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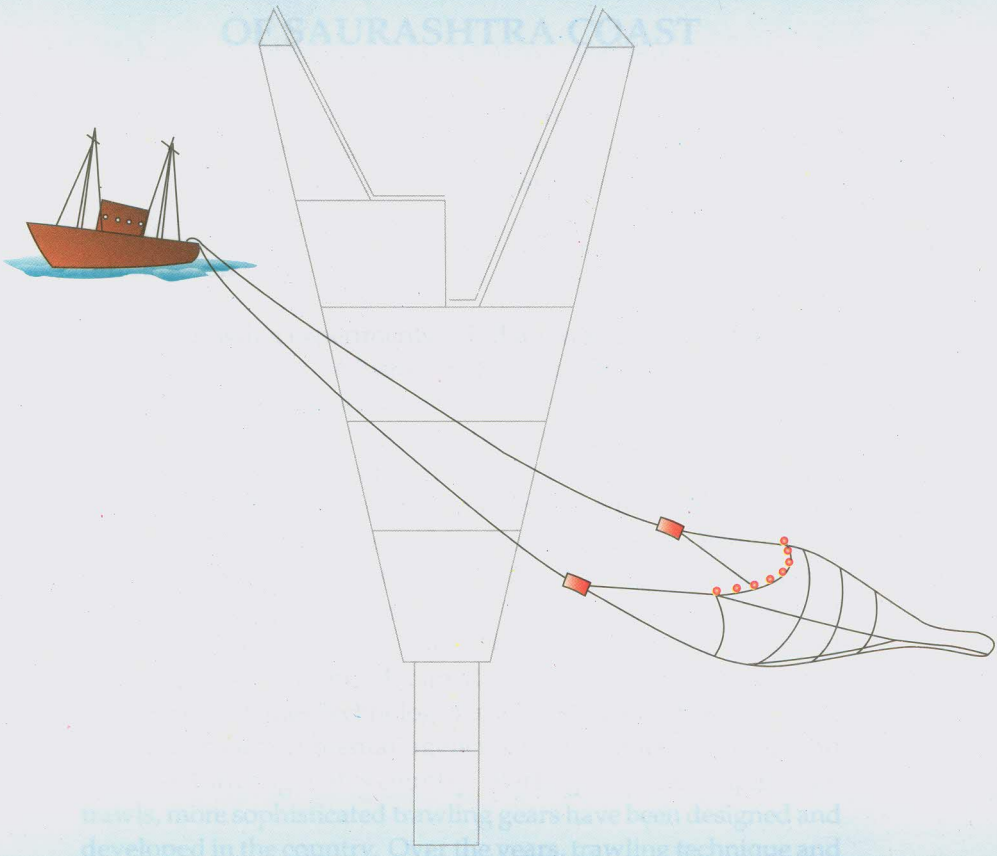
P. Pravin & V. Vijayan



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TRAWLING METHODS AND DESIGNS OF SAURASHTRA COAST

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Introduction

Trawling experiments in Indian waters can be traced back to the pre -war days. A historical account of trawling experiments in Indian waters before the IInd world war is given by Chidambaram (1950). The first attempt with a small otter trawl was made at the Malabar coast. (Jayaraman *et al.*, 1959, Nair *et al.*, 1973). Trends in development in the prawn fishing technique in India have been reviewed by Kuriyan (1964). Exploratory fishing in Bombay – Saurashtra waters were carried out in the early 70's (Nair, 1974). A review of Commercial trawl fishery off Veraval has been given by Rao and Kasim, (1985) and history of trawling in Veraval by Mohan Rajan *et al.*, (1988). The Central Institute of Fisheries Technology has played a pioneering role along with other Governmental agencies to introduce, develop and establish trawling in this country. Starting from the simple beam trawls, more sophisticated trawling gears have been designed and developed in the country. Over the years, trawling technique and the trawl net has undergone revolutionary changes in the concept of design, construction and mode of operation, and it still continues to be modified and perfected from time to time according to the type of fish sought, mode of fishing operation, local conditions, size and power of the fishing craft employed and economic conditions of the fishermen.

Trawling practices in Saurashtra coast

Gujarat State has a total of about 26,275 nos of marine fishing crafts, which include 17,456 mechanized and 8,817 non-mechanized crafts (Anon, 2001). Commercial trawling fleet consists of 5,685 small and medium fishing boats of sizes ranging from 9-17m OAL fitted with diesel engines of 88-165 hp. The vessels conduct fishing upto 6 days in various depths upto 200m. The usual fishing trips are at a depth of about 10-15m, whereas long trip boats generally go to deeper waters mainly off Kutch, Dwaraka, Jakhau, Jagadiya and Bombay high.

