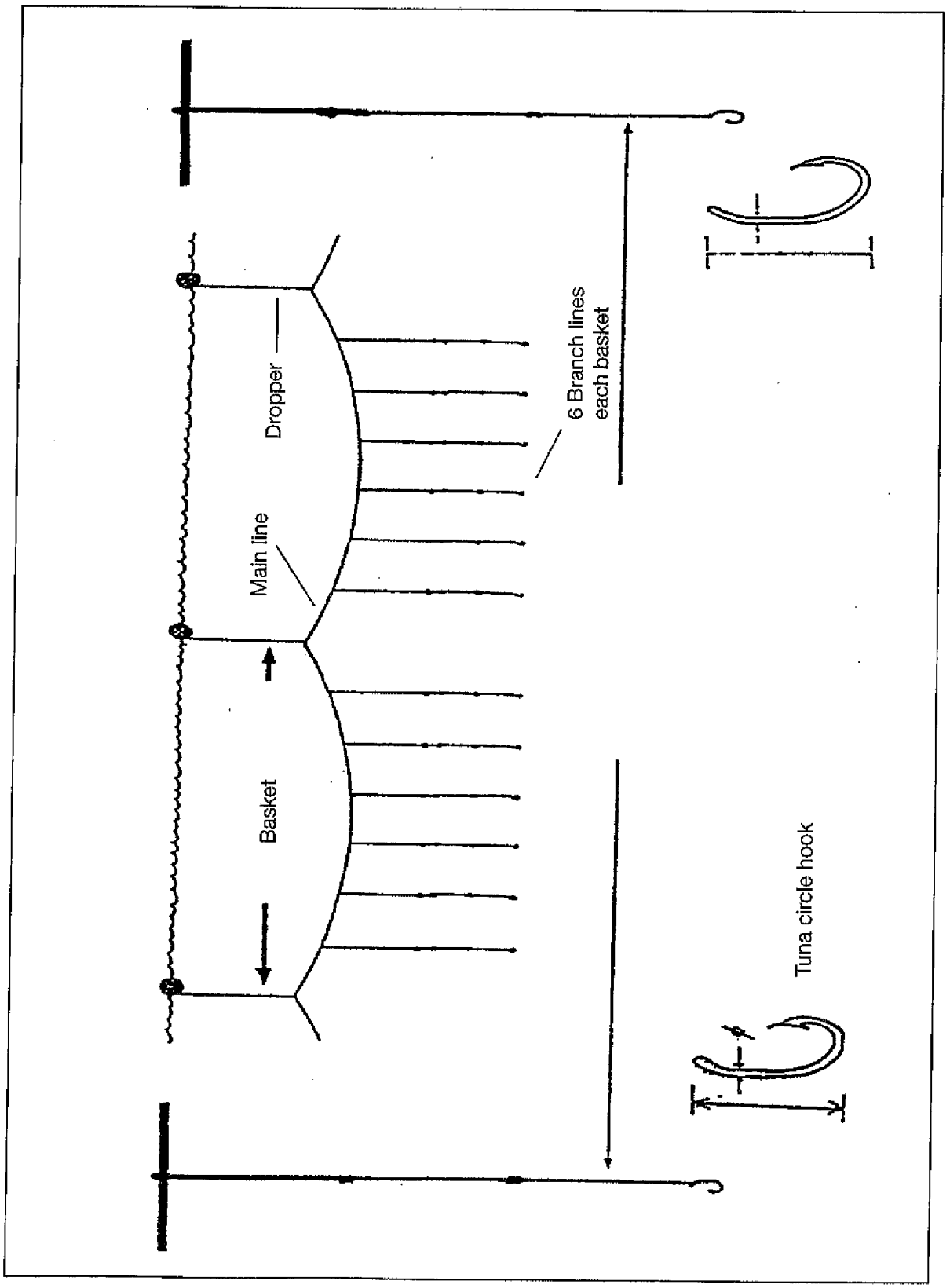


General Arrangement of a Tuna Long-Line



