ON THE DESIGN, OPERATION AND EFFICIENCY OF 11 M DUAL PURPOSE TRAWL FOR SMALL MACHANISED BOATS

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Preliminary midwater fishing trials were conducted off Cochin with a 11 m. dual purpose trawl during the monsoon months when the prawns were available in the column layers. Further, with a view to assess its suitability as bottom trawl, the gear with suitable modifications in thc rigging was towed in comparison with a 15 m. bottom trawl along the depth ranges of 5-10 m. and 10-20 m. and the fishing operations were found satisfactory.

INTRODUCTION

Margetts (1964) traces two broad groups in the approaches for the development of trawling gear. In the first category, the process of development started with ground trawls, which were subsequently modified for off bottom fish, by increasing the head line heights with suitable ancillary devices. In the second, the development commenced with truly midwater trawls, which were later adopted for bottom and off bottom operations. Although many attempts were made in this country, as well as elsewhere to develop bottom and midwater trawls separately, Parrish (1959) categorically states that a dual purpose trawl suitable for operation in the bottom and midwater would prove to be more economical. His views are supported by the works of Barraclough and Needler (1959), Okonski (1964) and Scharfe (1968).

Prawns, although a bottom dwelling form, are known to migrate to the surface in the shallow fishing grounds particularly during the South west monsoon months (George, 1961). During this period the trawling at the bottom is ineffective. Hence, the need for a dual purpose shrimp gear that can be operated both at the bottom as well as the surface and subsurface layers require no over emphasis. The present authors, therefore, conducted a series of experiments to evolve the design of a dual purpose trawl for operation from small mechanised boats and the results of these studies are commmnicated in this paper.

DESIGN OF GEAR: The design and constructional details of the trawl with detachable wings are pressnted in Text Figs I & II.

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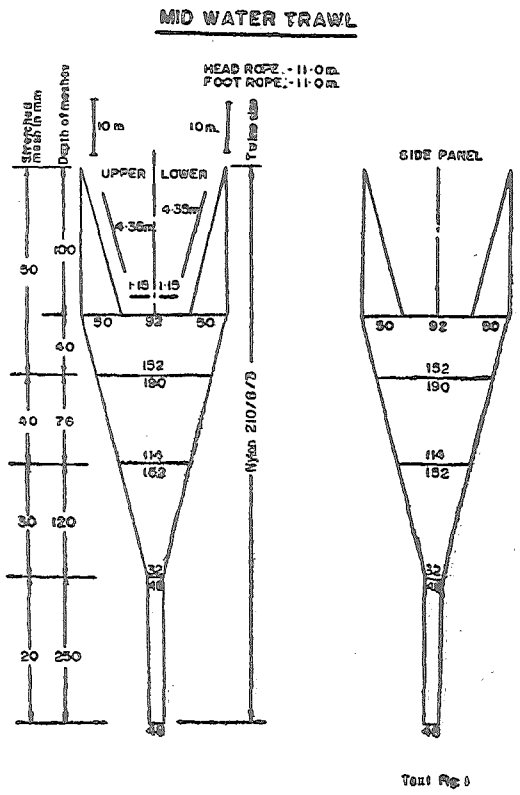


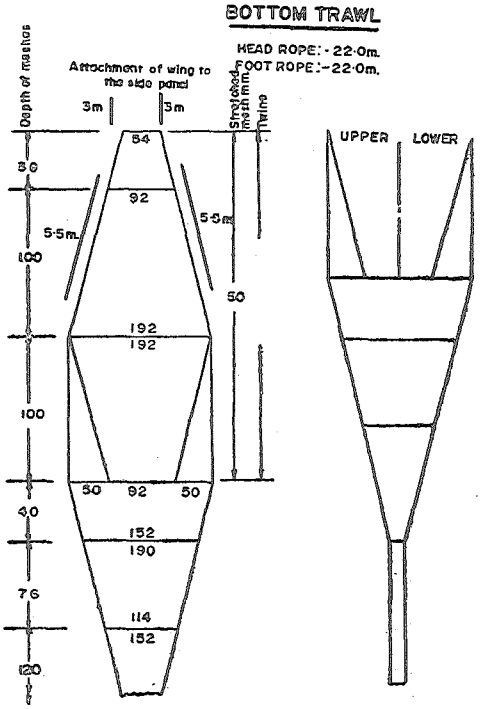
For mid-water operation, the net was provided with 11 number of 12.7 cm. dia aluminium floats and lead sinkers having a total weigtht of 12-14 Kgs. Suberkrub otterboards similar to the types described by Perumal (1966) and Sivan *et. al.* (1970) and of size 120 cms X 60 cms. weighing 50 Kgs. each were used as accessory.

For bottom operation, additional wings of 5.5 m. in length each were provided to the net. The number of floats and lead weights were correspondingly increased upto 15 Nos. and 22-24 Kgs. respectively. The otter boards were of h ri-zontaly curved type (Mukundan *et. al* 1967) and of size 120 × 60 cms. weighing 50 Kgs each.

Experimental fishing operations were conducted off Cochin with a 9.75m. (32'-0) mechanised boat powered with a 63 BHP engine.

Experimental Procedure

The mid-water fishing operations were carried out during the months of July-September 1969 in the inshore region of 5-10 m. depth The net was towed at an average trawling speed ranging between 2.0 and 2.5 knots The fishing depth of the net in operation was adjusted either by increasing the length of the towing warp or speed of trawling.



