Chapter 3

An Overview of Fishing Vessels

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3.1 Introduction

Fishery resources are continuously being exploited using fishing vessels whose number, size and effectiveness are on the increase. In the past, the major fish producing countries have implemented many developmental programmes in fisheries sector including craft, gear and accessories. Artisanal fisheries characterized by the traditional ingenuity are still a source of livelihood in India and several other countries and is part of their life and culture. Design and construction of traditional fishing craft vary from place to place. They have evolved over centuries to suit the particular regions. The geographical features of a region, the fishery of the coast, the seasonal nature of the fisheries, the type of building material available, etc., determine the type of fishing craft developed by fishermen. Artisanal fishing crafts contribute significantly to the fish landings, especially, in tropical developing countries. The multi-species nature of the tropical fisheries and fast changing, fast growing technologies and innovations have brought about several changes in fishing craft. The use of outboard motor for propulsion has given a new face to the traditional fishing sector. The redeeming feature of technological advancements in fisheries is the happy co-existence of the traditional and modern sectors. The small-scale fisheries uses only one fifth as much capital and one fourth to one fifth as much fuel per tonne of fish landed and creates hundred times more employment per unit investment than the large scale fishery. The traditional fishing craft and the modern factory vessel represent two phases of development of the fishing vessel. Fishing vessels numbered about four million in 2002, of which about one-third were decked while the remaining were undecked (FAO, 2008).

3.2 Classification of fishing vessels

A simplified International Standard Statistical Classification of Fishery Vessels by Vessel Types (ISSCFV), based on the type of gear used by the vessels (FAO, 2009), in use since 1996 is given in Table 3.1. The fishery vessels are categorized into (i) fishing vessels which are engaged only in fishing operation and (ii) non-fishing vessels which perform other functions

related to fisheries, such as supplying, protecting, rendering assistance or conducting research or training (FAO, 1985; 2008).

Table 3.1 Simplified International Standard Statistical Classification of Fishing Vessels by Vessel Types (ISSCFV)*

Vessel type	ISSCFV Code	Standard abbreviation
Trawlers	01.0.0	TO
Purse seiners	02.0.0	SP
Other seiners	03.0.0	SOX
Gill netters	04.0.0	GO
Trap setters	05.0.0	WO
Long liners	06.0.0	LL
Other liners	07.0.0	LOX
Multipurpose vessels	08.0.0	MO
Dredgers	09.10	DO
Other fishing vessels	09.00	FX

Source: FAO (2009)

3.3 Artisanal fishing crafts

3.3.1 Dugout canoes

These are made from large logs of wood by scooping out the inner part, the keel portion being thicker than the sides. Due to scarcity of timber, dugout is rarely built now–a-days. Dugouts are usually operated in shallow waters and sandy beaches where the craft has to be beach landed. Dugout canoes are found along the coast of Kerala, Gujarat, Maharashtra, Karnataka and Tamil Nadu. Timbers used should have adequate length, girth, lightness and rot resistance. *Bombax* sp. *Mangifera indica, Tetrameles nudiflora* and *Artocarpus chaplasha* are commonly used. Among these, mango wood is the most popular material used for dugouts canoes. The dug out canoes (*shoe dhoni*) of Andhra coast are made out of palm tree trunks. The palmyra palm trunk is used in West Bengal for the construction of dugouts by hollowing out the butt and stem of the palm and is used for angling and cast net fishing. Propulsion is by sails or paddles. A small number of canoes use sails (Srikrishna, 2002). Large dugout canoes are used for operating boat seines. The large dug outs (*vanchi* or *odam*) of 10-12 m long form the main fishing crafts of Malabar coast in Kerala, for operating a variety of nets. The smaller dugouts (*thoni*) are generally used for gill netting

and seining. These dugout canoes are operated in large numbers from the sandy beach along the southwest coast of India (Biswas, 1990) and are employed for day-to-day fishing operations and they are hauled on shore when not in use. Dugouts known as *vallam* are used in fishing in the backwaters and estuaries of Kerala.

Single outrigger canoes are found in Madagascar, Sri Lanka, Indonesia and other areas. Known as *oru*, it is most important traditional craft in Sri Lanka, in terms of numbers. Earlier, single outrigger canoes were propelled by oars and later sails were introduced.

3.3.2 Plank-built canoes

The simplest form of built-up canoes is the plank-built canoe which is most common (Fig. 3.1). They are considered to be dugouts with planks on either side for enlarging. They are largely used in Kerala for boat seine and other fishing. This type is also seen in Kathiawar and Bombay. They are built with or without ribs inside. Some built up canoes have out-riggers and are commonly used for fishing along the Karnataka coast The planks are held together by tying with coir ropes and the gaps are caulked using cotton sprinkled with oil. The joints are then sealed and made water-tight with a mixture of plant resin, chalk powder, etc. The use of metal fastenings is not commonly seen.

