Advantages of Large Meshes in Midwater Trawl

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Results of investigations on the effect of incorporating larger meshes in a 10.3 m rectangular midwater trawl are presented in this paper. The midwater trawl with large meshes proved to be comparatively more efficient for the capature of *Lactarius* sp., *Trichiurus* sp. and *Arius* sp. An increase in the catch of quality fish by 29.6% was also observed.

Midwater trawling as an effective fishing gear system, made steady progress since 1963 and successful midwater trawling is now an accepted practice (Dickson, 1971). Perumal (1966), Sivan *et al.* (1970), Mhalathkar *et al.* (1975, 1982 and 1983), Verghese (1975) and Vijayan *et al.* (1985) have made experimental attempts to formulate and improve midwater trawling in Indian waters. Dickson (1971) has discussed the advantages of using larger mesh size in the fore parts of the trawl in terms of its effect on net drag and catch of schooling fishes. This communication deals with the study on the effect of incorporating large meshes in the front trawl sections of a tested design of 10.3 m rectangular midwater trawl.

Materials and Methods

A 10.9 OAL wooden trawler, Fishtech No. IV was utilised for these investigations undertaken during January 1981 to May 1982 off Goa. The vessel fitted with Ashok Leyland engine of 65-85 hp, could develop a trawling speed of 3.0 to 3.5 kn at 1100 to 1300 rpm.

10.3 m rectangular midwater trawl (Mhalathkar *et al.*, 1983) was fabricated incorporating meshes of 14.0 cm around mouth area and with corresponding increase in mesh size in the next two panels of the belly and side panels. The efficiency of the gear was tested with the control net having a mesh size of 9.50 cm around the mouth area. The design details of 10.3 m large mesh net are given in Fig. 1. Both the gears were rigged with 120 x 60 cm vertically curved otter boards weighing 50 kg each (Sivan *et al.*, 1970). Rigging of the gear, otter boards and bridles were similar to that described by Mhalathkar *et al.* (1975 & 1970). Apart from the sinkers attached to the foot rope, front weights made of bunched chains weighing 15 kg each were provided at the junction of the bridle to the foot rope legs, to facilitiate vertical trawl opening.

During the course of the investigations the two experimental gears were operated in rotation giving equal chances, keeping the various parameters such as fishing

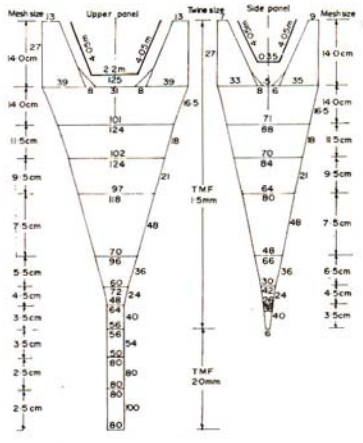

Fig. 1. Design of 10.3m large mesh midwater trawl

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ground, depth of operation, depth to warp ratio, trawling speed and duration of tow, constant. 54 comparative hauls were made with each net during the span of 28 fishing days. Warp tension offered by both nets were recorded following the method described by Satyanarayana & Nair (1965).

Results and Discussion

The results of the fishing operations conducted are presented in Tables 1 and 2. It can be observed that there is a reduction in the average tension offered by the large mesh net indicative of the fact that the mesh size is a decisive factor in the total drag offered by the gear system. Analysis of the data collected indicates superiority of the large mesh net with a percentage increase of 29.6 and 17.6 respectively of quality fish and total catch. Large meshes eventually reduce net drag and this enable trawlers to use larger nets for the same amount of power, thereby increasing their efficiency (Noel, 1975). The increase in percentage of trash fish caught in large mesh net is only2.1 whereas it is 29.6 in the case of quality fish which is also advantageous.

