PRESENT STATUS OF TRAWL DESIGNS IN COCHIN AREA*

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Abstract

Trawling is one of the efficient techniques employed for the exploitation of prawns in the shallow waters of Cochin area. During the initial stages trawls mainly of four seam type was operated by small trawlers.

To meet the ever increasing demand of shrimps in foreign countries the fleet size and total effort have increased. As a result of intensive fishing, since 1977 a downward trend in the CPUE was observed. In order to increase the catches and shift the emphasis from prawns, attempts were made to develop new trawls to catch off-bottom quality fishes along with prawns. Experiments were also carried out on fish trawls for exploiting the shallow water resources. This paper traces the various efforts made in this direction and gives the designs and construction details of the gear operated in Cochin.

Introduction

Advent of independence marked the beginning of development process organised through the successive five year plans which stimulated and strengthened the industrial, economic, scientific, educational, training and social advances. The objectives of fisheries developmental programmes are to augment fish production for raising nutritional standards of population, economic uplift of fishermen and subsidiary industries and export of selected varieties of sea foods on an increasing level to earn the much needed foreign exchange. Recognising the R & D needs, the fisheries research and education organisations were established. Collaboration with developed countries and international institutions for appropriate technologies and assistance were sought. The mandate of Central Institute of Fisheries Technology (CIFT) is to cater to the harvest and post-harvest technologies of the fishing industry and its craft and gear wing is to look into the needs of harvest facet. Since its inception, constant efforts were made to increase the efficiency of fishing boats and nets needed for the exploitation of the resources by both artisanal and mechanised sectors of both inland and marine waters. In this paper an attempt is made to trace the work carried out in the direction of introduction, subsequent improvement of the otter trawling gear, its present status and to identify the thrust areas for further development.

PRESENT STATUS

The first attempt for introduction of modern fishing technique like trawling in Indian waters was by the mechanised vessel 'Premier', in the year 1900 off Bombay Coast and the succeeding efforts made were briefly documented by many authors, but did not give the details of the design of the gear used. The details of the beam trawl used for the survey of the bottom fauna off the Travancore Coast in the fifties and trawl used for the survey of the east and west coasts in the sixties are available. Based on the experiments with beam trawls, it was suggested that beam trawls could be used from powered boats. Kuriyan (1965) describes briefly the early works on beam and otter trawls conducted primarily for the introduction of these active fishing methods. With the debut of the organised trawling, Cochin as base, for prawns from mechanised vessels of 7.6 to 10.9 m length, designs of 11 four seam and 7 two seam trawls were recommended (Satyanarayana *et al.*, 1962). It became imperative to determine the relation between power of the engine and size of the gear for effective utilisation of installed power of these trawlers and an empirical relation was drawn between the size of the trawl and the dimension of its different parts, in order to design prototype trawls.

In the 7.6 to 10.9 m class trawlers, during the initial studies it was found that only 12% of the power was used while trawling. Another attempt was to calculate the thrust developed from propeller dimensions and its revolutions during trawling to assess the power available and used. It was observed that the difference between available and used horse power were small in the case of 9.1 m vessels, but comparatively large with 10.9 m vessels indicating the possibility of increasing the size of the gear. The attempt made by the authors to calculate the resistance of the gear and match it to the pull did not succeed.

For increasing catching efficiency of shrimp trawls, experiments were conducted with tickler chains and electric shrimp trawls and found that these accessories enhanced the landing of shrimps than the control gear. A chain is tied at present, in between otter boards which is said to have a tickling effect.

