STUDIES ON THE LENGTH OF OVERHANG FOR TRAWLS

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The effect of overhang and its optimum size on a bulged belly type trawl net was studied and the results reported in this paper.

INTRODUCTION

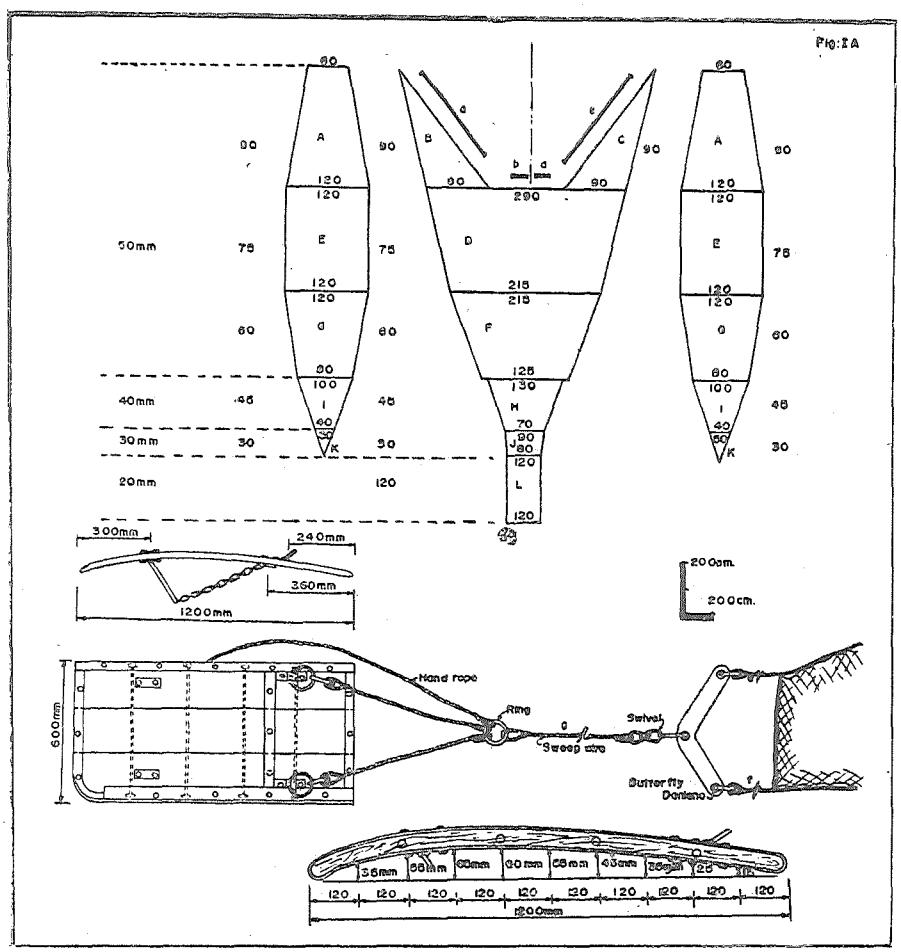
Certain species of fish try to escape from an advancing trawl by swimming upwards and forwards (Anon, 1965). The catches of fish trawls can therefore be significantly enhanced by an increase in the head line height of the net. Many workers (Takayama and Koyama, 1958 & 1959, Phillips, 1959 and Ben Yami, 1959) have adopted different techniques to obtain this increased vertical opening. Verghese *et al* (1968) made a preliminary attempt to increase the fishing height by redesigning the conventional trawl net into a 'bulged belly' type. In view of the probable behaviour pattern of some of the column fishes, it is likely that an improvement in the design of the 'bulged belly' net can be brought about by adding an overhang, thereby minimising the upward escapement of fish.

Nair and George (1964) based on a survey of existing designs, suggested certain relationships between the 'square' (overhang) and the upper belly in shrimp trawls. However, in the case of fish trawls information as to the optimum size of the overhang is lacking. The present study is therefore an attempt to evaluate the effect of the overhang as well as its optimum size to improve the design of the 'bulged belly' type of net.

MATERIALS AND METHODS:

The trawl gear used in the experiment was a modified version of the one described by Verghese *et al (op cit)*. The design details of the nets are given in Figs 1 A, 1 B and 1 C.

Net A without square was the control and nets B and C with squares of length 30 and 60 meshes respectively were the experimental ones. All the nets were rigged with sweep wires of 20 m length and horizontal curved otter boards of size 120 cm x 60 cm (Mukundan, *et al*, 1967). Trawling was conducted from Fishtech No. II, 32′ (9.85m) boat fitted with 40 H.P. engine, in the sea off Cochin, at depths ranging from 15 to 30 m. Fortysix fishing voyages were undertaken from October 1967 to April 1968. The three nets were towed for one hour each per day and changed in regular rotation at successive



hauls, giving all the nets equal chances. Catch data were analysed separately for prawns, fish and total catch.