Fig. 3.1 Plank-built canoe

The best type of built-up boats in India is seen on the west coast. The Ratnagiri type built-up canoe has a pointed bow, straight but narrow keel and low gunwale. The *Satpati* type has a medium pointed bow, broad beam, straight keel and high gunwale. They are exclusively sailing canoes,

though oars, paddle and punting poles are also used. The *Bassein* type, locally called *machwa* has a broad hull, pointed bow and straight keel. The timber used for construction is teak (*Tectona grandis*) for the hull, *babul* (*Acacia* sp.) for the frames and *poon* (*Callophyllum* sp.) for the mast. *Lodhia, machuwa, kotia* and *Satpati-Versova* type are built-up canoes that have been found to be fit for mechanization (Zeiner et al., 1958). The plank canoe is usually divided into compartments by transverse planks. There are all exclusively sailing canoes, though oars, paddles and punting poles are also used. The *masula* boat of the east coast are made of wooden planks which are stitched together with or without transverse frames inside. Tuticorin type of boat of the Tamil Nadu coast, *nava* of Andhra coast, *batchari* and *chot* type of fishing boats from West Bengal are other types of built-up canoes.

Very large plank-built canoes are decked and fitted with inboard motors for sea fishing operation using large seine nets, in recent years in India. The plank canoes are classified into very large, (>18 m), large (12-18 m), medium (8-12 m) and small (2-8 m) (SIFFS, 1998). Another variation of the plank-built canoe is the plank transom canoe developed by local boat builders as an alternative to the plywood boat for motorised operations. This was made by cutting a large plank canoe into two (SIFFS, 1998).

The inland fishing craft used in the rivers of West Bengal called the *dinghi* are plank built canoes. These crafts have narrow tapering bows and sterns and have no keels. The flat bottom plank-built boats, known as *nava* are used for inland fishing in Orissa and Andhra Pradesh and *machuwa* type plank boats are used in Gujarat.

In Lakshadweep Islands, canoes are built of planks from coconut palm or locally available wood. In the Minicoy Island of Lakshadweep plank-built canoes are known as *kalundhoni* (Srikrishna, 2002). Two types of plank-built canoes - one with fishing platform at the stern and one without platform - are used. They are used for pole and line fishing and trolling. *Masodi* is the traditional sailing-cum-rowing boat used for tuna pole and line fishing.

3.3.3 Catamarans

In the surf beaten coasts of India and Sri Lanka, the catamaran (*kattumaram* or *theppa*) is the most dominant fishing craft (Fig. 3.2). This generally consists of a variable number of definitely shaped logs tied together to form a raft. To this structure are added a number of accessory pieces in shape of stem and sometimes rowing rail. It is usually made of 3-5 logs and occasionally 7 logs measuring about 3.6-7.5 m length. Logs are cut square

at the stern and tapered at the bow with lithe raise. Catamarans are usually classified on the basis of number of logs. In Tamil Nadu coast, the catamarans are classified as follows (Srikrishna, 2002).

Periyamaram: This type of catamaran is made of four logs and securely lashed fore and aft. The middle pair projects about 3.6 m beyond the outer logs. The size of the craft is 7.65 x 1.05 m.

Irukkumaram: This is made of 5 logs of which the middle one is longest and project some distance beyond the inner lateral logs which in turn project beyond the outer logs.

Kolamaram: This is the largest catamaran made of 7 logs used for catching flying fish. Propulsion is by sail.

Thundilmaram: This is constructed from 5 logs with a beaked prow.

Chinnamaram: This is small in size and is made of three logs.

The boat catamaran (*teppalu*) is operated off the Andhra Pradesh coast, India. The logs are pegged and tied by coir ropes in the shape of a boat. Washboards are attached at the sides and all logs end in a line at the aft. Sails are used for propulsion. Ganjam type catamaran is operated off the Orissa coast. It is boat shaped and made of 5 logs, which are pegged together.