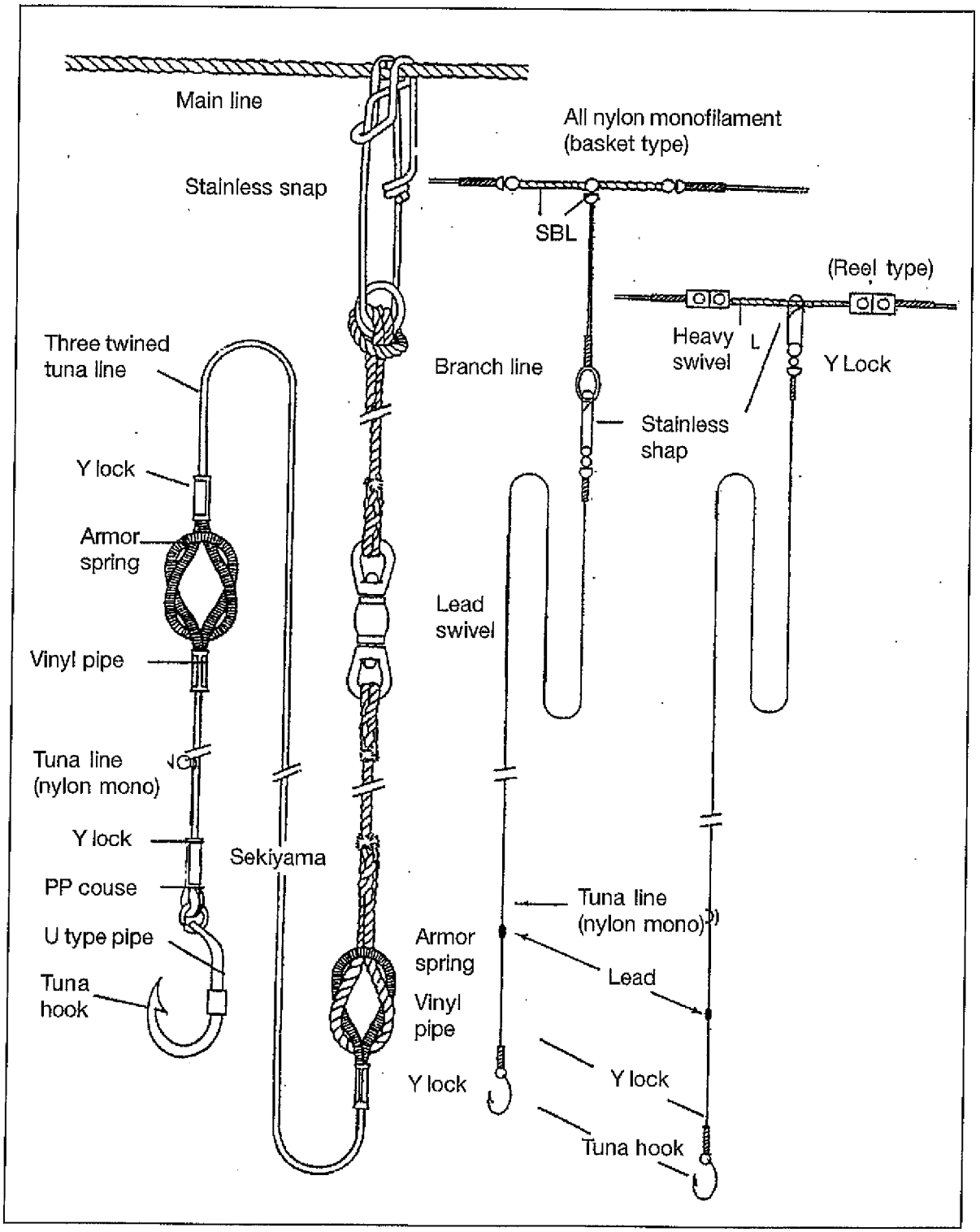
OHP Figure 2.16

Long-Line Set Up