Trawling contributes about 62 % of the total marine fish landings in Gujarat State. A large range of bottom trawl nets for shrimp and fish in terms of size and designs are being operated along Gujarat coast, suitable for vessels in the range of 12m – 17m OAL. They operate two seam shrimp and fish trawls with head rope length ranging from 20-60m. All the nets are fabricated with polyethylene. Each vessel on an average carries six trawl nets for exploitation of different target species. Recently, incorporation of large meshes in the fore parts of the net has become popular among the fishermen of Gujarat largely as a result of the trainings and demonstrations conducted by CIFT highlighting the benefits (Pravin & Manoharadoss, 1996). Mesh sizes as large as 600 mm stretched length in the fore parts of fish trawls are quite common in Gujarat.

Due to the high value of shrimp in the export market, trawling experiments were mainly confined to increase the shrimp catches. Design emphasis to attain an optimum horizontal opening, use of tickler chain along foot rope, extended wings to obtain more sweep area and improved rigging of the gear to enhance shrimp catching efficiency were some of the areas that received increased attention (Deshpande *et al.*, 1967 & 1968). During the same period, 11.43m two seam shrimp trawl was introduced. Subsequently, rapid strides were also made on improving the structure and design of trawling gear to harvest shrimps as well as fishes. Many designs of two seam trawls, four seam trawls, six seam trawls,

multiseam, bulged belly trawls, high opening trawls and large mesh trawls etc. were designed, experimented and developed by CIFT in the process, to cater to small, medium and large fishing boats. Experiments conducted with these gear also helped in determination of optimum horizontal trawl mouth opening, scope ratio standardization and optimum trawling speed. Mid water trawls were also experimented and introduced to capture the pelagic and semi-pelagic fishery resources. However, mid water trawling did not find favour with the fishermen and they resort to only demersal trawling. CIFT has also played a major role in the development and designing of deck equipment's like winches and gallows which are pre-requisites for trawling.

A study was conducted under the project 'Development of resource specific trawl gear system and assessment of commercial trawling practices' at Saurashtra coast in Gujarat State during the period 1995 to 1998 to broadly categorize the different trawl nets in vogue, its distribution in Saurashtra region and the impact of trawl designs developed by CIFT on them. The deck lay out and the different designs of deck equipments and accessories used for trawling are presented, along with commonly used trawl designs of Saurashtra coast.

Several important fishing gear designs developed and introduced in this area by the Institute were readily accepted by the fishermen. The real impetus for trawling in Saurashtra coast was received with the commissioning of a 36' stern trawler (FT – IV) by CIFT at Veraval during 1964. Trawling in Saurashtra coast was first attempted by the fishermen in 1966-67, when an old gill-netter 'Sagar Kunj' was converted and rigged for trawling under the guidance and supervision of CIFT. Simultaneously, three departmental fishing vessels of the Gujarat State Fisheries also started trawling operations for the first time. By 1967, the technology of trawling picked up very fast and many fishermen were aware of the benefits reaped by trawling. Over the years, the size of the trawl nets increased and four seam nets were introduced. By the year 1968, studies on the effectiveness of tickler chains were successfully

completed and fishermen readily started attaching tickler chains to their trawl nets for enhancing the shrimp catches. During this period, polyethylene filaments (P.E.) popularly known as *Garfil* was introduced in the fishing industry and this material was used for fabricating trawl nets at Veraval. The Gujarat Fishermen Cooperative Association (GFCCA), an apex cooperative society, took up the leading role to supply boat and gear as a package of assistance to the fishermen on a subsidy cum loan basis. CIFT also developed a new 15.8 m 6 seam trawl for harvesting the inshore demersal resources from small class of vessels. By the year 1970, cotton was completely replaced and only synthetic materials were used for fabrication of fishing gears. As a technological innovation in the design and fabrication of trawl gear, fly meshes were introduced on the wing portion of the net to facilitate easy mounting. Use of large meshes (10 cm) in the trawls were tried by CIFT. New designs of trawls like the 32 m long wing trawl and 17m bulged belly trawls were introduced. High opening trawls was experimented and introduced in Veraval waters. The concept of large meshes in the fore parts were experimented and with the many advantages of large meshes over the conventional small meshes, newer designs of large mesh trawls like the 32 m large mesh trawl, 25m large mesh high opening trawl and the 'Sputnik' trawl with large meshes were successfully experimented and introduced.