RESULTS:

Results of the comparative fishing experiments are shown in Fig II.

The analysis of variance of the prawn, fish and total catch are presented in Table I.

DISCUSSION

The analysis of the catch data indicate that the net B with a square of 30 meshes recorded better catches than the other two (Fig 2). Of the total catches landed by the three nets, 41.3% was landed by net B, 36.2% by net A and 22.5% by net C. This is an indication that net B might have engulfed the maximum number of fishes that have tried to escape upwards. The lengthy square C, on the other hand, has recorded the minimum catch probably due to the increase in length of square, which might have caused the headline to sag and consequently decreased the fishing height.

The significance of variation was studied statistically by applying the analysis of variance technique. The catch per unit effort figures were converted into their corresponding logarithmic values for comparing the output of the three nets for prawn, fish and total catch separately. The analysis of variance (Table-I) for prawn catch shows that the between net variation was significant at 5% level indicating that the rate of output of the three nets were not uniform. The mean logarithmic catch of net B is 0.7882, followed by net A, 0.7064 and net C, 0.5955. In the analysis of variance for fish, the between

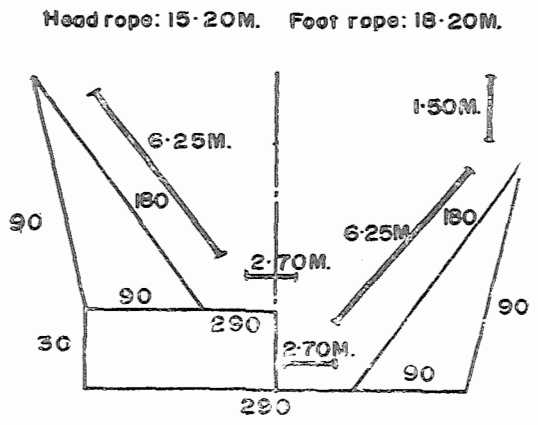
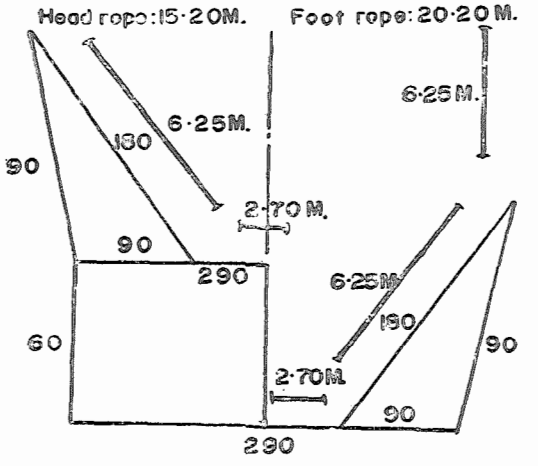


Fig: IB



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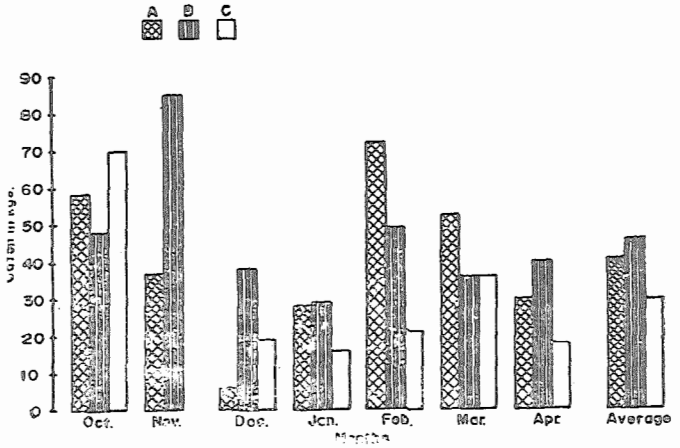

Fig 2. Comparative catch per unit of nets A, B & C

net variation was significant at 1% level. The mean logarithmic catch of net B is 1.4576 followed by 1.3867 of net A and 1.1856 of net C. In the analysis of variance for total catch also the between net variation was significant at 5% level and the trend remains the same, the mean logarithmic catch of net B being 1.5864 followed by net A (1.5075) and net C (1.3022).

TABLE I ANALYSIS OF VARIANCE

Source	SS	DF	MS	F
Prawn catch				
Total	14.9456	59	...	...
Bet. nets	0 3744	2	0.1872	3.97*
Bet. days	12.7782	19	0.6725	14.25**
Error	1.7930	38	0.0472	...
Fish catch				
Total	7.3743	59	...	...
Bet. nets	0.7964	2	0 3982	14.75**
Bet. days	5.5508	19	0.2921	10.82**
Error	1.0271	38	0.0270	...
Total catch				
Total	8.9269	59	...	...
Bet. nets	0.8477	2	0.4239	4.87*
Bet. days	4.7689	19	0.2510	2.88**
Error	3.3103	38	0.0871	...