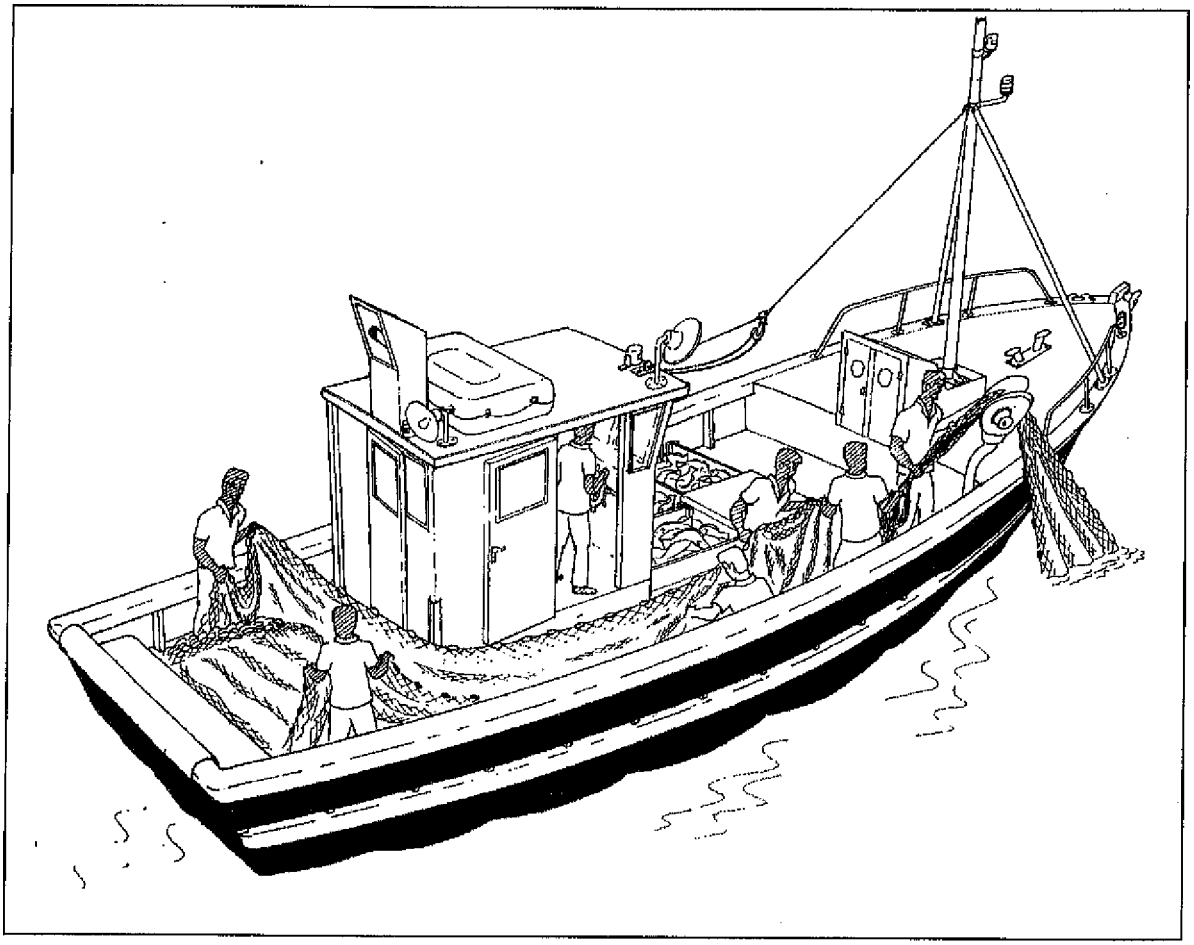
OHP Figure 2.17

Construction of Long-Line Branch Lines



