BELLY DEPTH STUDIES FOR SHRIMP TRAWLS - PART III

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Earlier investigations with 13.69 m (45') four seam shrimp trawl indicated the optimum depth of belly to be 70 meshes. Present communication details further experiments on similar lines with a bigger shrimp trawl of size 17.07 m (56') without over-hang. The results obtained have not only given corroborating evidence in support of the earlier findings but also helped in arriving at a relationship that for a given stretched width of belly 'L' the stretched depth of belly could be either 2L/5 or 40% of 'L' with an allowance of ± 2 meshes.

INTRODUCTION

In the two earlier papers Mhalathkar and Iyer (1966) and Mhalathkar and Jegadeesan (1970) have shown that the depth of belly in a 13.69 m (45') shrimp trawl could be reduced. As the next step, experiments were conducted with a 17.07 m (56') four seam trawl, not only to determine the possibility of reducing the depth of belly when fishing for shrimps but also to evolve a possible mathematical equation to determine the maximum depth of belly in shrimp trawls. The investigations were carried out at Cochin during the fishing season in the year 1967–68.

MATERIALS AND METHODS

A 17.07 m (56') four seam cotton trawl of non-over-hang type, (Fig 1) with 140 meshes in its belly depth was chosen as the control net 'A', to suit the capacity of the trawler, Fishtech II. Two other experimental nets 'B' and 'C' were also simultaneously fabricated, which were identical to net 'A' except for the number of meshes in the belly depth. Following similar pattern as in the earlier experiments (Mhalathkar and Jegadeesan, *loc cit*) the depth of belly in net 'B' was 102 meshes while that of net 'C' was 80 meshes. In the net 'B' the number of meshes reduced in the depth of the belly was proportional to the number of meshes reduced in the net 'E' (13.69 m four seam trawl) mentioned by Mhalathkar and Jegadeesan *loc cit*), which is almost 2/5 or 40% of the stretched width of the belly along the bosum. The dimensions of the bellies

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the bosum. The dimensions of the bellies in nets 'B' and 'C' are shown in dotted lines in Fig 1.

All the three nets, 'A', 'B', and 'C' were operated in rotation during each day of operation. To the best possible extent, all the fishing conditions namely, fishing ground, fishing depth, length of warp released, towing direction, towing duration, towing speed, buoyancy on head rope, weight of sinkers on foot rope and the size of otter boards were kept constant.

Results and discussion

In all 27 fishing trips were made and 27 hauls per net were taken on a comparative basis. Data regarding towing duration, percentage horizontal opening, tension on warps (resistance) and catches collectively and individually were gathered and are tabulated in Table I.

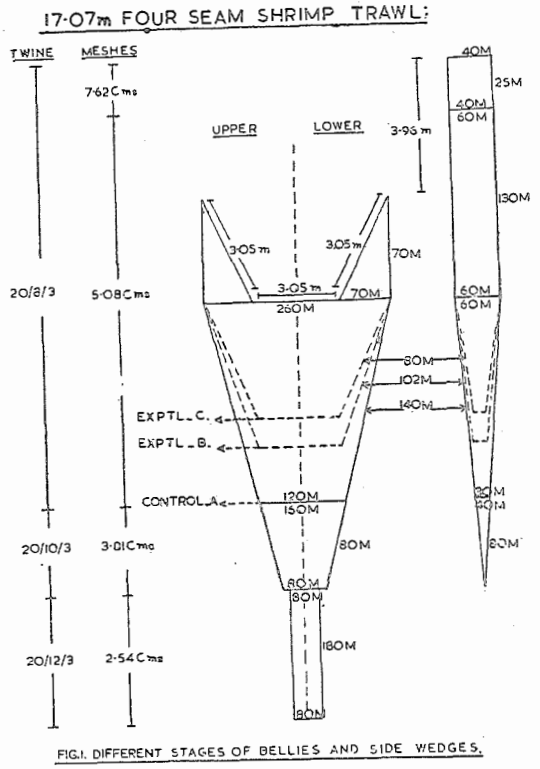

FIG.I. DIFFERENT STAGES OF BELLIES AND SIDE WEDGES.