*Significance at 5% level.
**Significance at 1% level.

Check on square

The square length was checked by the method illustrated by Dickson (1966). The calculation was done from the lead in angle, 18° being typical value, and the proportion of the straight (T) to the semi ground rope length. The μ value is taken as 0.2 in this two wire leg system. Using the Fig III and dip (d) curve of Fig IV, it is possible to check the length of square adequate for overhang (OG).

$$OG = d \text{ at } f_2 \times 2S_2 + T \cos \psi_2 - d \text{ at } f_1 \times 2S_1$$
$$= 0.371 \times 48 + 6 \cos 17.75° - 0.355 \times 50$$

Thus the length of overhang required is 5.5′ (1.8 m). The actual length of square can be derived from the setting angle of the meshes at the bosum (8.25′ – 2.5 m).

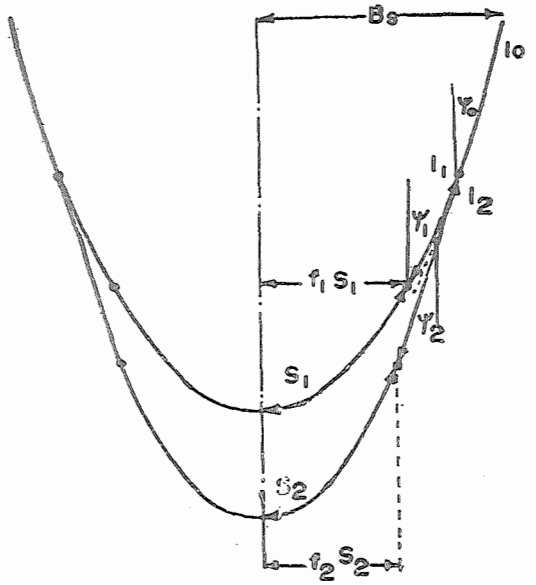

Fig 3. Headline and Ground rope plan form (Dickson, 1966)

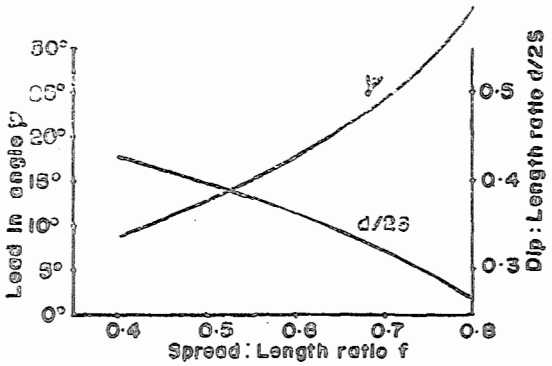

Fig 4. Graph relating spread, Lead in angle and Dip. (Dickson, 1966)

Setting angle Sin $\psi = 0.45$

$\psi = 26° 45'$

$\because$ Cos $\psi = 0.89$

Hence the length of square

$$= \frac{OG}{\text{Cos}\,\psi} = \frac{5.5}{0.89} = 6.19' \text{ (1.9 m)}$$

Thus the limit of the length of square that can be fixed as optimum is 38 meshes.

Summary

Experiments were undertaken with a view to studying the effect of overhang and its optimum size on the bulged belly type of trawl net developed earlier at the Institute. The investigations have indicated that the overhang significantly affects the catch output of the nets and the optimum size of square derived at is 1.9 m. In addition, it is also established that the size of the overhang has a bearing on the yield of the nets.

Acknowledgement

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References

Anon, 1965, *World fishing*, 14 (12); 60–61.

Ben-Yami, M., 1959, *Modern fishing gear of the world, Fishing News (Books) Ltd , London*, 213-227.

Dickson, W., 1966, Lecture on trawl gear geometry and resistance. FR. TIF/66/10. *FAO / USSR Seminar / Study tour (Group fellowship) on instrumentation and methodology in fishing technology, 3-22 October*, 1966: 22 p.

Mukundan, M, Satyanarayana, A. V. V. and Krishna Iyer, H., 1967, *Fish. Technol.*, 4 (2), 53-61.

Nair, R. S. and George, N. A., 1964, *Fish. Technol.*, 1 (1), 95-105.

Phillips, J., 1959, *Modern Fishing gear of the world, Fishing News (Books) Ltd., London:* 200-203.

Takayama, S. and Koyama, T., 1958, *Bull. Tokai Reg. Fish. Lab.*, 21, 25-32.

———, 1959, *Modern fishing gear of the world, Fishing News (Books) Ltd., London:* 185-193.

Verghese, C. P., Vijayan, V. and Kuriyan, G. K., 1968, *Fish. Technol.*, 5 (1), 9-14.