Catamarans are used for operation of gill nets, lines and shore seines. The timber used for catamaran construction are usually light, with low water absorption, rot resistance and good weathering resistance. Commonly used

Fig. 3.2 Kattumaram

species *Albizia chinensis, Bombax ceiba, Melia composita, Melia dubia, Ailanthus malabarica, Erythrina indica* and *Samanea saman.*

3.3.4 FRP canoes

FRP is emerging as a new material for use in the artisanal fisheries sector. FRP canoes for gillnetting in the inland and coastal waters have been operational for the past one decade. FRP can be utilised for the construction of small open canoes to medium sized fishing craft with amenities like fish hold, storage space for fishing gear and fishing accessories and provision for installation of outboard motors. The high production costs and the availability of skilled labour force are reasons for the slow popularization of FRP fishing boats among artisanal fishers.

3.3.5 Plywood boats

Plywood boats are relatively new entrants into the artisanal fisheries sector. Plywood boats are constructed as decked boats and open boats. Decked boats are usually used for hook and line fishing, while open boats are used for large mesh gill netting. Plywood boats of L_{OA} up to 17 m are now being used by fishermen. Ring seines and mini-trawls are also operated from these boats (SIFFS, 1998).

3.3.6 Tin boats

Boats made out of tin are used in the reservoirs of Rajasthan and Bihar. They have a flat bottom and range between 3.6 and 6 m in length. They are constructed by fixing galvanized iron sheets on wooden frames The metal sheets corrode rapidly and the service life of these boats is less than two years. They are usually operated by 2-3 fishermen and are used for gillnet fishing.

3.3.7 BOBP beach landing crafts

The Bay of Bengal Programme (BOBP) introduced modified and improved designs of beach landing crafts, in order to increase the carrying capacity and productivity of beach landing boats along east and west coast of India (Gulbrandsen *et al*, 1980,1986). These boats were constructed out of conventional wood or marine plywood and propelled by air cooled engines. The engine was installed in pivotable watertight box with an integral shaft and rudder assembly. The hulls are decked fore and aft with hatch covers. The BOBP also conducted experiments on the motorization of *thanguvala* canoes and small mesh gill-netters and tested new sailing beach landing craft for small mesh gillnetting in Kerala. A low powered sail assisted beach

landing craft for large mesh gill netting was also developed under the project. These motorization experiments conducted during the early eighties paved the way for the large-scale motorization tin Kerala.

3.3.8 Coracle

The coracle is a simple craft used in reservoirs of south India (Fig. 3.3). It is oval or circular in shape and is made of a framework of circular rods covered with animal hide, canvas or plastic sheet. In recent times coracles are also made of FRP. It is keel less and is popular in rivers. The common size is about 1.9 m in diameter. Gillnets, shore seines and long lines can be operated from this raft. The coracles are commonly used in Karnataka, Tamil Nadu and Andhra Pradesh.

Fig. 3.3 Coracle

3.3.9 Rafts

Rafts made of plantain stem, earthen pots, sealed tins, dried grass, inflated rubber tubes etc are also used for fishing in inland waters.

3.4 Mechanised crafts

3.4.1 Trawlers

A trawler is a fishing vessel designed for the purpose of operating a trawl, a type of fishing net that is dragged along the bottom of the sea (or sometimes above the bottom at a specified depth) (Fig. 3.4). These vessels are provided with engines of sufficient power to tow the net at the appropriate trawling speed. They are fitted with trawl winches and equipment necessary to haul the net onboard and lift the codend over the deck. Depending on

the scale of operation and the trawl used, trawlers vary in size from open boats, powered by outboard engines to huge factory ships, which can fish in the distant waters.

In the case of side trawlers, the trawl is set on the side and the warps pass through blocks hanging from two gallows, one forward and one aft. Usually the superstructure and wheelhouse are placed aft, the fish hold is situated amidships and the trawl winch transversally at the front of the superstructure. When the vessel is not trawling, the otter boards are stored between the gallows and the bulwark.

In stern trawlers, the warps are led from the trawl winch through various lead blocks to the after deck and over the stern. The wheelhouse or bridge is usually situated in the forward part of the vessel. Medium sized and large stern trawlers are often fitted with a stern ramp, on which the trawl is hauled on to the deck. On small vessels a stern roller is used to reduce friction when shooting and hauling up the trawl. The trawl winch is placed transversely usually behind the wheelhouse. On small vessels the fish hold is situated amidships and on medium sized and large stern trawlers in the forward part of the vessel. The majority of small trawlers and some medium sized trawlers are not equipped with refrigeration plants Many of them have insulated fish holds and carry ice to preserve fish. Vessels on which the fish is preserved by freezing are called freezer trawlers and are fitted with freezing equipment and cold storage. Factory trawlers are generally large stern trawlers equipped with processing plants including mechanised gutting and filtering equipment with accompanying freezing installation, fish oil, fish meal and sometimes canning plants. Separate holds are provided for each of the products.