Statistical analysis of the log-transformed data were carried out using analysis of variance technique. The results of the analysis show that there is significant difference between the towing tension of the two nets. Large mesh trawl net offered significantly less tension compared to the control net and the mean tension for the large mesh and control nets were 520 and 535.0 kg respectively.

There is also significant difference between the two nets in the total catch and the quality fish landed. Large mesh trawl landed significantly high proportion of total catch and quality fish compared to the control gear. The mean catch rate of large mesh gear and control gear were respectively 29.97 and 23.13 kg/h for quality fish and

Table 1. *Details of comparative fishing operations*

	10.3 m large mesh gear	10.3 m control gear
Number of fishing trips	28	28
Number of hauls	54	54
Total towing duration	53 h 45 min	53 h 45 min
Depth of operation, m	15-25	15-25
Depth-warp ratio	1:5	1:5
Towing rpm	1100-1300	1100-1300
Average warp tension, kg	520.0	535.0
Total catch, kg	2588.0	2200.0

Table 2. *Particulars of catch*

	10.3 m large mesh gear		10.3 m control gear	
	Catch, kg.	CPUE, kg/h	Catch, kg	CPUE, kg/h
Quality fish including sciaenids	1611.0	29.97	1243.0	23.13
Trash fish	977.0	18.18	957.0	17.81
Total catch	2588.0	48.15	2200.0	40.93
Catch composition:				
Arius sp.	278.0		157.0	
Trichiurus sp.	560.0		435.0	
Sciaenids	550.0		480.0	
Lactarius sp.	139.0		107.0	
Pampus sp.	24.0		15.0	
Scomberomorus sp.	5.0		3.0	
Chirocentrus sp.	1.5		2.5	
Elasmobranchs	23.0		15.0	
Loligo sp.	30.5		28.5	
Trash fish	977.0		957.0	

Table 3. *Analysis of variance of warp tension, total catch and catch components*

	Source	*SS*	*df*	*ms*	*F*
a) Towing tension	Total	0.07466	107	-	-
	Nets	0.00470	1	0.00470	12.37**
	Days	0.04994	53	0.00094	2.47**
	Error	0.02002	53	0.00038	-
b) Trash fish catch	Total	13.38768	107	-	-
	Nets	0.12368	1	0.12368	8.74*
	Days	12.51417	53	0.23612	16.69**
	Error	0.74983	53	0.1415	-
c) Total fish catch	Total	20.86822	107	-	-
	Nets	0.00086	1	0.00086	<1
	Days	19.37660	53	0.36560	13.00**
	Error	1.49076	53	0.02813	-
d) Sciaenids	Total	11.03568	107	-	-
	Nets	0.09379	1	0.09397	3.64
	Days	9.57486	53	0.18066	7.01**
	Error	1.37603	53	0.02579	-
e) Quality fish	Total	18.96376	107	-	-
	Nets	0.54950	1	0.54950	17.39**
	Days	16.73961	53	0.31584	9.99**
	Error	1.67465	53	0.03160	-

*Significant at 5% level ** Significant at 1% level

48.15 and 40.93 kg/h for total catch. There was no significant difference between the two nets in terms of trash fish and sciaenids caught and the between days variations were highly significant in all cases. The catch data were also subjected to Wilcoxon matched pairs signed rank test (Table 4) which confirmed the results obtained by ANOVA and showed the difference in total catch as highly significant.

The results obtained point to a reasonable assumption that the large meshes around the mouth area of midwater trawl gear have a reducing effect on the resistance of gear under water and have a herding effect which will guide fish into the trawl. With the lower resistance, vessels can tow a larger trawl and consequently catch more fish or reduce the amount of fuel consumed.

Table 4. *Results of statistical analysis using wilcoxon matched pairs signed rank test*

Variables	Z value	Remarks
a) Total fish catch	2.63	Significant at 1% level
b) Trash fish	0.8154	Not significant
c) Sciaenids	1.74	Not significant
d) Quality fish	3.51	Significant at 1% level

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