Effect of Heavy Bridles on the Performance of Demersal Trawls

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Heavy manila ropes of 38 mm dia were used as lower bridles in a 25 m high opening trawl and a 32 m large mesh demersal trawl to evaluate its efficiency in improving trawl catch, compared to HDPE bridles of 18 mm dia. The difference in catch rates of total catch and constituent groups during comparative fishing operations were not statistically significant except for *Lactarius* sp in 25 m high opening trawl. Heavy bridles therefore appear to have only marginal advantage over light bridles.

The overall performance of the trawl system depends on the independent and interactive influence of its component parts. The importance of bridles and sweeps in improving the efficiency of trawl by improved bottom tending and enhanced herding effect on finfish has been discussed by Parrish (1959), Blaxter & Parrish (1964), Chapman (1964) and Main & Sangster (1981). Hard-laid thick manila ropes of 16-24 mm dia have been used in bottom trawls for the capture of flatfish and roundfish (Scharfe, 1959 a,b). On soft muddy bottom sweep lines tend to dig into the mud and maintain good ground contact while trawling (Ben-Yami, 1959), Mhalathkar *et al.* (1982) have reported length of bridles as an important factor governing the shape and contour of the net. Optimum length of bridles for demersal trawls has been discussed by Mohan Rajan *et al.* (1990)

Effect of introducing heavy manila ropes on the fishing performance of bottom trawls has been discussed in this paper, based on full scale comparative field trials.

Materials and Methods

Two tested designs of bottom trawls namely, 32 m large mesh demersal trawl and 25 m high opening trawl, described by Kunjipalu *et al.*, (1979, 1989) and flat rectangular otter boards of wood and steel construction, 1524 x 762 mm size, weighing 100 kg each (Kurian *et al.*, 1964), were used for the experiments. The gears were rigged with 20 m long double bridles. In the control gear, 18 mm dia HDPE rope, each of 3.34 kg dry weight, were used as upper and lower bridles. 38 mm dia manila ropes each of 17 kg dry weight, were used as lower bridles in the experimental gear (Fig.1). Extension pieces of 1.5 m length were added to facilitate the replacement of bridles during comparative hauls.

Field trials were conducted from research vessel Fishtech No.8 (15.2 m LOA, 165 hp) during day-time, in the depth range of 25-30 m, in the waters off Veraval, India. 30 comparative hauls each of 2 h duration were taken using 25 m high opening trawl during December 1988-January 1989 and 33

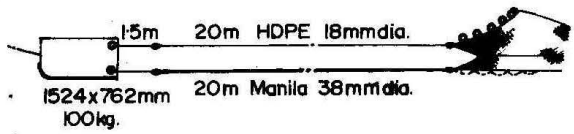

Fig. 1. Bridle arrangement in experimental gear.

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Table 1. *Particulars of comparative fishing operations*

	25 m high opening trawl		32m large mesh demersal trawl	
	Experimental Gear	Control Gear	Experimental gear	Control Gear
Length of bridles, m	20	20	20	20
Material of upper bridles	HDPE 18 mm dia	HDPE 18 mm dia	HDPE 18 mm dia	HDPE 18 mm dia
Material of lower bridles	Manila 38 mm dia	HDPE 18 mm dia	Manila 38 mm dia	HDPE 18 mm dia
No. of hauls	30	30	33	33
Depth range, m	25-30	25-30	25-30	25-30
Depth-warp ratio	1:5	1:5	1:5	1:5
Towing rpm	1300	1300	1300	1300
Total towing duration	58 h 30 min	58 h 30 min	66 h	66 h
Total catch, kg	3353	3450	2924	2988

comparative hauls using 32 m large mesh demersal trawl during February-May 1989. The two bridle arrangements have been put to operation alternately, maintaining the depth, duration of tow and engine revolutions constant during each of the paired comparative hauls. Operational details are given in Table 1.

Results and Discussion

Details of catch rates obtained during comparative fishing trials are presented in Table 2. Results of statistical analysis using the paired *t*- test is furnished in Table 3. Those species which were present in the catch in most of the fishing trips were taken for comparison. The analysis of experimental data of 25 m high opening trawl fitted with heavy and light bridles showed significant difference only in the case of *Lactarius* sp. The catch of *Lactarius* sp. was significantly ($p < 0.05$) high in the heavy bridle net compared to the light bridle net. The 32 m large mesh trawl attached with heavy and light bridles did not show any

Table 2. *Average catch rates of important species caught during comparative fishing trials.*

Groups	CUPE, kg. h^{-1} Heavy bridle	Light bridle
(a) *25 m high opening trawl*		
Dhoma (small sciaenids)	4.49	4.85
Ribbon fish	3.89	3.89
Squid	3.62	3.15
Razor edge (*Pellona* sp.)	1.68	1.46
Lactarius sp.	1.66	1.44
Silver bar (*Chirocentrus* sp.)	1.76	1.33
Koth (*Otolithoides* sp.)	0.53	0.43
Misc. fish	39.59	42.42
Total catch	57.32	58.97
(b) *32 m large mesh demersal trawl*		
Ribbon fish	13.15	13.89
Squid	4.40	4.30
Dhoma (small sciaenids)	3.36	2.17
Lactarius sp.	1.15	1.50
Misc. fish	22.24	23.41
Total catch	44.30	45.27

significant difference for the species compared.

From the Table 2, it is seen that the catch rate is almost equal in both the trawls with heavy and light bridles. Heavy Manila rope was expected to tend the bottom more effectively than light HDPE rope and thereby

Table 3. *Results of statistical analysis*

Group	*t*-value
(a) *25 m high opening trawl*	
Total catch	0.0275
Dhoma (small sciaenids)	0.4173
Ribbon fish	0.5008
Squid	1.2920
Razor edge	0.5806
Lactarius sp.	2.3115*
Silver bar	1.0697
Degrees of freedom , n-1:26	
(b) *32 m large mesh demersal trawl*	
Total catch	0.0281
Ribbon fish	1.5063
Squid	0.4030
Dhoma (small sciaenids)	1.2247
Lactarius sp.	1.5554
Degrees of freedom, n-1:26	

* Significant at the 0.05 level

improve the catch of fish living close to bottom. The difference in catch rates during comparative fishing operation, however, were not significant except for one species group in one of the two experimental trawls. Heavy brildles, therfore, appear to have only marginal advantages over light bridles.

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