The outrigger trawlers have strong outrigger booms to tow the fishing gear (Fig. 3.5). These outriggers are usually fastened to the mast and extend out from the sides of the vessel each towing one or two trawls. These are used for shrimp trawling.

In pair trawling two boats are deployed to tow a single trawl. The boats maintain a distance apart equal to about half the warp length. Otter boards are not needed for pair trawling operation. This reduces the overall drag of the gear and permits the use of larger nets.

The main equipments onboard a trawler are (i) trawl winch (mechanical or hydraulic), (ii) gallows (T-frame, rectangular frame or goal post shaped), (iii) mast and boom (derrick), with winch, (iv) stern ramp for smooth hauling of the catch and (v) net drum, depending on size and capacities.

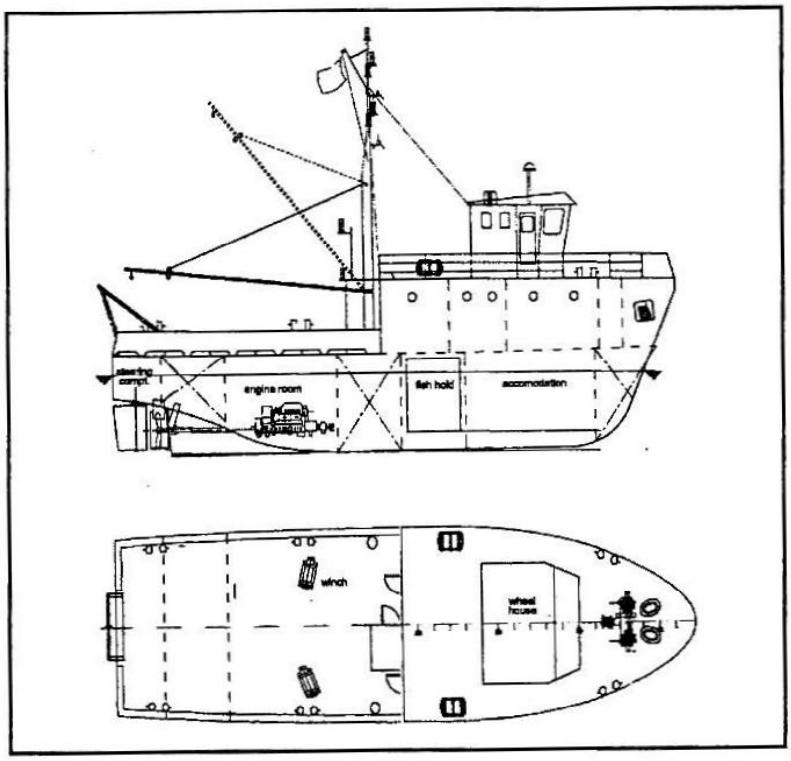

Fig. 3.4 Profile and deck plan of a 17.5 m mechanised stern trawler

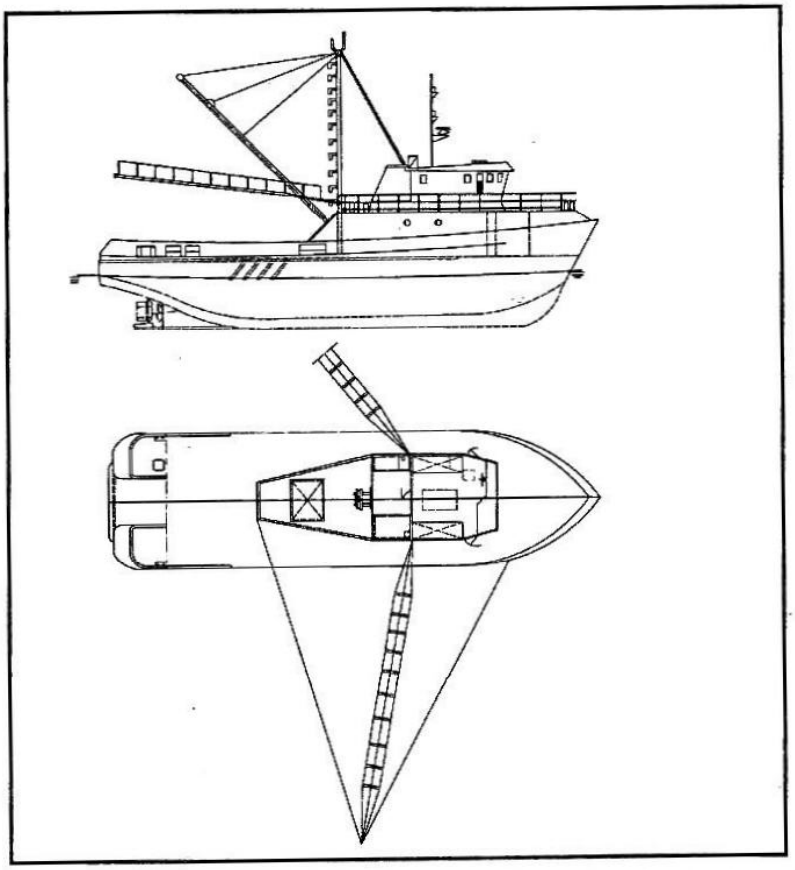

Fig. 3.5 Profile and deck plan of a 22 m double rig trawler

3.4.2 Seiners

A purse-seine is a surrounding net having a line at the bottom passing through rings attached to the net, which can be drawn or pursed. (Schmidt, 1960). The two-boat system is the oldest system of purse-seining and was first developed on the east coast of USA. In this system, two small boats are carried in davits on a large vessel and on reaching the ground these are lowered. Each boat carries half of the purse seine net. The boats move in opposite direction, encircles the shoal and again comes together. The net is then hauled and the catch is brailed or pumped in.

