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Performance of 25 m Rope Trawl in Inshore Waters

S.V.S. Rama Rao and G. Narayanappa
Research Centre of Central Institute of Fisheries Technology, Kakinada - 533 003, India

Rope trawl in which the leading sections of netting are substituted by ropes of sufficient breaking strength, is a recent innovation in trawl design. Design details of a 25 m rope trawl (200 mm x 320 meshes) developed for inshore trawling and its performance in the waters off Kakinada, Andhra Pradesh, India, are reported in this paper. The rope trawl appeared to be effective for capture of ribbonfish, silver bellies, anchovies, sciaenids and pomfrets. During comparative operations with a 25 m bulged belly trawl as control, the rope trawl registered a significantly ($p < 0.01$) low fuel consumption rate.

Fuel cost is a major component of the operating expenditure of trawlers. Fuel consumption is directly proportional to the resistance offered by the trawl gear. Drag of netting alone constitutes about 60 percent of the total drag of the gear. The use of large meshes in the leading sections of the trawl and appropriate use of thinner twine and knotless netting in its construction have been recommended as possible means of reducing the net drag (Wileman, 1984; Fujishi, 1985). Large meshes have been incorporated in the front trawl sections in an effort to reduce drag without affecting catching efficiency (Kunjipalu *et al.*, 1979 a; 1989; Nayak & Sheshappa, 1993). Rope trawl is an innovation in which netting in the forward sections of the trawl has been substituted with ropes (Verbaan, 1977). Ropes, as with larges meshes reduce the towing resistance considerably while still maintaining herding effect on many finfishes. In this paper, the design details of a 25 m rope trawl are presented along with results of field trials in inshore waters, off Kakinada, Andhra Pradesh, India.

Materials and Methods

Design details of 25 m rope trawl (200 mm x 320 meshes) are given in Fig. 1.

During the first phase of the experiment, 14 replicate operations were conducted using a 25 m bulged belly trawl (Kunjipalu *et al.*, 1979 b) as control, under identical fishing conditions, to evaluate the fuel consumption rate and fishing performance. Fuel consumption during each tow was obtained by connecting a separate graduated fuel tank (10 l capacity to the engine as described by Naidu *et al.* (1987). During the second phase, 25 m rope trawl was put to extensive field trials at different depths and catch details were recorded.

Flat rectangular otterboards of 1390 x 630 mm size weighing 55 kg each were used for the operations in combination with double sweeps of 10 m length. Operations were conducted from Fish Tech VII (12.9 m LOA; 102 hp) in the waters off Kakinada, 10-30 m depth, during 1987-92.

Results and Discussion

During the comparative evaluation, the rope trawl obtained a mean catch rate of 11.4 kg h^{-1} with fuel consumption rate of 7.5 l h^{-1} whereas the control gear obtained a catch rate of 7.5 kg h^{-1} with fuel consumption rate of 7.9 l h^{-1}. Results of statistical analysis of the data on fuel

consumption and aggregate catch rate are given in Tables 1 and 2, respectively.

Table 1. *Analysis of variance: Oil consumption*

Source	DF	SS	MS	F
Nets	1	1.0492	1.0492	17.97**
Hauls	13	0.4161	0.0320	< 1
Interaction	13	0.7589	0.0584	
Total	27	2.2242		

Table 2. *Analysis of variance: Total catch*

Source	DF	SS	MS	F
Nets	1	1.0744	1.0744	8.65*
Hauls	13	18.7966	1.4459	11.64**
Interaction	13	1.6149	0.1242	
Total	27	21.4859		

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

Fuel consumption rate during rope trawl operations was significantly ($p < 0.01$) less than that for control while the catch was significantly ($p < 0.05$) more.

Results of 100 operations (total towing duration: 100 h) using rope trawl at different depths are summarised in Table 3. Average catch rate obtained was 25.2 kg h^{-1}. Ribbonfish constituted 40.9% followed by silver bellies (24.6%), anchovies (13.5%) and sciaenids (6.6%). Pomfrets formed 4.2% of the landings.

It has been reported that escapement of fish could be reduced by the process of herding through increased visibility of net material (Zijtstra, 1977). Visibility of gear parts under the water and its importance in determining the efficiency of capture have been discussed by Blaxter *et al.* (1964). They recommended the use of two or more bridles for increased herding efficiency. The aspect of herding has to be studied further in order to optimise its effect in a rope trawl.