The introduction of high opening trawls (25.6m) by Bay of Bengal Programme (BOBP) during the year 1982 caught the imagination of the fishermen and it soon became highly popular in Saurashtra coast and is still the most prevailing gear design in the region. The net had large meshes (20cm mesh size) in the fore parts and was nicknamed as 'Disco'. The BOBP introduced both the shrimp and the fish versions of the trawl gear. A survey conducted during 1988 showed that most of the fish trawls in Veraval used 200 mm stretched mesh but on a subsequent survey conducted in 1994 most of these trawl nets were using 400-600 mm mesh sizes in the fore parts of the trawl net. However it was observed that though there was an increase in the mesh sizes in the fore parts of the trawl net, the mesh sizes used in the cod ends

were very small (10mm). Fig. 1-12 depict some of the popular designs of trawl in the Saurashtra region which are close variants of CIFT developed designs.

Otter boards

The conventional flat rectangular wooden otter boards are generally used in Saurashtra coast due to its simplicity in construction and operation. Trawling experiments carried out by CIFT, with 'V' form steel otter boards showed many advantages over the flat rectangular otter boards. The 'V" form steel otter boards were introduced in Saurashtra coast successfully and most of the fishermen from Veraval, Mangrol and Porbunder use CIFT designed 'V' form steel otter boards at present.

Deck equipments

Decks equipments are a pre-requisite for successful trawling operations. Presently, all trawlers are fully mechanized. Many innovations have come through in the design of gallows. Single gallows, double gallows, gantry etc. are now quite popular among the fishermen. These equipments and accessories have paved way for smoother and safer fishing operations out at sea. The details of the deck lay out and the deck equipments used on board trawlers in Saurashtra coast (Porbunder, Mangrol and Veraval) are shown in Fig. 13-16. One recent introduction is the use of split winch which is placed on starboard and port side of the vessel for easy manoeuverability of the towing warps. It is said that the life of the towing warps increases due to less wear and tear and therefore frequent replacement is not necessary.

The fishermen have brought in their own innovations and modifications to the standard trawl net designs of CIFT to suit their operational requirements. A survey conducted in the year 1988 to discern the trend in the change in trawling gear design over the years and also to know the extent of adoption of the CIFT technology showed that all the trawl net designs studied were

within the basic designs of CIFT trawls, implying that designs developed by CIFT were accepted by the fishermen. The study also revealed that, of the total trawl nets operated in Gujarat, about 40 % of them were shrimp trawls and the rest, fish trawls. The average life of each trawl net is about four years. Every year, large number of new trawl nets with modifications in size and design are fabricated to cater to the needs of the trawlers. Traditional methods of fabricating the trawl gear by hand braiding is fading away mainly due to easy access to machine made netting of required mesh and twine size for trawl nets. It was observed that in spite of considerable development in trawl designs, the conventional two seam bottom trawls with overhang were mostly used in commercial fishing in Gujarat. Most of the fishermen/net makers do not have a standard design for fabrication of a trawl net. However, the rule of the thumb is being followed by most of the fishermen to fabricate it. Most often it was observed that a well constructed trawl net does not perform quite well due to faulty rigging and unskillful operation. There is always a tendency for the fishermen to increase the size of the gear irrespective of the size of the vessel and hp of the engine and therefore, mismatching of the gear with the power of the engine is encountered more often in Gujarat (Pravin, 1977). However it can be seen that the general basic pattern of the trawl nets operated in the region are similar to designs of that developed and designed by CIFT. The fishermen are always willing to adopt new designs provided they are convinced that it is easy to fabricate, repair and the gear is likely to benefit them economically.

Over the years, the Central Institute of Fisheries Technology has designed and developed various trawl nets. Trawl gears experimented, developed and introduced at the Veraval Research Centre is given in Table. 1. These trawl gears were designed for harvesting bottom and midwater resources from boats of varying sizes. Most of these trawl designs have been adopted by the fishermen as such or by making few modifications in certain design parameters to suit their specific needs for exploitation.