In the one-boat system net is carried onboard the bigger vessel. A small auxiliary boat called the 'skiff' is released with one end of the net on sighting the shoal. The seiner then quickly surrounds the shoal and as it reaches the skiff purses the net and hauls it sufficiently enough to brail the fish. The size of a purse seiner, according to Schmidt (1960) depends on the distance to the fishery ground, expected catch, availability of a vessel for transportation of catch etc. The equipment on boat a purse-seiner are power block, hydraulic system for hoisting the boats, fish pumps, etc. Usually purse seiners have onboard equipments for fish detection, large fish holds. A brailer attached to a derrick is provided for removing fish collected in the purse. Sometimes a pump is lowered into the pursed seine and the fish is pumped through a hose and a water separator on deck into the hold. To assist in fish school detection crow's nest is fitted on masts.

Based on the deck arrangements, two main types of one boat purse-seiners can be distinguished *viz.*, (i) North American type and (ii) European type (FAO, 1985). The North American type of seiners have the bridge and accommodation placed forward (Fig. 3.6). The power block is slung from a derrick attached to the mast behind the wheelhouse. The winch is usually fitted to the parallel drums and is situated opposite the pursing gallows. The net is carried at the stern of the vessel. In the European type purse seiners, the bridge and accommodation are located aft. The fish hold is situated amidships. The net is carried on the upper deck and power block is fitted to the side of the bridge. The pursing winch is normally situated forward with the drums facing the pursing davit. Small purse seiners operated in traditional fisheries of India are known as ring seiners (Fig. 3.7).