In order to ascertain the suitability and the relative efficiency of the design for bottom operations, the gear was towed in comparison with a 15m. bottom trawl at fishing depths ranging from 5-10m. and 10-20 m. The design specifications and rigging of the 15 m. bottom trawl are similar to the one reported by Nair *et. al.* (1971). Alternate hauls were taken with these two nets from the same vessel.

Results And Discussion

Table-I presents the results of the operation of the dual purpose trawl in the mid-water and the bottom.

From the table it can be seen that there are significant variations in towing tension and horizontal opening when the gear was tried in mid-water and bottom. The resi-

Table I

Results of operations of 11 m. dual purpose trawl in the mid-water and the bottom.

Type of gear		11 m. dual purpose trawl operated as mid-water	11 m. dual purpose trawl operated as bottom trawl
Depth of fishing ground		below 10 meters	below 10 meters
Depth-warp ratio average		1:3.3	1:5.5
Towing tension (kgs.) average		286.36	346.6
Distance between otter board (m) average		5.33	10.65
No. of hauls		11	6
Total trawling time (Hrs.)		4.00	3.75
Total catch in kgs.	Prawn	148	162
	Fish	240	82
	Total	388	244
Catch/Hr. in kgs.	Prawn	39.25	43.20
	Fish	60.00	21.86
	Total	99.25	65.06

stance offered during operation of the gear as bottom trawl was 1.21 times more than that for the mid-water operation, which might be attributed to the combination of factors like change in the ottor boards and provision of factors like change in the otter boards and provision of addition of wings. During midwater operation the net has developed more vertical spread as evidenced by the readings of the distance between otter boards, which was on an average 5.33 m. (40%). In bottom operation, the distance between otter boards was 10.65 m (60%) affording convincing proof that the net had more horizontal spread than vertical spread. The average catch per hour of prawns in both the types of operation was more or less equal and at the same time the quantity of fish landed in mid-water operation was 2.72 times more than that of the bottom operations.

Table II shows the results of operations of the two nets in 5-10m. depth and TableIII that of 10-20m. depth

The increase in towing resistance due to the change in fishing depth was 1.22 times more for the dual purpose trawl while it was 1.08 times for the bottom trawl. The dual purpose trawl net has given 1.48 times more horizontal spread than the bottom trawl and this can be attributed to the possible difference in the profile of the design. Taking the rate of landings into consideration the dual purpose trawl landed 2.10 and 1.30 times more of prawns from the respective fishing depths than that by the other net.

The results obtained from the comparative operations with the dual purpose trawl and the bottom trawl were analysed statistically. The catch per hours figures were converted into their corresponding logarithmic values and compared using the analysis of variance technique for prawn, fish and total catch vide Table No. IV.

From the Table it could be seen that, between trawls the variations in the catches of prawns are signifieant ($P \leq .01$). But

Table II

Results of comparative operation of 11 m. dual purpose trawl and 15 m. bottom trawl below 10 m. of fishing depth.

Type of gear		11 m. dual purpose trawl	15 m. Bottom trawl
Depth of fishing groud		Below 10 m,	Below10 m.
Depth-warp ratio average		1:5.5	1:6
Towing tension in kgs. average		346.6	410.6
Distance between doors (M) average		10.65	7.38
Number of hauls		6	16
Total trawling time (Hrs.)		3.75	13.00
Total catch in kgs.	Prawn	162.00	265.00
	Fish	82.00	167.00
	Total	244.00	432.00
Catch/Hr.	Prawn	43.20	20.38
	Fish	21.86	12.84
	Total	65.06	33.22

Table III

Results of comparative operations of 11 m. dual purpose trawl and 15 m. bottom trawl in between 10 and 20 m. of fishing depth.

Type of gear		11 m. dual purpose taawl	15 m. bottor traw
Depth of fishing ground		10 to 20 m.	10 to 20 m.
Depth of warp ratio average		1:5.4	1:5.2
Towing tension average (kg.)		423.52	443.75
Distance between doors (M) average		11.49	7.53
No. of hauls		34	24
Total trawling time (Hrs.)		21.25	21
Total catch in kgs.	Prawn	983-00	715.00
	Fish	232.00	255.00
	Total	1215.00	970.00
Catch/Hr. Kgs.	Prawn	45.16	34.04
	Fish	10.91	12.14
	Total	56.06	46.18

Table IV

Analysis of variance

Prawn catch	*Source*	*SS*	*DF*	*MS*	*F*
	Total	4.6299	79		
	Between trawls	0.6810	1	0.6810	12.87 †
	Between hauls	1.8844	39	0.0483	0.91
	Error	2.0645	39	0.0529	
Fish catch	*Source*	*SS*	*& DF*	*MS*	*F*
	Total	26.5595	79		
	Between trawls	0.1403	1	0.1403	0.63
	Between hauls	17.7785	39	0.4559	2 05 *
	Error	8.6407	39	0.2216	
Total catch	*Source*	*SS*	*DF*	*MS*	*F*
	Total	4.4739	79		
	Between trawls	0.4134	1	0.4134	7.27 *
	Between hauls	1.8405	39	0.0472	0.83
	Error	2.2290	39	0.0569	

* Indicates significance at 5% level
† Indicates significance at 1% level

for the capture of fish, both the nets were found more or less equally effective and no significant variations were observed. In the total catches of the two nets significant differences were also found ($P. \leq .05$) The 11 m. trawl caught on an average 9% more per hour per hauls than that of the 15 m. trawl net. The variations between the hauls in the catches of prawns and in the total catch were not significant as evident from the analysis of the variance table.

From the results as discussed in earlier paragraphs, it is apparent that the 11 m. trawl can be successfully operated in mid-water and bottom layers of the sea by effecting slight modifications in the rigging.

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