Towards Optimisation of Bridle Lengths in Bottom Trawls

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Apart from increasing the swept area of the trawls, the importance of bridles as a herding device based on fish behaviour is discussed. The results of 10, 20 and 30 m bridles when rigged with a 15 m bulged belly trawl in combination with 114x 57 cm flat rectangular otter boards are presented. The net with 20 m bridle landed better catches.

Bridles increase the swept area of trawls (Scharfe, 1964) and herd the fishes towards the net (Larsson, 1964; Mohr, 1971), herding being governed by the vibrations of the bridles (Crewe, 1964; Kuroki, 1969) and by visual stimuli (Hemmings, 1969). Bridles must also be long (Dickson, 1971) for minimising the scaring effect caused by vessel transmit (Von Brandt, 1971) with an angle of attack of bridles less than 17°for effective shepherding (Bridger, 1969). Narayanappa (1968) and Mhalathkar *et al.* (1982), Vijayan *et al.* (1982) have stressed the importance of the length of the sweep line wire bridles in trawls. Realising the importance of the length of bridles the present experiments were done to standardise the length of bridles for a 15 m bulged belly trawl developed by the Central Institute of Fisheries Technology.

Materials and Methods

A 15 m bulged belly trawl was operated with 114x 57 cm flat rectangular otter boards each weighing 50 kg (Mukundan *et al.*, 1967). The experimental fishing was done during January to May 1980 off Marmagoa, latitude 15° 25′–15° 35′N and longitude 73°45′ to 73°58′E at a depth range of 17-30 m from a boat 11.8 m OAL (Deshpande & Kartha, 1964). 21 hauls of a total duration 20 h 20 min were made with the net for each bridle length. Warp tension was measured as described by Satyanarayana & Nair (1965). Three bridle lengths in doubles of 10, 20 and 30 m using HDPE 14 mm rope were rigged to the net in regular rotation keeping other parameters constant for the fishing operations

Results and Discussion

Data were collected on catch and tension offered by the warps with a view to compare the efficiency of different combinations. The operational details are given in Table 1 and the catch data in Table 2 (with the three lengths of bridles). It is evident from Table 2 that the catch/h of trawling is maximum when the net is rigged with 20 m bridle and it caught 27.4% more than the net rigged with 10 m bridle. The net rigged with 30 m bridle landed only 0.41% more catch than with 10 m bridle. The catch data from all the 21 hauls were analysed by analysis of variance (Table 3). Taking all observations irrespective of directions, the

Table 1. *Operational details*

Length of bridles			
*H.R., m	10	20	30
**F.R., m	10.5	20.5	30.5
Depth range, m	17–30	17–30	17–30
Warp ratio	1:5	1:5	1:5
Towing speed, r.p.m	900–1100	900–1100	900–1100
Towed directions	N,S, NW,SW	N,S, NW,SW	N,S, NW,SW
Average warp tension, (on both warps), kg	232+232	233.2+ 233.2	229.6+ 229.6

*Head rope **Foot rope

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Table 2. *Catch data for 15 m bulged belly trawl with different bridle lengths*

Length of bridles, *H.R.,m	10	20	30
**F.R.,m	10.5	20.5	30.5
Catch of shrimps, kg	16.55	16.65	15.45
Catch/h shrimps, kg	0.81	0.82	0.76
Catch of fishes, kg	577	739	580
Catch/h fishes, kg	28.4	36.4	28.57
Total catch, kg	593.55	755.65	595.45
Total catch/h kg	29.21	37.22	29.33
Percentage increase over 10 m bridle	—	27.4	0.41

*Head rope **Foot rope

Table 3. *Analysis of variance of prawn catch*

Source	*SS*	*DF*	*MS*	*F*
Total	1.7185	62	—	—
Bridles	0.0038	2	0.0019	<1
Days	1.2500	20	0.0625	5.39**
Error	0.4647	40	0.0116	
Analysis of variance of fish catch				
Total	4.7500	62	—	—
Bridles	0.1739	2	0.0870	3.67*
Days	3.6277	20	0.1814	7.65**
Error	0.9484	40	0.0237	—

