Nevertheless the results of the trawling presented in this paper further indicate the good catch of large sized prawns of commercial importance that could be exploited from this area. It would be of interest to watch the results of regular trawl fishing at various depths in this region, both night and day to study the depthwise distributions of the main categories of fishes especially prawns in various months.

During the period of experimental fishing conducted between 8–15 fathoms it was noticed that the bulk of the catches was made only if low price fetching fishes such as Silver bellies, small sciaenids and thread fins. The occurrence of large sized fishes was rather erratic. While the observations made were mostly during day time, on a few days in August and September, 1957 when night trawling was resorted to with Wing Trawl it was rather interesting to find large sized Pristis sp. and considerable numbers of Muraenesox sp. among the catch. On no other occasion were noticed. It would be worthwhile to see whether such differences in the composition of the catch is on account of trawling after dusk in this area. The comparative poverty of flat fishes in catches may indicate that they are not present in good number in this area but this requires further substantiation.

Another interesting observation recorded was the catch of shoals of Arius sp. and Plotosus sp. in the months of October and November, 1959 when a branch of the same was intercepted in this area. From subsequent reports it was brought to the notice that shoals of these fishes appear in and around Punnaikayal during September–December. It is desirable to investigate into this and undertake intensive trawling in these months.

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CERTAIN ASPECTS ABOUT IMPROVED GEAR IN PRAWN FISHING

By

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Prawns contribute to a fishery of economic importance particularly on the West coast of India. Being a chief foreign exchange earner amongst the marine products, the introduction of improved gear to step up production is an aspect which is receiving considerable attention. Different prawn fishing methods form important items of investigations of the Gear Research Institute at Cochin and the present communication is a review of the work so far done with improved prawn fishing gear.

BEAM TRAWL

Experiment I : Beam Trawls, although simple in construction and operation, are considered effective for the capture of prawns. Being suitable for operation from both sailing and powered crafts, these nets are obviously the "connecting link" between the mechanised modern trawls on the one hand and similar towed gear from sailing vessels on the other. As a result of the above qualities, the beam trawls are still in use in countries like England, Japan, Philippines, Thailand etc.

In order to assess the catching capacity of this gear for prawns in our waters, preliminary fishing tests were conducted in the fishing season of 1959 with a 10 ft. beam trawl. The net used was a 19 ft. four seaming, overhang trawl of cotton. The head and foot rope bridles of either side of this net were attached to the spliced ends of short bridles passing through upper and lower ends of wooden trawl heads. The trawl heads were held in position with the help of the wooden beam at the top. To the lower short bridle of each side lead weight (16.5 lbs.) was secured to compensate for the loss of weight caused by the absence of metallic trawl heads or shoes. To the short bridles of each side the free end of the main bridle was attached and the main bridle in turn was secured to the towing warp. At the union where the main bridle is tied to the tow line a cement weight of 67 lbs. was shackled to keep the gear along the sea bed during the course of its operation.

The above net was operated from 30' motorized fishing vessel having 30 BHP semi-diesel engine. For a relative assessment of efficiency, the fishing operations with the beam trawl were conducted in close association with a mechanised craft operating an otter trawl and a country canoe operating an indigenous one boat seine. During the period of investigations 39 hauls of about 31 hrs. total duration were made. The depth of water at the fishing ground was between 4½ to 13 fathoms and the bottom was mostly of soft mud.

The results of fishing operation with beam trawl analysed together with the catch data of mechanised and indigenous vessels have led to the following conclusions :

(1) The catch per hour of beam trawl and the indigenous gear although more or less equal, the catch per head per day is more in case of beam trawl net—39 lbs. in case of beam trawl and 12 lbs. in case of the local gear.

(2) The comparison of catches of beam and otter trawls on the basis of the unit volume of water filtered showed that the difference in the two was not much.

Experiment II : Comparative fishing tests with a 45 ft. nylon, four seaming overhang otter trawl and a 15 ft. wooden beam trawl were again conducted during the monsoon of 1959 in Cochin backwaters. The nets were operated in succession in the same area and direction. On a day 3 to 5 hauls of 20 to 30 minutes duration each were made with each of these nets and 100 total hauls were made during 12 fishing trips. The fishes gathered during the period of these comparative trials were analysed species-wise. The length and weight of each individual fish were also recorded. The qualitative as well as quantitative analysis of the catch was made bearing in mind the horizontal opening of each net while in action and the towing speed. The conclusions drawn from the analysis are as follows :

(1) Prawns, Soles, Eels, Platycephalus and Gobius were relatively more in the beam trawl catches.

(2) Rays, Sillago and Lutjanus were caught equally in both these nets.