Table. 1 : Trawl gears experimented and operated by the Veraval Research Centre of CIFT

1. 12.95m 2 seam net (Satyanarayana & Nair , 1965)
2. 11.43m 2 seam net (Satyanarayana & Nair , 1965)
3. 13.7m 4 seam net (Deshpande *et al.*, 1968)
4. 20.6m midwater trawl net (Kuriyan *et al.*, 1964)
5. 15.8m 6 seam net (Deshpande, *et al.*, 1970)
6. 29.26m 4 seam long wing net (Satyanarayana *et al.*, 1976)
7. 18.3m 4 seam net (Deshpande & Kartha, 1964)
8. 22.6m 2 seam net (Kuriyan *et al.*, 1964)
9. 10.5m 4 seam equal panel midwater trawl net (Mhalathkar *et al.*, 1975)
10. 10.5m 4 seam unequal panel midwater trawl net (Sivan *et al.*, 1970)
11. 6.8m 4 seam double rig trawl (Panicker *et al.*, 1977)
12. 17m 4 seam bulged belly net (Panicker *et al.*, 1978)
13. 32m 4 seam long wing net (Kartha , 1976)
14. 25m 4 seam bulged belly net (Deshpande *et al* 1970)
15. 25m 6 seam net (Kunjipalu, *et al.*, 1979)
16. 32m 2 seam large mesh net (Kunjipalu, *et al.*, 1979)
17. 25m 8 seam high opening net (Kunjipalu *et al.*, 1984)
18. 25m 2 seam large mesh net (Kunjipalu *et al.*, 1989)
19. 25m 6 seam high opening trawl net (Kunjipalu *et al.*, 1990)
20. 38m 2 seam Hybrid trawl net (Panicker, 1990)
21. 20m 2 seam large mesh Sputnik trawl net (Manoharadoss & Pravin, 1998)
22. 20m 2 seam small mesh Sputnik trawl net (Manoharadoss & Pravin, 1998)
23. 30m 2 seam trawl net (Manoharadoss & Pravin *)

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Fig. 1. 23.0m SHRIMP TRAWL
(Local variant - *Veraval)*

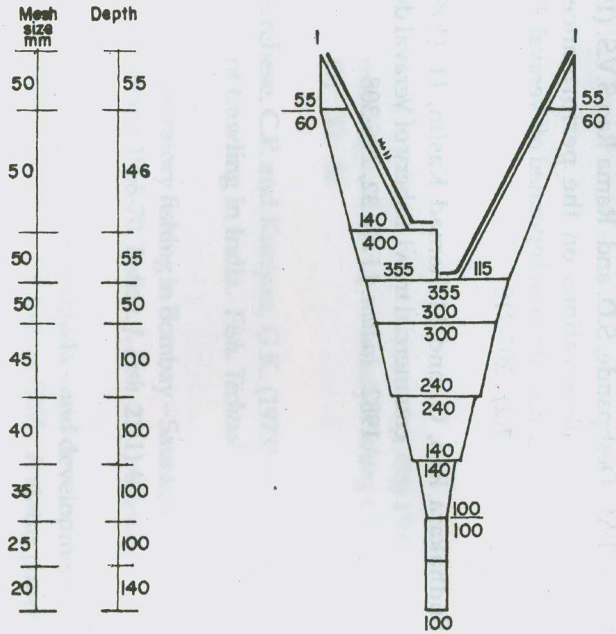


Fig. 2. 54m. 2 SEAM FISH TRAL (*Veraval)*

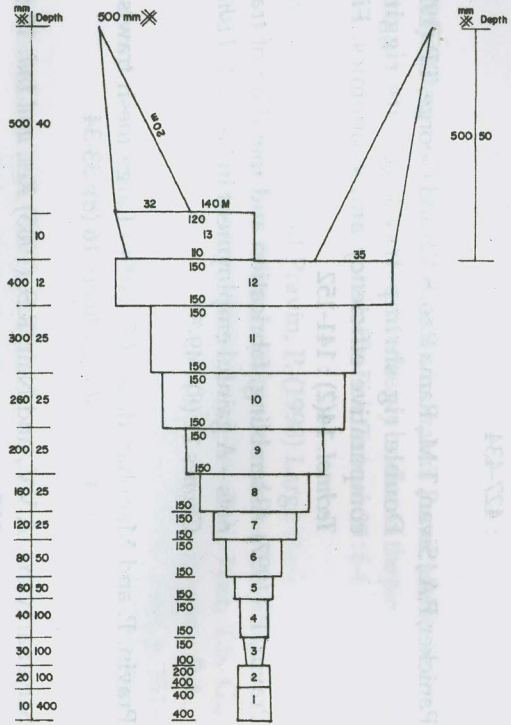


Fig. 3. 71m. FISH TRAWL (*Veraval*)