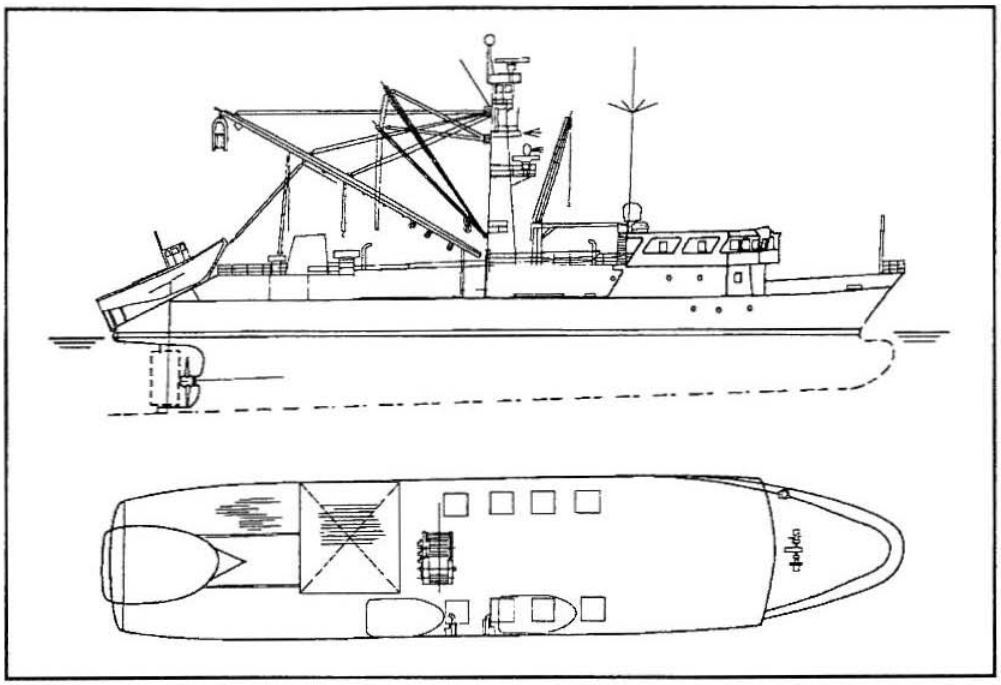

Fig. 3.6 Profile and deck plan of a large North American type purse seiner

Fig. 3.7 A purse seiner (ring seiner) operated in small-scale fisheries

3.4.3 Gillnetters

Gillnets can be operated from boats and canoes in inland and inshore waters, from small decked vessels in coastal waters and from medium sized vessels in the offshore waters. Small gillnetters have their wheelhouse either aft or forward (Fig.3.8). In medium sized vessels the bridge is usually located aft. On small vessels setting and hauling operations are by hand while in larger vessels hydraulic net haulers or net drums are used.

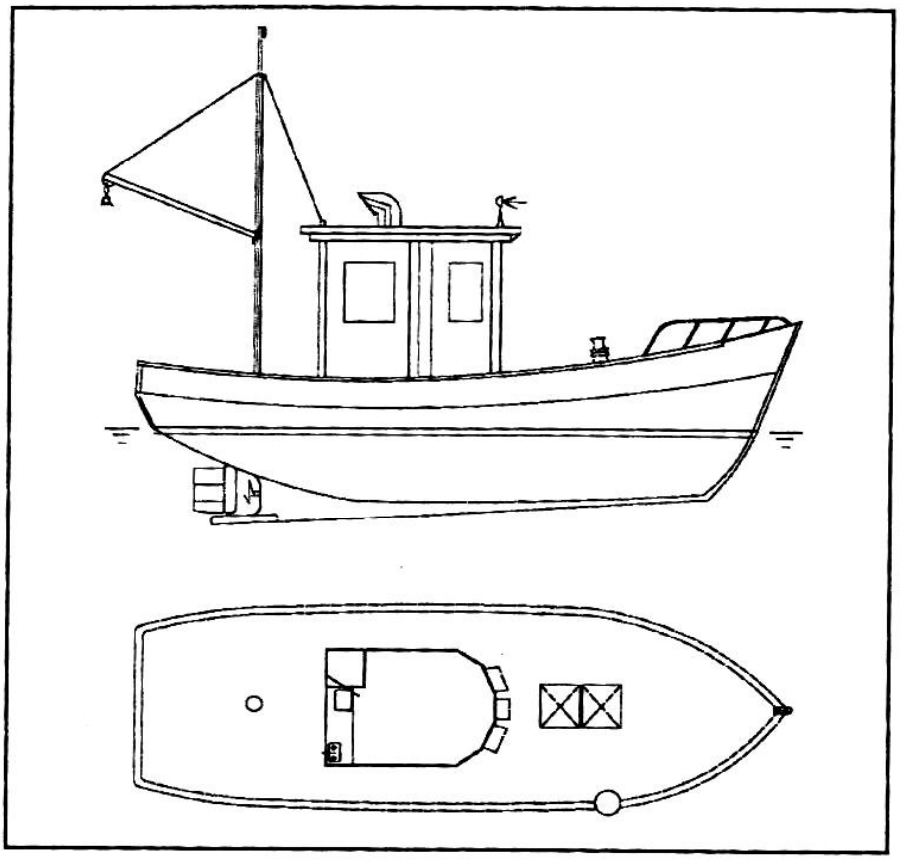

Fig. 3.8 Profile and deck plan of a small mechanised gillnetter

3.4.4 Liners

These vessels use lines and hooks with or without bait to catch tuna, skipjack, squid, snappers and other fishes. Handlines are operated from boats, canoes and other small vessels. Handlines can be set and hauled either manually or by mechanised reel fastened to the gunwale. The reels may be electrically or hydraulically operated.

Long lines can be operated from vessels of any size. In longliners, the general facilities include fish hold, line haulers and catch handling equipment. Generally, the gear is hauled from the bow or from the side with a mechanical or hydraulic line hauler and the lines are set over the stern. The wheel house can be situated aft or forward but in larger vessels the bridge is generally placed aft. Automatic and semi-automatic systems are used in bigger boats to bait the hooks and to shoot and haul the lines. Tuna long lines are usually operated from medium sized vessels (Fig. 3.9). The line hauler is placed on the starboard side. A baiting table and chute are located on the stern from where the lines are set. Typical equipment of a tuna long liner include brine freezing tanks for preserving tuna.