L.S.D. at 5% level is 0.0950

Average catch in log values

10 m = 1.3707
20 m = 1.4836
30 m = 1.3884

Analysis of variance of total catch

Total	4.6878	62	—	—
Bridles	0.1685	2	0.0843	3.60*
Days	3.5841	20	0.1792	7.66**
Error	0.9352	40	0.0234	—

L.S.D. at 5% level is 0.0944

Average catch in log values

10 m = 1.3937
20 m = 1.4945
30 m = 1.3020

statistical analysis on bridle length fitted with the trawl showed significantly ($p < 0.05$) higher catch in favour of 20 m bridle both for fish and total catch though the prawn catch was almost the same in all the three cases. Since the shrimp catch was sparse during the study only negligible quantities could be taken into the net and therefore no difference could be noticed among the different rigs. Marked difference in the catch of fish in favour of 20 m bridle is a positive indication that 10 m bridle could possibly have less sweep and less of herding effect. 30 m bridle could not herd the fishes effectively inspite of the excessive length. This is an indication that there was enough time and space for the escapement of the fish from the trawl's path. The vibrations in the bridle may not be significant enough to herd the shoals into the net because of the increased length (Crewe, 1964; Kuroki, 1969).

Data on tension could be collected from 13 trips only. No significant difference could be observed in the tension on the warps with different rigs (Table 1). Net fitted with 20 m bridle showed only 0.51% increase over the net with 10 m bridle which is negligible. This corroborates the statements of Scharfe (1959) and Mhalathkar *et al* (1982). But the net fitted with 30 m bridle showed slight decrease in tension (-1.02%). This may be due to the bridle just touching the muddy ground. The results show that 15 m bulged belly trawl rigged with 20 m bridle lands definitely better catches and the landings of the shrimp trawls can be increased by optimising the bridle length.

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References

Bridger, J. P. (1969) *FAO Fisheries Report* 62, 695

Crewe, P. R. (1964) in *Modern Fishing Gear of the World.* 2, p. 165, Fishing News (Books) Ltd., London

Deshpande, S. D. & Kartha, K. N. (1964) *Proc. Indo-Pacif. Fish. Coun.* **11** (2) 184

Dickson, W. (1971) in *Modern Fishing Gear of the World.* **3** (Kristjonsson, H. Ed.) p. 336, Fishing News (Books) Ltd., London

Hemmings, C. C. (1969) *FAO Fisheries Report,* **62,** 645

Kuroki, T. (1969) *FAO Fisheries Report,* **62,** 523

Larsson, K. H. (1964) in *Modern Fishing Gear of the World* **2,** p. 258, Fishing News (Books) Ltd., London

Mhalathkar, H. N., Rama Rao, S.V.S., & George Mathai, P. (1982) *Fish. Technol.* **19,** 79

Mohr, H. (1971) in *Modern Fishing Gear of the World.* **3** (Kristjonsson, H. Ed.) p. 368, Fishing News (Books) Ltd., London

Mukundan, M., Satyanarayana, A.V.V. & Krishna Iyer, H. (1967) *Fish. Technol.* **4,** 53

Narayanappa, G. (1968) *Proc. Indo-Pacif. Fish. Coun.* **13,** (3) 437

Satyanarayana, A.V.V. & Nair, R.S. (1965) *Res. Ind.* **10,** 229

Scharfe, J. (1959) *Stud. Rev. Gen. Fish. Coun. Medit.* **5,** (2 & 3)

Scharfe, J. (1964) in *Modern Fishing Gear of the World.* **2,** p. 221, Fishing News (Books) Ltd., London

Von Brandt, A. (1971) in *Modern Fishing Gear of the World.* **3** (Kristjonsson, H. Ed.) p. 450, Fishing News (Books) Ltd., London

Vijayan, V., Joseph Mathai, T. & Mhalathkar H. N. (1982) Paper presented at the symposium on *'Harvest and Post-Harvest Technology of Fish.'* Soc. Fish. Tech. (India) Cochin, Nov. 24–27, 1982