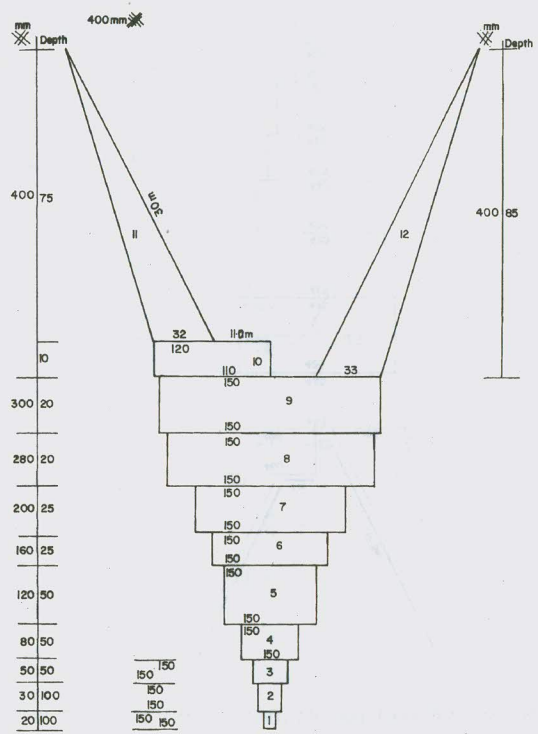


Fig. 4. 50m FISH TRAWL (*Veraval*)

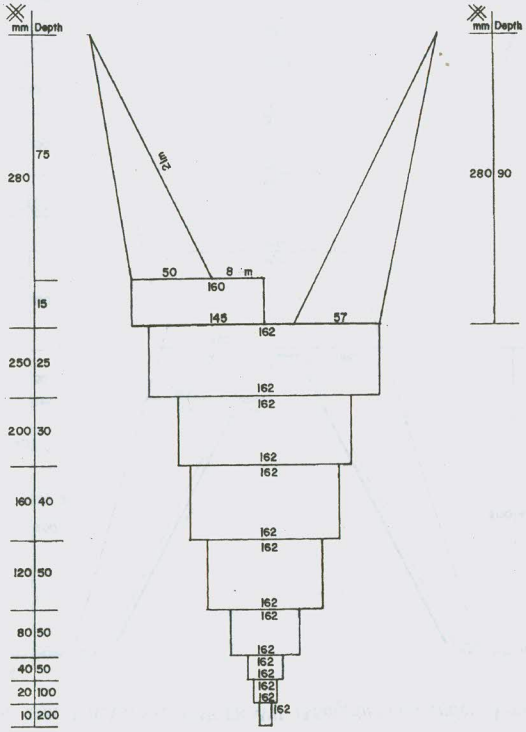


Fig. 5. 24m. 2 SEAM SHRIMP TRAWL (*Mangrol/Veraval*)

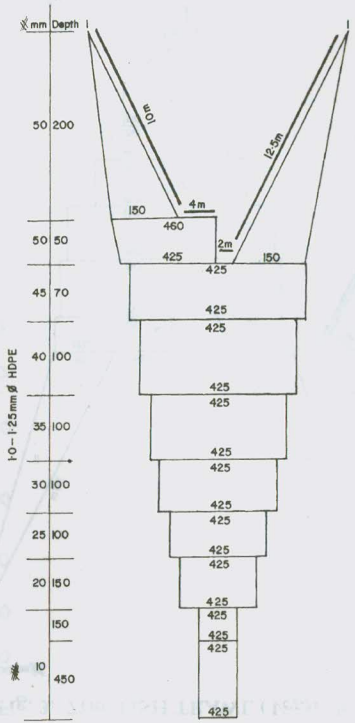


Fig. 6. 24m. 2 SEAM SHRIMP TRAWL (*Mangrol / Porbunder / Veraval*)

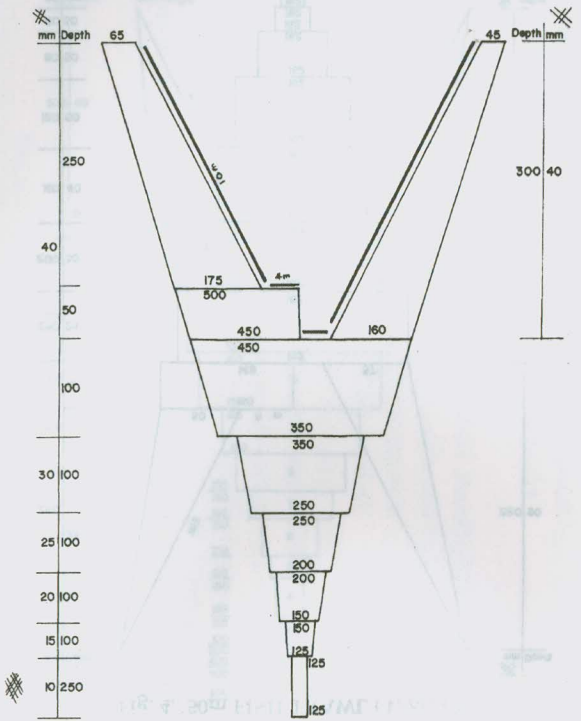


Fig. 7. 30m. SHRIMP TRAWL (*Veraval*)

