

An Appraisal of Twin-trawling with Sled on the East Coast

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Double-rig, double-twin-rig and triple rig trawling methods are the principal trawling methods for prawns all over the world. This paper deals with the efforts of the authors to operate one set of trawl gear (2 nets) from a single cable from a 12.2 m OAL vessel with a pair of otter boards and a sled in the centre. Besides catches, horizontal spread and warp tension were also recorded. The average horizontal spread of two 10 m nets worked out to be more by 39% than that of 20 m bulged-belly trawl. The tension offered by the twin trawls was 10% less than a the double sized single-rig trawl. The performance of the gear was good throughout and besides prawns many other demersal fishes constituted the main catch. The catch per hour of two nets together was 29.24 kg out of which prawns formed 8%.

Among the factors influencing the performance of a trawl, horizontal spread, vertical spread and resistance are important. When bottom fishes to be caught the spread of the net is more important than head line height. Apparently for this reason double rig-trawling which originated in the Gulf of Mexico during late fifties became principal shrimp fishing method in the Gulf of Mexico and Belgium and for both shrimp and flat fish in The Netherlands (Robas, 1959, and De-witt, 1964). Subsequently this concept developed into double rig-twin trawling, that is operation of two nets from a single cable. Harrington *et al.* (1972) Bullies *et al.* (1972) and Anon (1979, 1971), Bill Hughes (1982) reported widespread conversion to double twin-rig and tripple-rig trawling in Australia. In India, a scientific appraisal of double-rig and twin-trawling was done on the north-west coast during mid seventies (Panicker *et al.*, 1977; Ramarao *et al.*, 1977).

Eventhough, double-rig twin trawling for shrimp elsewhere involves operation of two sets of gear with out-rigger booms, the present attempt is with one set of gear to evaluate its efficiency on the east coast. A few field trials were made in 1978-79 to work out suitable riggings and regular twin-trawling operations were conducted during March to October 1982. Results of these studies are discussed in this paper.

Materials and Methods

Fishing vessel *Fish Tech 7* (12.19 m OAL, 60 hp engine) was used. The vessel was provided with two-drum winches and a single gallow. This method involves operation of two nets with a pair of otter boards and a sled in the centre connected by triple bridles to the warp on the drum. Two 10 m four seam trawls (Fig. 1, Table 1) and a pair of rectangular flat otter boards (1140 x 630 mm) with 45 kg weight were used

(Satyanarayana *et al.* 1962). The sled used was similar to the one described by Ramarao *et al.* (1977).

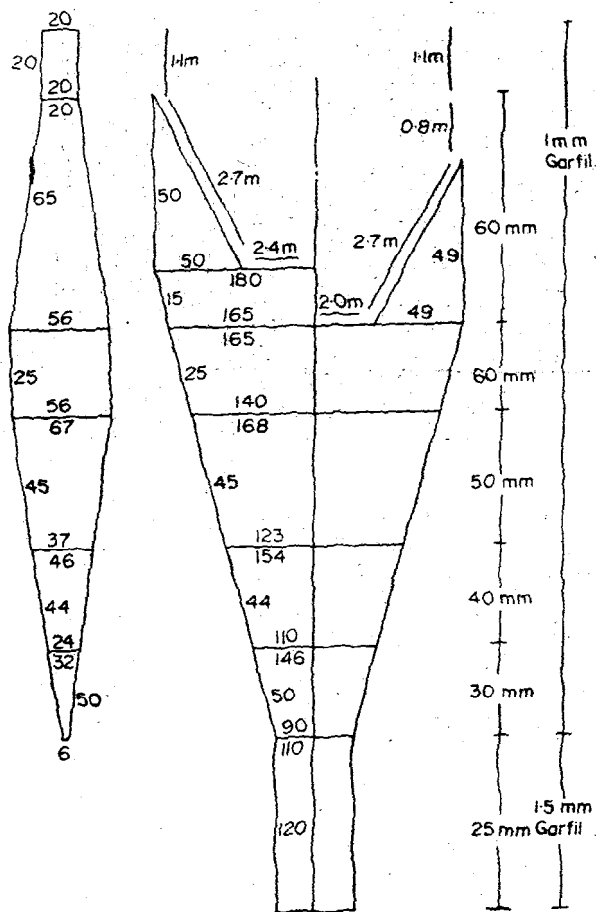


Fig. 1. 10 m four seam trawl

Table 1. Details of fishing gear and accessories

Nets	Two 10 m four-seam trawls
No. of floats	7 no. of 12.7 cm dia on each net with 5.5 kg buoyancy
Wt. on foot rope, kg.	11
Otter boards	Rectangular flat 1.14 X 0.63m 45 kg. in air (each)
Sled	Double frame, 0.8 x 0.4 m 30 kg. in air
Sweep lines	Double sweeps, 12 mm dia garfil rope, inner 4.5 m (towards sled) outer 5 m (towards otter boards)
Material specifications	6 mm, G. I. flexible wire rope
Length of triple bridles, m	100 each