(3) Fishes like Ambassis, White baits, Mullet and Chanos were caught in the otter trawl and were conspicuous by their absence in the beam trawl net which indicates probably that these fishes swim 2 ft. above the water bed.

Experiment III : The earlier experiments proved the utility of the beam trawl for the capture of bottom forms. Further work was therefore initiated to study the effectiveness of this gear in capturing different varieties of fishes that dwell at the sea floor particularly prawns. The investigations were conducted by using simultaneously two beam trawls to suit 10 ft. and 5 ft. wooden beam.

The nets were towed by a motorized vessel using a single warp. The 5 ft. net was secured immediately behind the 10 ft. one. The attachment of the 5 ft. beam trawl was with bridles which were secured to the spliced ends of the short bridles, of the first net. Iron chain weights were attached to the lower short bridles of each net. 37 hauls of 45 hours total duration covering 11 fishing trips were made. The trawling speed ranged between 1:5 to 2 knots per hour and each haul was of 60 to 90 minutes duration. Details of catch landed in each net and during each haul were gathered and analysed. The 5' beam trawl being attached immediately behind the 10' net, it can reasonably be assumed that a portion of the catch which escaped the first net was being picked up by the second. Since, however, the second net was only just half the size of the first net, the quantity of fishes escaped from the first net was calculated by doubling the total catch of the second net. On an average about 21% of prawns and 11% of fishes escaped a beam trawl net during the course of its operation.

Experiment IV : The experiments conducted earlier is suggestive of the fact that the prawns probably burrow deep into the mud and the bed is not fished completely by an ordinary beam trawl. In order to stir up the prawns for their capture, a thin galvanised iron chain of 5 mm. diameter was tied one foot ahead of the foot rope (at the bosom) of the 10 ft. beam trawl. Drags with and without such a chain were made to study the effect on the landings of the net.

The operations were carried out during the season in 1961 using a motorized vessel. 132 total hauls were taken. The hauls were made in the same area and direction. The data gathered regarding the catch of prawns and fishes in the fishing tests (with and without chain) have revealed that :

(1) the catch per hour of prawns and fishes landed by attaching and detaching the chain to the beam trawl works out to 51 lbs.; 39 lbs. and 34 lbs.; 38 lbs. respectively.

(2) the attachment of a thin "tickler chain" ahead of the ground rope of this beam trawl net increased the shrimp catch by 47%.

(3) such a thin chain had no apparent effect on the fish landings.

Otter Trawls.

Experiment I : Otter trawls are gaining popularity at all centres for the capture of prawns and fishes. These nets are at present operated from motorized and mechanised crafts. To compare the landings of the gear when

operated from partly and fully mechanised crafts, an investigation was conducted by using two identical boats having same H.P. engine and both using similar designs of net. The fishing vessels "Tarpon" and "Sagarkumari" were the ones used for the study. The vessel "Tarpon" is equipped with a mechanically operated winch whereas "Sagarkumari" was devoid of any such equipment for hauling the gear. Particulars of each vessel along with the details of gear are summarised below :

Specification	*Tarpon*	*Sagarkumari*
Design	Medium sized stern trawler	Medium sized stern trawler
O. L.	34′—4″	34′—4″
Tonnage	8.45	8.45
Engine	42 H.P. Yanmar	42 H.P. Yanmar
Warp used	9 mm. diameter flexible galvanised steel wire	19.05 mm. diameter manila rope
Total crew on board	5	6
Type of net	Four-seaming, non overhang, otter trawl.	Four-seaming, non-overhang, otter trawl.
Size of net	51′	40′
Mesh Size	Cod end 1″	Cod end 1″
	Rest 2″	Rest 2″

The fishing particulars such as the depth of water, length of warp used, duration of drag, trawling speed, horizontal opening of the net in action, shooting as well as hauling time along with the catch of prawns and fishes landed during each haul were recorded.

The vessel "Tarpon" made 71 voyages taking 335 hauls of 330½ hours total duration and the vessel "Sagarkumari" made same number of voyages and took 347 hauls of 370 hours duration.

The information gathered during the course of these studies was analysed and particulars such as catch per hour of prawns and fishes, catch per unit volume of water filtered, catch per unit area covered along the sea bed and relation between shooting as well as hauling time of the net and catch landed by each net were worked out and the following are the general conclusions :

(1) More members of crew is necessary for operating the gear by hand.

(2) The fully mechanised boat can operate a bigger net.

(3) In hand operation more time is required for hauling in the net.

(4) The opening of the net mouth is less in the case of a hand operated net.

(5) The catch per hour of trawling is more in case of mechanically operated trawl net. The catch of prawns and fishes landed by mechanically operated gear is more by 43% and 145% respectively.