Earlier cotton, manila and sisal were used for the fabrication of trawls and its ropes. Properties of these materials were studied in detail and efforts were also made to reduce abrasion and rotting. With the introduction of large number of synthetic materials and fibre types, the material can be selected to suit to the specific requirements of the gear. In India initial experiments were mainly to study the properties of these materials followed by investigations on standardisation and to improve the service life. Nylon twine made in the country was meant for gill nets and when used for trawls was found unsuccessful. Hence attempts were made to develop nylon trawl twines, though this type of twine became commercially available the industry did not take it for fabrication of trawls because of prohibitive costs and chances of loosing the gear. Further studies were with polyethylene twines and trawls made with this material proved it efficiency over cotton nets and was easily accepted by the industry. Earlier hand braided netting was used for trawl construction especially for small mechanised boats. With this type of netting, the knots were not tight and while tailoring, the edge meshes opened up. Now machine made netting is preferred to over come the difficulties. This has created a problem to the fishermen who were hand braiding the netting as they are not getting orders for braiding of nettings.

Polyprophylene, especially the split fibre type has excellent knot strength and stability and is comparable to polyethylene, but it is not available in the country. If studies were conducted and such twines are made available

to the fishermen, the above problem can be solved.

The horizontal opening between the wing tips of the trawl is one of the important operating parameters and it depends on the size of the gear, its characteristics and behaviour, towing power, speed, depth of operation and the warp released. The relation between the warp released to the trawling depth was studied by many workers and found that the common ratio of 3 : 1 used is inadequate for shallow water trawling and there is need for progressive increase of the ratio as depth increases. It was observed that the spread of the trawl increased with speed and reaches the maximum and then decreases. It was also observed that for trawling in shallow water there is an optimum size of gear.

Flat rectangular otter boards are commonly used for shrimp trawling in the country. Initial experiments were for improving its efficiency by understanding the design, construction and operation. Though this door is cheap and easy to construct, its efficiency as a spreading device is poor. Hence investigations were carried out with other forms like Curved rectangular, Vertical curved, V-form, Russian oval and Mexican type otter boards. The experiments indicated that the vertical curved and horizontal curved boards were better than other types regarding its spreading power. Compared with other boards, the horizontal curved boards landed more catch. The V-shaped and oval board, though its spreading capacity is less, was found efficient for trawling over uneven grounds. The Mexican type board did not show any specific advantage. In spite of the above information, rectangular boards are still used. The weight of board has a profound influence on the ground reaction forces which could be used to spread the gear. Experiments were also conducted to determine the optimum weight for a board.

To increase the horizontal distance between wing tips of a trawl, studies were conducted by attaching additional wings to trawl with which the catch of prawns and fishes could be enhanced by increasing the swept area without much increase in resistance of the gear. New trawl design like long wing trawl was tried and found to increase the shrimp catches.

The boards can be attached to the trawl directly or indirectly through sweep lines either single, double or even triple with or without danleno. The sweep lines enable the doors to be away from the trawl and move much wide apart thereby increasing the swept area without increase in towing resistance. The herding effects of the sweep line is well known. Experiments conducted proved the capacity to increase the catch. Length between 20-25 m was found optimum for trawls in the experiments. In addition, these lines dampen the disturbances caused by the boards thereby enabling the net to move steadily. The trawls operated in the area invariably use a single sweep line more or less of the same length mentioned above.

The vertical opening of the trawls operated in the country has not yet received much attention. The opening is not measured mainly because of the absence of sophisticated underwater equipment. It was measured in the model and field testing of a 31 m trawl (Perumal et al., 1973) operated from a 28.2 m vessel. Inspite of the impediments to measure the vertical gape of trawls, attempts were made to improve it as assessed by the increase in catch of off-bottom fishes landed by the gear. Comparative fishing with control gear and the nets fitted with gussets, false headline, kite, sail kite indicated the increase in landings of off-bottom fishes. These viable, cheap trawl accessories are yet to be used by the industry. In another series of studies, the buoyancy/weight ratio to be used for trawls were determined and found that 0.75 was better than 0.5 and 1.0 ratios.