OHP Figure 2.18/19

Small Gillnet Boat Layout 1



Small Gillnet Boat Layout 2

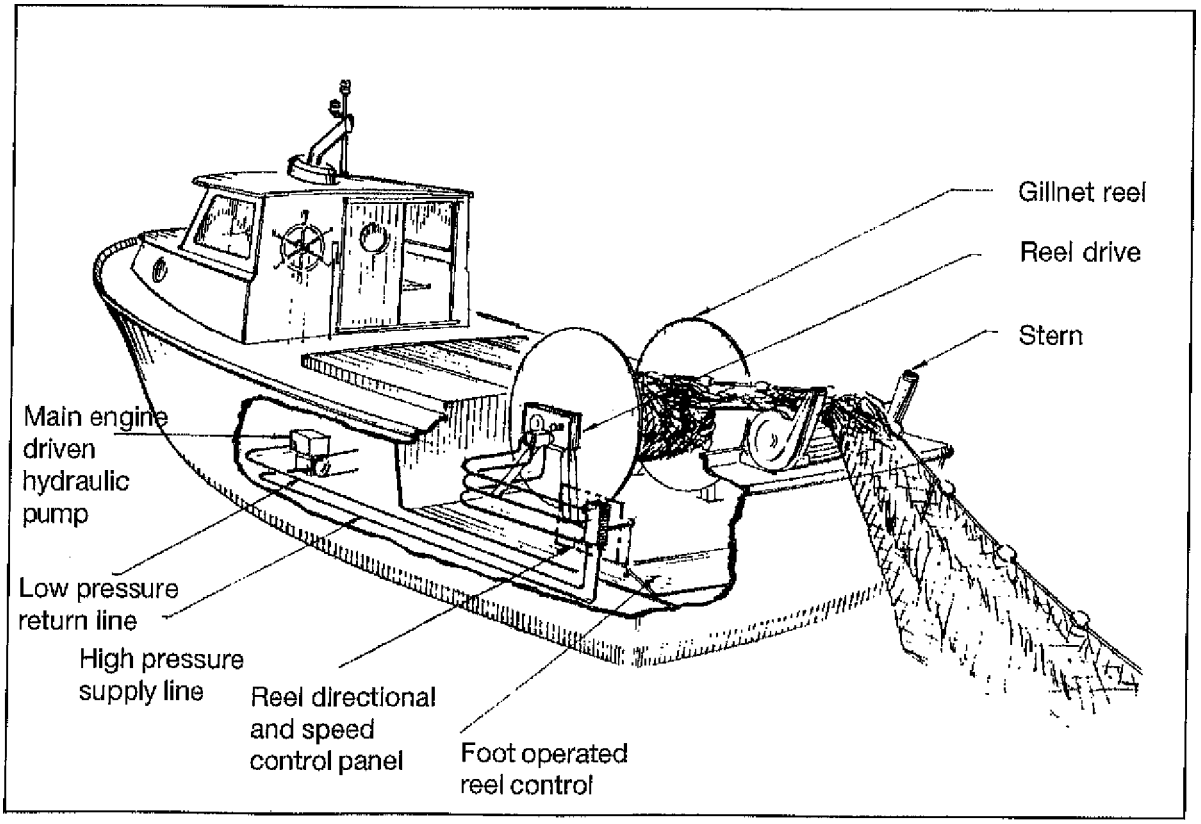
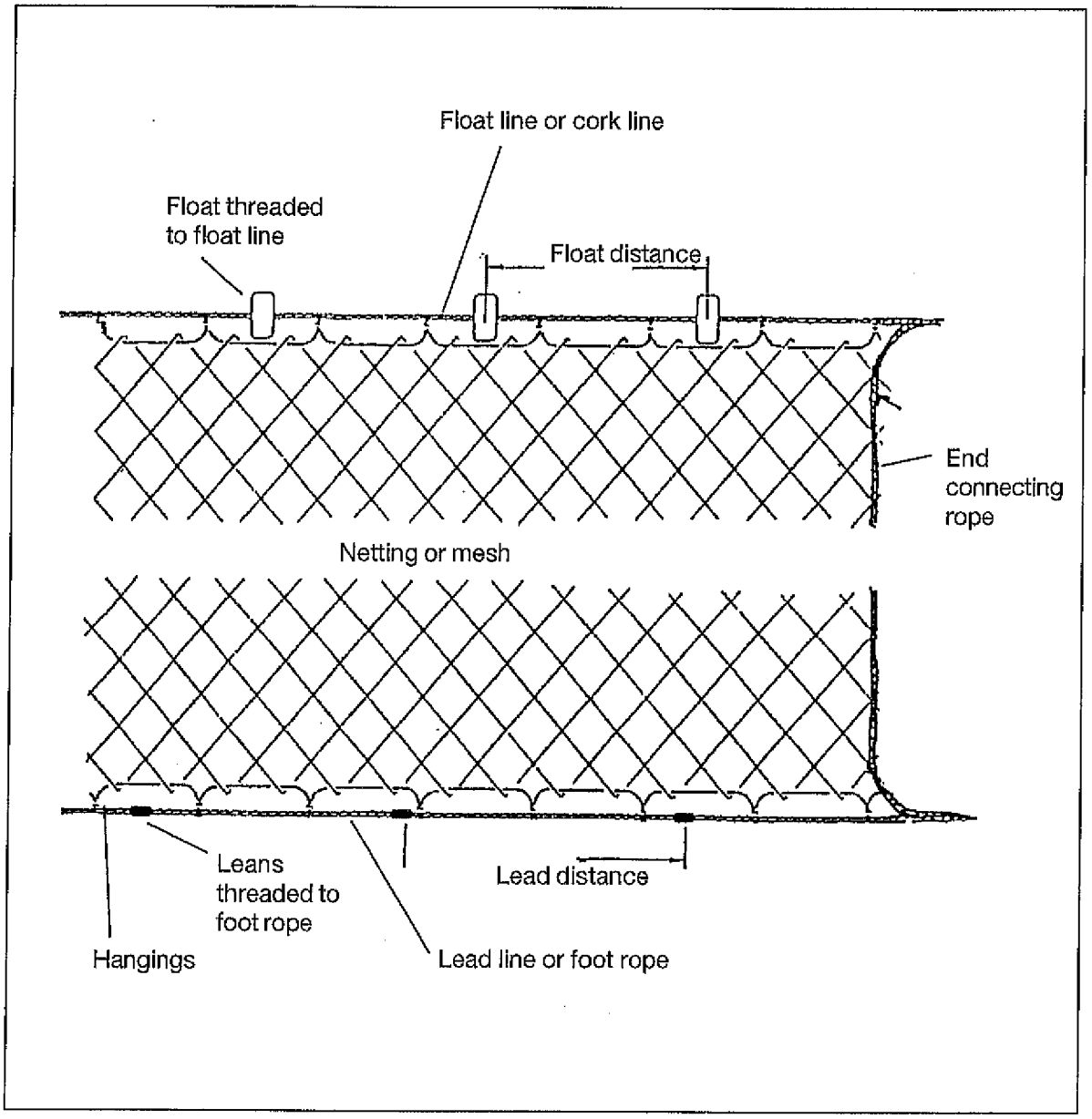