Experiment II : Comparison of catches of otter and beam trawls is already indicated in experiment No. 2 under Beam Trawl. The deductions drawn about the otter trawl can be summarised thus :

(1) Otter trawl net mainly catches fishes swimming above the water bed.

(2) The vertical fishing height of the 45 ft. shrimp, nylon otter trawl while in operation was observed to be 5'.

(3) The quantity of small prawns and soles which shelter in the soft mud ooze are less in this gear.

Experiment III : To increase the catch of prawns and relatively reduce the landings of fish swimming above the sea bed, experiments with an otter trawl were conducted reducing the vertical fishing height of the net. The net used is a 55' nylon, four-seaming, overhang, shrimp otter trawl net. Since extra buoyancy of floats attached to the head rope of the net control the vertical fishing height, a series of comparative hauls were made with the net by attaching different numbers of floats. The floats used were Indian made aluminium alloy floats having 12·5 cm. diameter and 1·75 lbs. extra buoyancy each.

For convenience of experimentation, the floats attached to the above net were grouped in four different series which were :

Series No.	*No. of floats attached*
1	0 and 16
2	1 and 12
3	2 and 8
4	4 and 12

Comparative hauls were made by attaching the number of floats specified in each series, and a minimum of 9–9 hauls were made with the floats mentioned in each series.

Particulars such as the duration of the drag, towing speed, horizontal opening of the net in action and catch of prawns and fishes landed during each haul were collected during the course of fishing operations. In each series, the length of warp, depth of water and the trawling speed were maintained as same. The data on analysis indicated that in each series the catch of shrimp was more when the number of floats attached to the net was less. This would be suggestive of the fact that for effectiveness of shrimp otter trawling heavy ground rope and less extra buoyancy of floats on the head rope are necessary.

Experiment IV : In this experiment series, to increase the catch of prawns landed by a 55' net, a thin "tickler chain" of 5 mm. diameter was attached one foot ahead of the ground rope of the net at the bosom part. Attachment of such a chain, it was expected, would disturb the sea bottom, stir up the prawns sheltering in the soft mud and will drive them into the following net. The tickler chain (27 ft. in length and 7.5 lbs. in weight) ends were secured to the foot rope 8 ft. away from the wing tip of either side. Comparative hauls with and without chain were made in the same area and using same length of warp and trawling speed. Based on the analysis of the data gathered during 41 paired drags of 32 hours duration the following deductions were made:

(1) The catch per hour of prawns landed during the attachment and non-attachment of the tickler chain works out to 86 lbs. and 51 lbs. respectively. The catch of prawns landed by the net is increased by about 71% due to the attachment of the chain.

(2) The observation on the landing of fish with and without chain indicated that the catch per hour of fish of this net can be increased by 25% by attaching the chain.

(3) Information regarding the actual spread of the net in action during test fishing revealed that attachment of a thin tickler chain had no adverse effect on the horizontal opening of this gear.

Experiment V: Comparative studies on the beam and otter trawls have provided evidence that prawns in most seasons remain at the sea bottom and that for an increase in the landings otter trawl should necessarily cover more area on the sea floor. Investigations were therefore initiated to assess the effect of long wings on the catches of a trawl net.

A 45 ft. nylon, four seaming shrimp overhang otter trawl with detachable wings of 20 ft. (each) was operated from the mechanised fishing vessel. Comparative hauls with and without wings were made on each day of operation. A total of 104 hauls covering 18 voyages and 67.5 hours total duration were made. The hauls were made in the same area, using same length of warp. The particulars relating to the duration of each drag, trawling speed, opening of the net in action along with the catch of prawns and fishes landed during each haul were recorded.

The analysis of the data gathered during the comparative tests revealed the following:

(1) The catch per hour of shrimps caught with and without attachment of wings to this net works out to 119 lbs. and 58 lbs. respectively.

(2) The catch per hour of fishes landed by this net with and without wings comes to 254 lbs. and 180 lbs. respectively.

(3) Observations on the horizontal spread of the net in action during attachment and non-attachment of wings shows that there is increase in the opening of this net due to attachment of additional wings by about 7.4′ which appears to be the probable reason for the increased landings.

From the results of the experiments conducted during the years from 1958 to 1961, it can be concluded that adoption of otter trawl net designs with less floats along the head rope, heavier foot rope, comparatively long wings and attachment of a thin tickler chain ahead of the foot rope will result in a substantial increase in the prawn landings.

A NOTE ON A RECORD CATCH IN A 40′ TRAWL NET AT MANGALORE

BY

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On 15th March, 1960, the Training Boat of the Fisheries Training Institute, Mangalore operating a 40′ Otter Trawl Net (Type A) for an hour