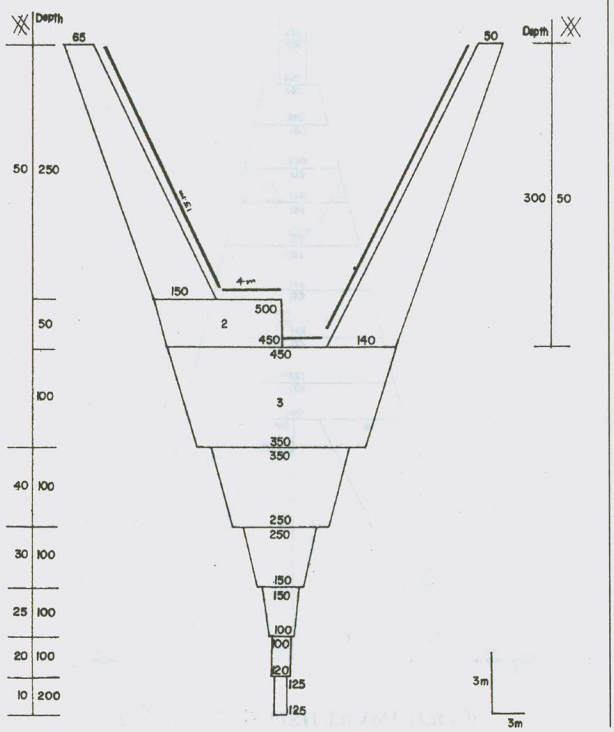


Fig. 8. 55m. FISH TRAWL (*Porbunder / Okha*)

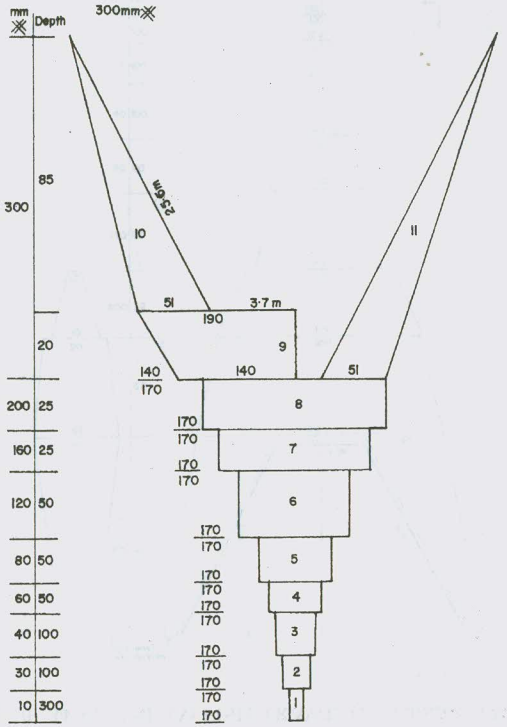


Fig. 9. 42m. 2S FISH TRAWL (*Okha*)

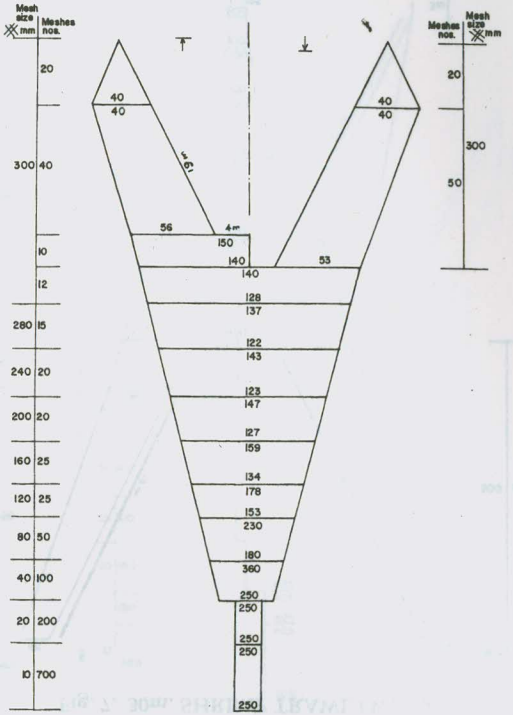


Fig. 10. 34.5m. 4 SEAM FISH TRAWL (*Porbander / Okha*)