Pole and line vessels are fitted with a narrow platform protruding all around the vessel at deck level outside the rail or bulwark. The fishing platforms on the bow are designed in such a way as to accommodate as many fishermen as possible, to withstand heavy waves and to enable the anglers to keep in contact with those on the other side and to allow the fish to slide to the deck. The crew stand on this platform to fish using pole and line. These vessels are used for catching tuna. Tanks with live bait and a water spray system for fish attraction are typical features of these vessels. Two types of pole and line vessels are generally recognized *viz.*, (i) the Japanese type and (ii) the American type (FAO, 1985). In Japanese type pole and line vessels, the fishermen stand at the railing on the forward part of the vessel, bridge is accommodated aft and the fish hold is placed in the middle part of the vessel. In the American type pole and line vessels, the platform for fishermen is located near the stern of the vessel, bait tanks in the aft deck and wheelhouse situated forward.

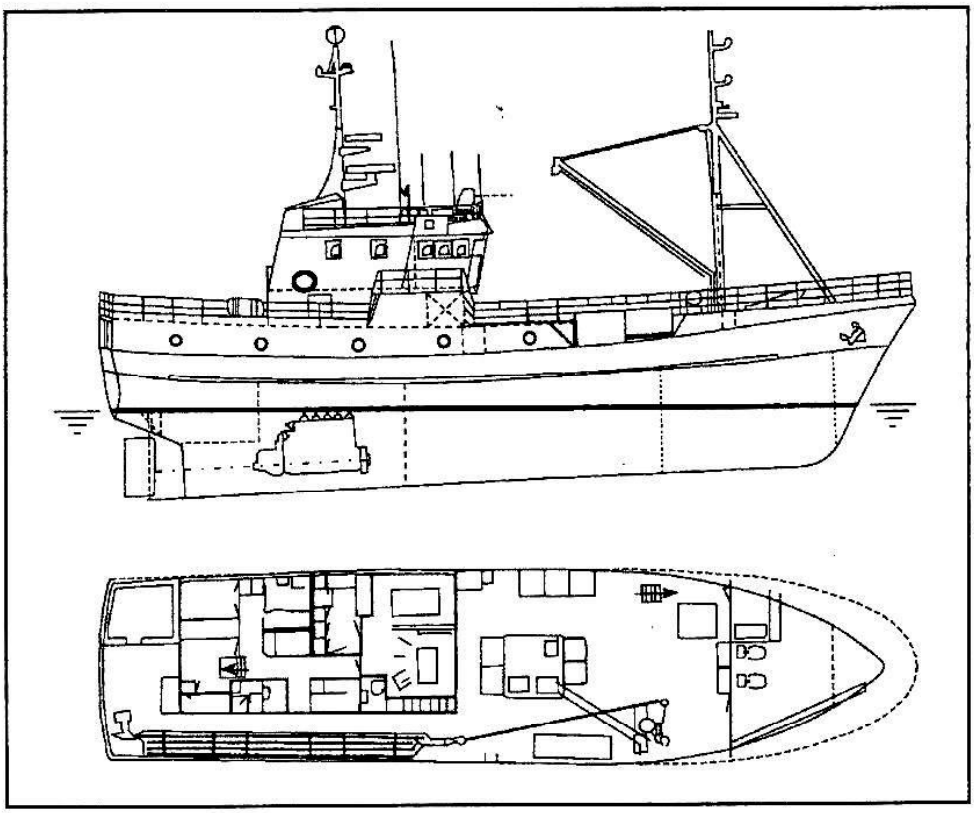

Fig. 3.9 Profile and deck plan of a large mechanised longliner

3.4.5 Dredgers

These vessels use a dredge for collection of molluscs from the sea bottom. The vessel drags the gear and the power requirements can therefore

be similar to those of a small trawler. A powerful water pump is necessary to operate the water jets of a mechanical dredge. For lowering and lifting of the dredge, derricks and winches are installed.

3.4.6 Lift-netters

These vessels are equipped for the operation of large lift nets, which were held out from the ship's side and raised and lowered by means of outriggers. Powerful lights hung from the boom and underwater lights are used for fish attraction. The vessels have the bridge amidships and are fitted with derricks and winches for handling the lifting lines, outriggers and light booms. Dip nets are used to catch sardine, anchovy and baitfish.

3.4.7 Trollers

These vessels tow a number of lines fitted with hooks and lures. The wheel house and mast either located forward or in the aft. Troll lines are used to catch surface swimming fishes using un-baited hooks. Fishing is generally done just after dawn or before sun set.