To increase vertical opening, new designs of trawls like bulged belly, six seam, large mesh four panel, large mesh two panel, etc. were tested. The large mesh two panel, net (Kunjipalu et al., 1979) was found to catch better and it is similar to the BOBP high opening trawl. BOBP fish and fish cum shrimp trawls as in other regions (Antony Raja, 1987), have replaced other designs of trawls in Cochin area because it is cheaper, lighter, easy to construct and repair and capable of catching off-bottom varieties. Variants of BOBP trawls (Figs. 1 and 2) are reported to catch better.

Recommendations

1. Power utilisation of trawlers may be studied in detail to suggest measures to reduce fuel consumption.

2. Behaviour of fishes in the vicinity of the mouth of the trawl is not known. To improve the efficacy of the trawl, behaviour studies may be given importance.
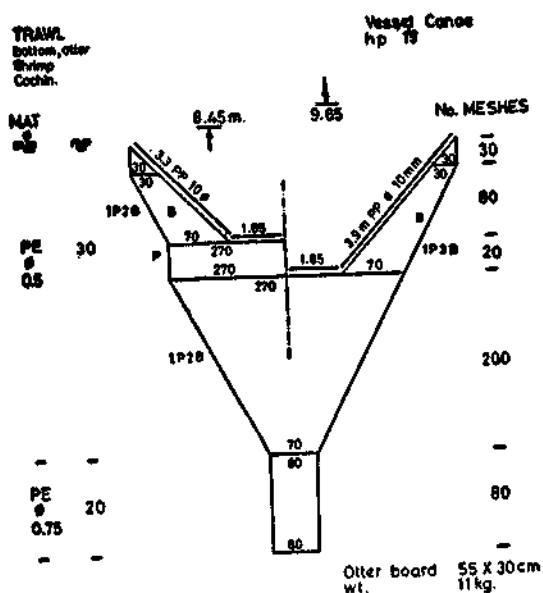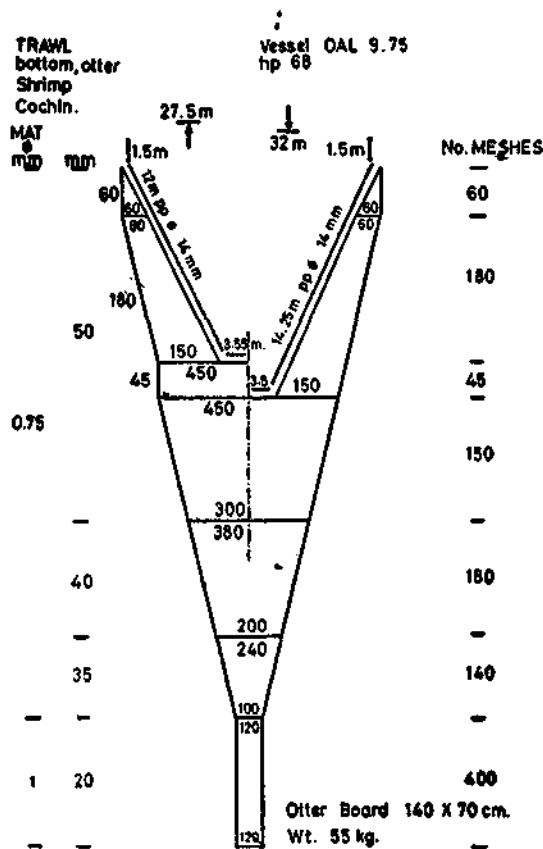

Fig. 1.

Fig. 2.

In spite of reduction in CPUE, the cod end mesh size used ranges from 20-28 mm. Based on the work of Panikkar and Sivan (1965), Kalawar et al. (1985) recommended 35 mm for cod end mesh and its legal imposition for management of the resources of prawns and fishes.

3. Fishing gear model studies have not received much attention in India. Ship model tank facilities available cannot provide the information sought in the gear experiments. Testing in flume tanks is essential to study the gear parameters. For accelerating the gear development, this neglected aspect may be given top priority.

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