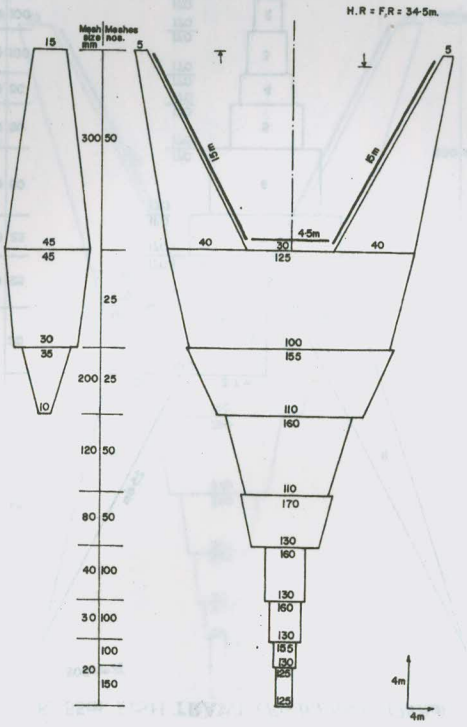


Fig. 11. 17m. 2 SEAM SHRIMP TRAWL (*Okha / Porbunder*)

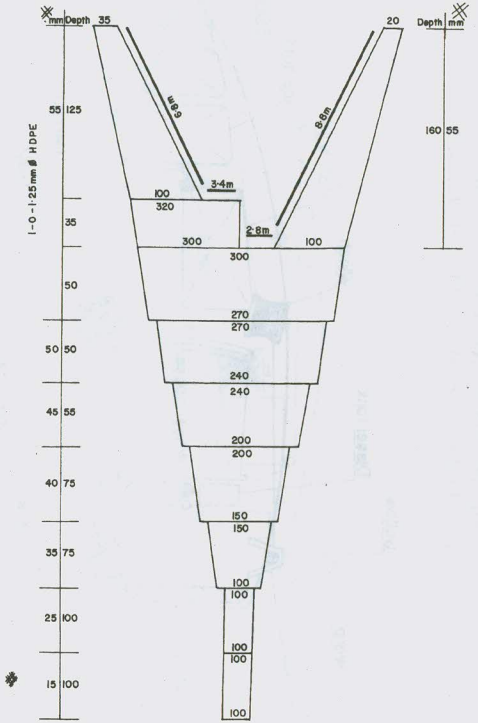


Fig. 12. 21m. 2 SEAM SHRIMP TRAWL (*Okha / Porbunder*)

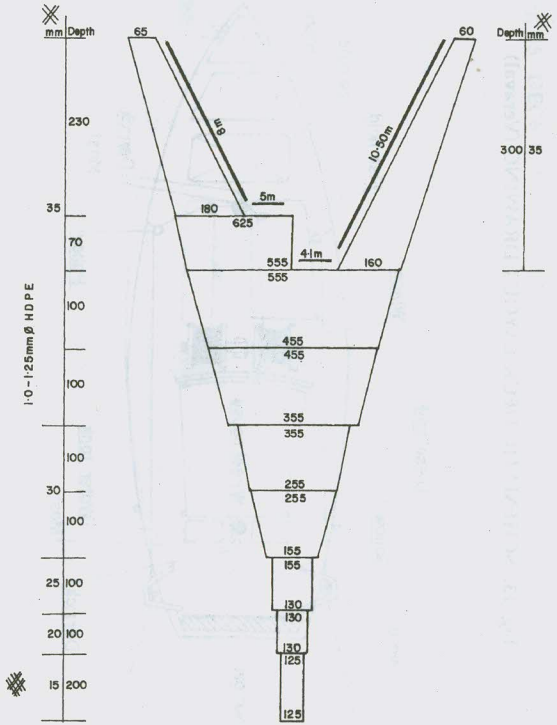


Fig. 13. SCHEMATIC DECK LAYOUT DRAWING (Veraval)