Table 3. *Results of fishing operations using 25 m rope trawl*

No. of hauls	100	
Total towing duration, h	100	
Total catch, kg	2515.5	
CPUE kg h^{-1}	25.2	
Catch composition :		
	Catch, kg	%
Ribbonfish (Trichiuridae)	1028.0	40.9
Silver bellies (Leiognathidae)	618.0	24.6
Anchovies (Engraulidae)	340.0	13.5
Sciaenids	167.0	6.6
Pomfrets	106.0	4.2
Prawns	18.5	0.7
Miscellaneous fish	238.0	9.5

The operation of the new gear was as facile as the conventional bottom trawl. Use of cylindrical headline floats with central hole prevented entanglement of floats with ropes during shooting and hauling operations. Rope trawl was successfully operated from the stern trawler, M T *Murena* (69.34 m LOA; 1920 hp) during Indo-Polish Industrial Survey, 1976-78 in the deeper waters (55-370 m) off northwest coast of India, landing species like horse mackerel, ribbonfish, elasmobranches and pomfrets (Pelozarski *et al.*, 1979). More recently a 35 m rope trawl (800 mm x 124 meshes) was operated with good results during cruise No. 105-A, November 1992 of FORV *Sagar Sampada* (71.5 m LOA; 2285 hp) in the depth range of 60 to 130 m off northwest coast of India and Nemipterids dominated the landings (Rama Rao *et al.*, 1994)

Lower drag of the new gear could contribute to faster towing speed and facilitate capture of fast swimming fishes by an inshore trawler. Fuel economy and

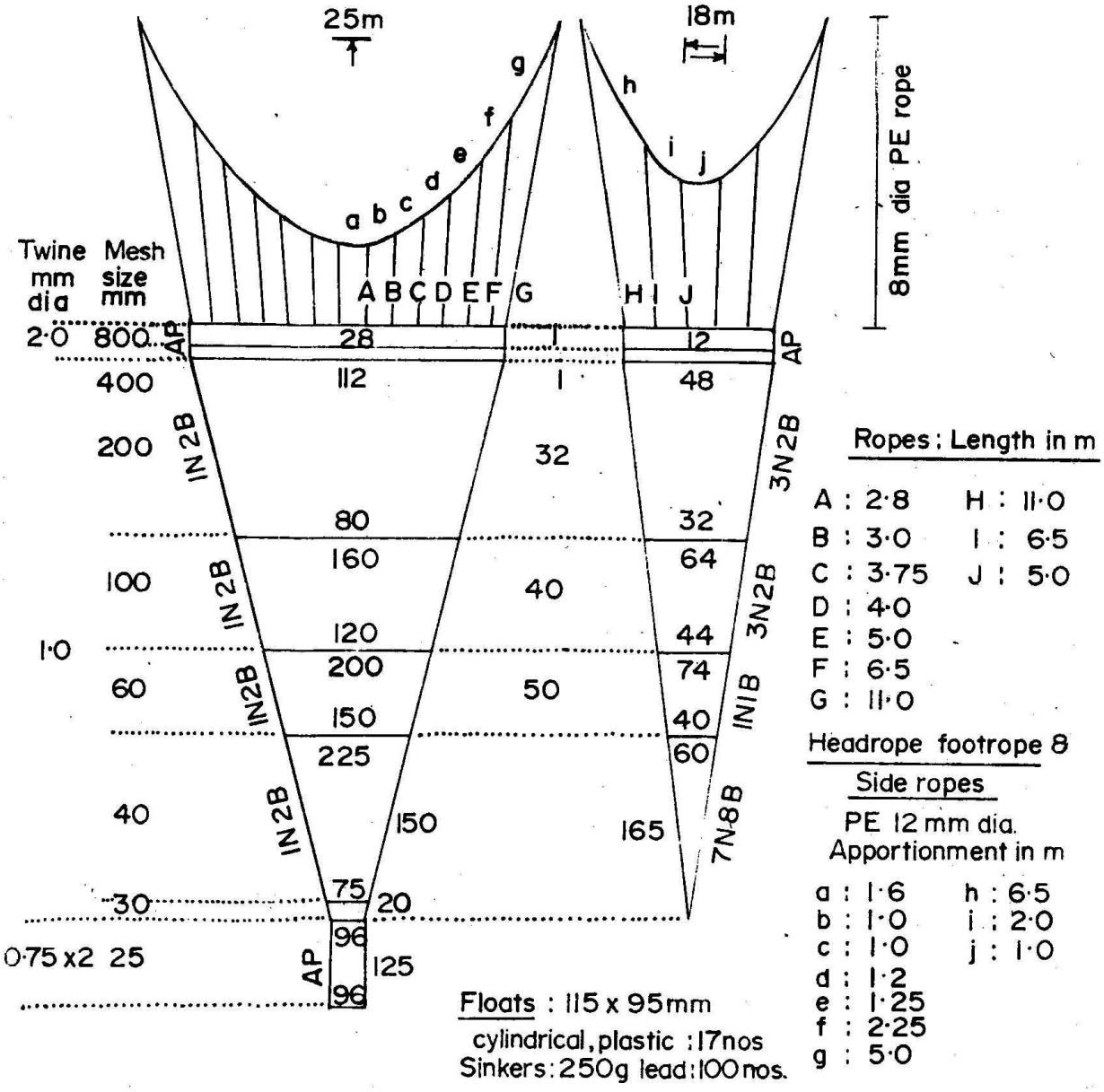

Fig. 1. Design details of the 25 m rope trawl

ability to catch important finfish categories such as pomfret, ribbonfish, anchovies and sciaenids indicate its suitability for commercial fish trawling in inshore waters.

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