3.4.8 Trap setters

These include vessels setting traps and pots but also pound nets, fyke nets, stow nets and various kinds of barriers for catching lobsters, crabs, crayfish and other kinds of reef fish. In inshore and inland waters traps and pots are operated from artisanal fishing vessels. Larger pot vessels are equipped with derricks or cranes for setting and hauling of pots. On smaller vessels mechanised pot haulers are fitted. On small-decked pot vessels the wheelhouse is located either forward or aft and fish hold amidships.

3.4.9 Multipurpose vessels

These vessels designed for alternative use of two or more fishing gear without major modification to the vessel's outfit or equipments. Examples are gillnetter-cum-longliner, trawler-cum-gillnetter and trawler-cum- seiner.

3.5 Marine fishing fleet in India

Marine fishing fleet in India consists of about 238770 vessels, of which 44% were non-motorised, 32% motorised and 24% mechanised (CMFRI, 2006) (Fig. 3.10).

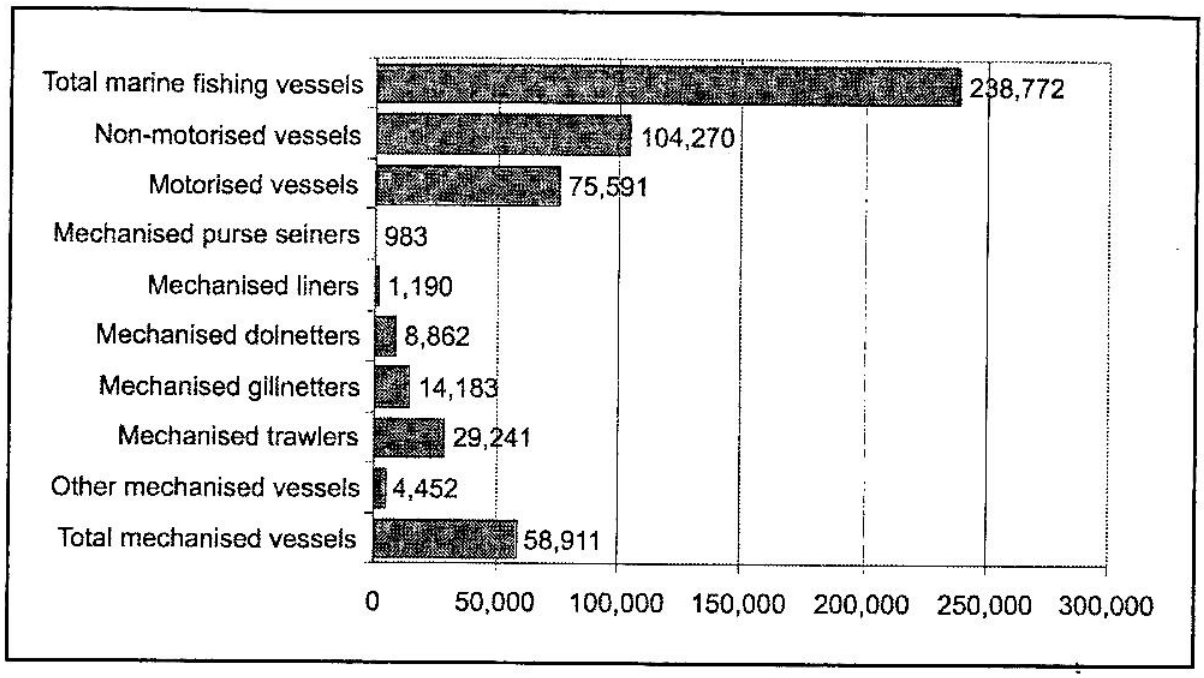

Fig. 3.10 Marine fishing fleet in India (CMFRI, 2006)

Traditional non-mechanised fishing fleet in India consists of kattumaram, plank canoes, dugout canoes, plywood and FRP canoes operating encircling nets, boat seines, shore seines, gillnets, hooks and lines and cast nets. Traditional mechanised fleet consists of plank canoes and crafts built of steel, fiberglass or plywood powered with OBMs or IBMs operating ring seines, gill nets, encircling nets, hooks and lines, boat seines and shore seines. The majority of fishing vessels operating in the mechanised sector in India are of 8.5 to 21 m L_{OA}, equipped for trawling, purse seining, gillnetting, lining and bag netting and are generally confined to the shelf waters. Hence the most immediate requirements in fishing craft are development of improved designs of fuel-efficient, functional, multipurpose, medium class, multi-day fishing vessels for exploitation of the deep-sea resources. Development in construction, hull form, marine engines, propulsion systems, optimization of energy and safety at sea should be given thrust while going on to new types of fishing vessels.

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