Fig 2.20 Parts of a Gillnet

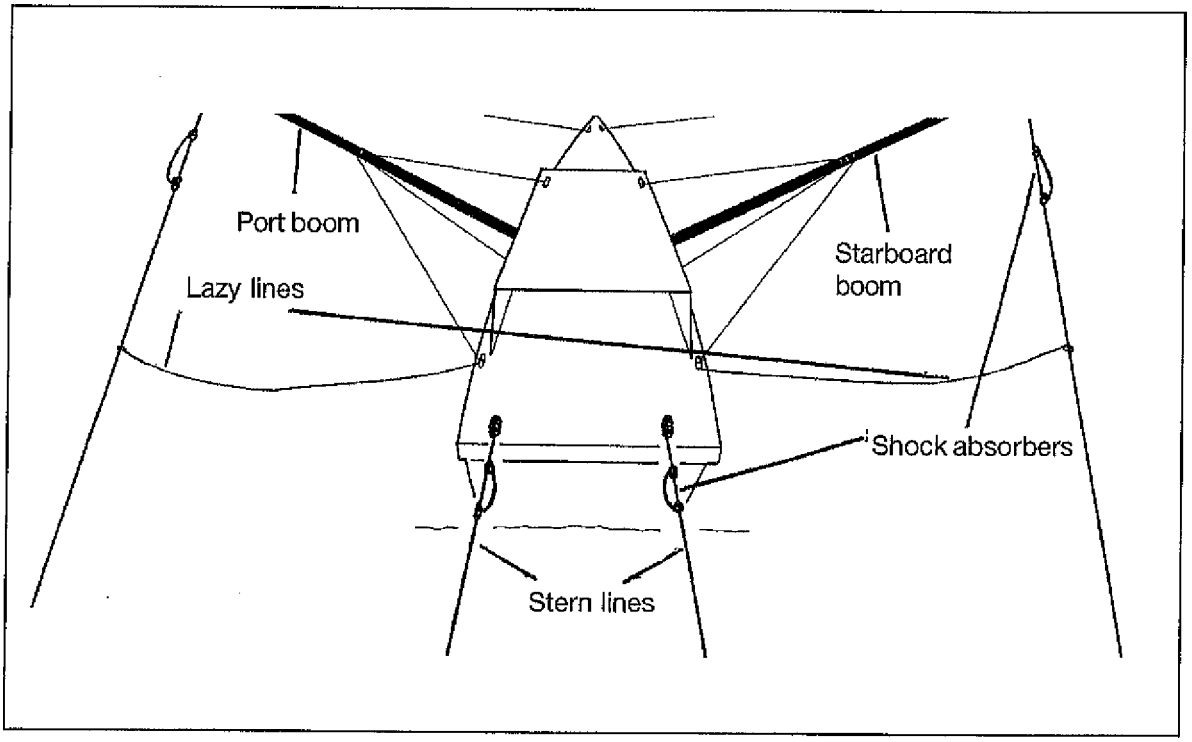
OHP Figure 2.20

Small Gillnet Boat Layout 1



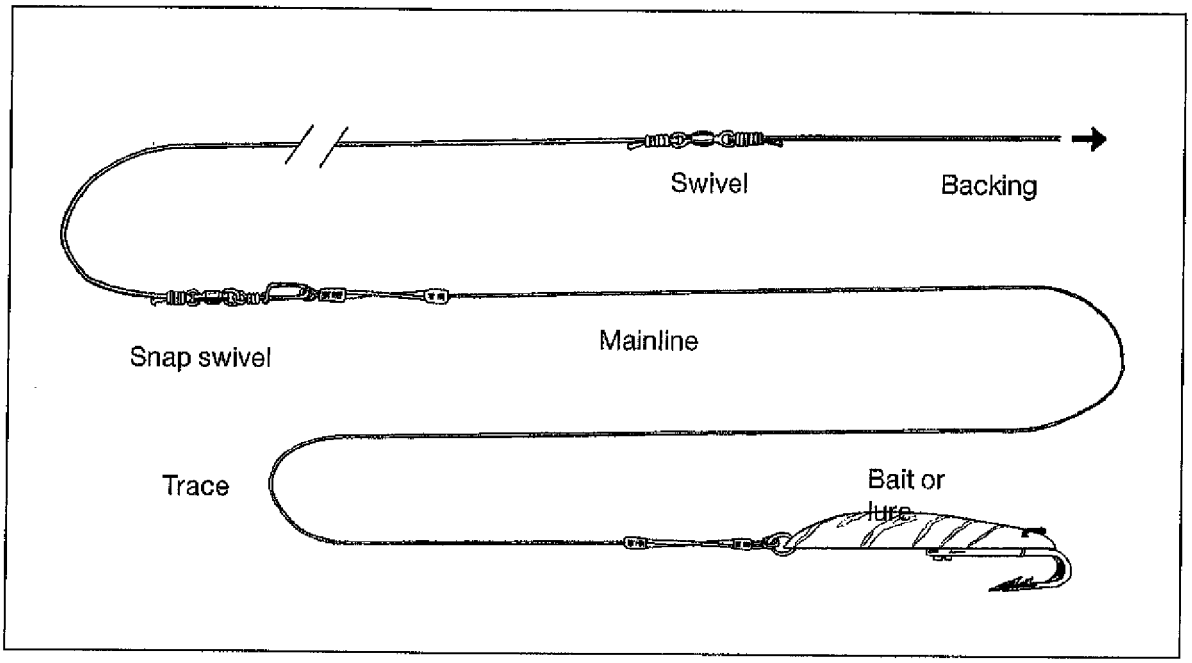
OHP Figure 2.21

Small Boat Set Up for Trolling



OHP Figure 2.22/23

Monofilament Troll Lines



Types of Troll Lures