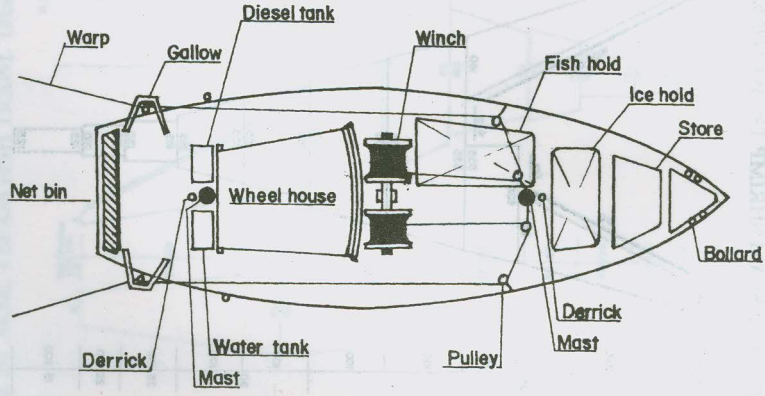


Fig. 14. DECK LAYOUT OF (12-17m)
TRAWLERS WITH SPLIT WINCH (*Veraval*)

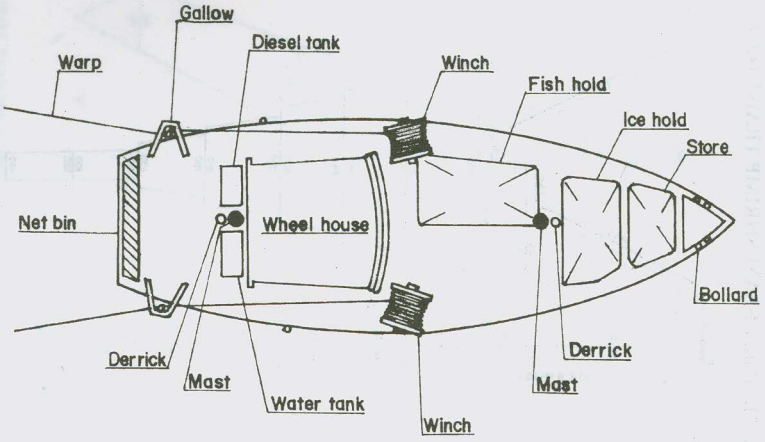


Fig. 15. DECK LAYOUT FOR (9-12m) TRAWLERS (*Mangrol / Porbunder*)

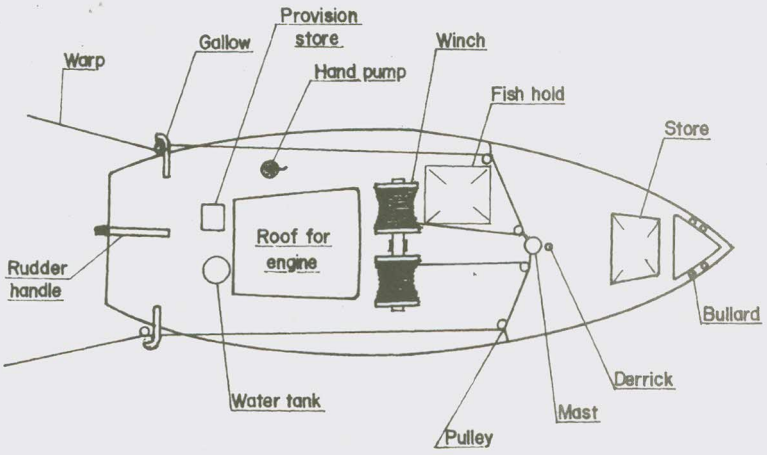
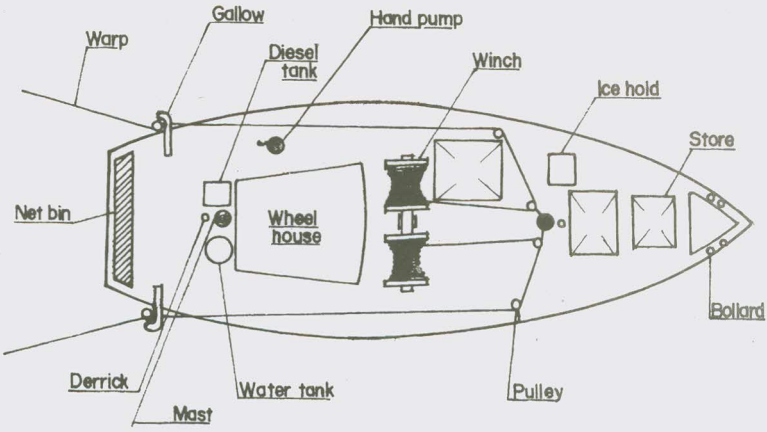


Fig. 16. DECK LAYOUT FOR (12-17m) TRAWLER (*Mangrol / Porbunder*)



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