Table I Details of operation:

Nets	No. of hauls	Towing duration in mins.*	% Horizontal opening*	Tension on warps kg *	Catch in kg.*		
					Prawn	Fish	Total
'A' (140 meshes in depth)	27	44	58.30	389.00	10.63	14.00	24.63
'B' (102 meshes in depth)	,,	,,	58.85	379.66	13.55	19.00	32.55
'C' (80 meshes in depth)	,,	,,	58.04	384.14	8.48	13.96	22.44

* Average of 27 operations for each net.

Table II Analysis of variance:

Source of variation	Horizontal opening:				Tension in warps:			
	S. S.	D. F.	M. S.	F.	S. S.	D. F.	M. S.	F.
Total	8855.73	80			170100.00	80		
Between nets	9.23	2	4.615	1.56	1476.22	2	738.11	2.53
Between days	8691.83	26	334.30	112.56**	153456.00	26	5902.15	20.23**
Error	154.67	52	2.97		1567.68	52	291.69	

** — Indicates significance at 1% level.
SS — Sum of Squares. DF — Degree of Freedom
MS — Mean Square. F — Variance Ratio.

The nets were randomised over the fishing days throughout the experiment. Data collected for horizontal opening, tension on warps, prawn catch, fish catch and total catch were analysed using analysis of variance technique. For tension and horizontal opening the data were used as such but for prawns, fish and total catch the figures were converted into their corresponding log values. The analysis of variance tables prepared are shown in Tables II and III.

In the horizontal opening and the tension on warps, there was no significant difference among the nets 'A', 'B' and 'C', at 5% level (Table II). But the difference was significant ($P<.01$) in the catching rate of the three nets with regard to prawn and total landings (Table III). The logarithmatic figures of the prawn landings of the three nets 'A', 'B' and 'C' were respectively 21.2827, 24.1254 and 20.1071. This clearly indicates that the net 'B' was catching significantly more of prawns when compared to the other two nets. The catch of prawns of net 'C' was relatively less amongst the three nets. Likewise the logarithmatic values for the total landings, namely 34.7295 for net 'A', 38.0682 for net 'B' and 33.9046 for net 'C', also showed superiority in the catching rate of the net 'B'. The difference in the rate of fish catch was significant at 5% level as shown in Table III and here also the catching rate of the net 'B' was superior to those of nets 'A' and 'C'. In all the above cases, the between day variations were significant ($P<.01$), which could be due to the highly fluctuating conditions of the sea during the investigation.

Earlier investigations of Mhalathkar and Iyer (*loc cit*) and Mhalathkar and Jagadeeshan (*loc cit*), had proved the possibilities of reducing the depth of the belly for a 13.69 m (45') four seam

Table III Analysis of Variace:

Source of variation	Prawn catch S. S.	D. F.	M. S.	F.	Fish catch S. S.	D. F.	M. S.	F.	Total catch S. S.	D. F.	M. S.	F.
Total	20.0855	80			12.9353	80			11.2719	80		
Between nets	0.3162	2	0.1581	7.60**	0.3394	2	0.1697	5.81*	0.3601	2	0.1801	9.73**
Between days	18.6850	26	0.7186	34.54**	11.0795	26	0.4261	14.59**	9.9487	26	0.3826	20.68**
Error	1.0843	52	0.0208		1.5164	52	0.0292		0.9631	52	0.0185	

* — Indicates significance at 5% level
SS — Sum of Squares.
MS — Mean Square.
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DF — Degree of Freedom.
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shrimp trawl. Based on the earlier findings and from the present studies, it has been quite possible to arrive at a mathematical equation viz; $D = 2L/5$, where 'L' denotes the stretched width of the belly either in inches or cm and 'D' denotes stretched depth of belly with 12 meshes for any marginal adjustments while either hand-braiding or tailoring the webbing.

Further, reduction of the belly depth resulted finally in the economy of the twine utilized, with least effect on the catching efficiency as well as the mechanical characteristics of the net. The reduction in the twine utilized was as significant as 47.9% and 27.1% in the case of 13.69 m (Mhalathkar, *et al, loc cit*) and 17.07 m four seam cotton trawls respectively. This reduction also resulted in considerable reduction of the number of meshes in the belly region particularly and this accounted to about 46.16% and 27.76% respectively in the case of the above referred 13.69 m and 17.07 m trawls. This adds to the saving of fabrication charges, as trawl nets are mostly hand-braided in India till the present day. Thus there is bound to be a definite reduction in the initial cost of fabrication of the gear on the whole.

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