The method of operation is similar to that described by Ramarao *et al.* (1977) Distance between otter boards was measured following the method of Deshpande (1960) and Benyami (1959) and warp tension by the warp load meter developed by Sivadas (1970). Daily 4 hauls were made. A few hauls were also taken with 20 m bulged-belly net for comparing horizontal spread and tension.

Table 2. Details of operations

Depth of operations, m	5-18
No. of hauls	100
Total trawling time, h	100
Average trawling speed, knots	2
Catch, kg	Prawns 234.50 Fish 2,689.85 Total 2,924.35

As can be seen from the Table 2, the catch per hour of fish and prawns were 26.9 kg and 2.34 kg respectively.

Table 3. Mouth opening and resistance

Type of rig	Twin-rig	Single-rig
Net	Two 10 m four sean	20 m bulged-belly
Horizontal spread between doors, m	13 + 13 = 26	16.6
between wings, m	8 + 8 = 16	11.5
Vertical height (calculated), m	1.8	2.6
Warp tension, kg	450	500

Results and Discussion

It is clear from Table 3 that the horizontal spread between wings of two 10 m nets together is 39%

more than that of single-rig 20 m net. This is in conformity with the results obtained by Verhoest *et al.* (1964). The vertical height was calculated as described by Satyanarayana *et al.* (1970). Due to the increase in horizontal spread there is considerable reduction in vertical height (30.8%) compared to the double sized single rig trawl. The resistance offered by the two nets was 10% less than the single rig 20 m trawl. Catch composition of two 10 m nets along with catch per h of each species is given in Table 4. The efficiency of two small nets over the double sized single nets is too well known to warrant any comparative studies (Panicker *et al.*, 1977 and William Hughes, 1982). However to get an idea of the trends in catch in the 20m bulged-belly net operated at the same ground, and depth during the same period the total catch and catch per h were computed (Table 4).

Table 4. Composition and catch rate of two 10 m nets and 20 m bulged-belly net

Period	March 1982-October 82	Mar. 82 to Oct. 82		
Depth range, m	5-18	5-18		
Nets	Two 10 m trawls	One 20 m trawl		
Trawling time, h	100	75		
Species landed	Catch, kg	Catch h ⁻¹	Catch, kg	Catch h ⁻¹
Prawns	234.50	2.34	158.50	2.10
Sciaenids	238.50	2.28	27.25	0.36
Crabs				
(<i>Neptunus</i> sp.)	174.00	1.74	29.00	0.38
Ribbon fish	79.00	0.79	93.75	1.25
Elasmobranchs	65.00	0.65	—	—
Silver bellies	49.50	0.49	55.00	0.73
Soles	30.00	0.30	14.50	0.19
Small crabs	455.00	4.55	—	—
Eels	29.75	0.29	—	—
Bombay duck	782.00	7.80	10.50	0.14
<i>Cynagris</i>	18.00	0.18	17.00	0.23
<i>Lactarius</i>	—	—	26.00	0.34
Anchovies	—	—	60.00	0.80
Miscellaneous fish	289.60	2.90	202.00	2.60
Trash fish	479.50	4.80	366.50	4.90
Total kg	2,924.35		1,060.00	
Average catch h ⁻¹		29.24		14.13

Table 4 shows slight increase in the catch rate of prawns in twin-trawls. Difference in the catch rate is not very significant as prawn landings were meagre and fluctuating. When catches are low, comparisons

are not likely to be conclusive but when demersal fishes as a whole is considered twin-trawls performed relatively better. The off-bottom fishes like anchovies, *Lactarius*, silverbellies were landed more in bulged-belly net, perhaps due to its better vertical height. The catch rate of twin-trawls (29.24 kg h^{-1}) is higher over that of bulged-belly (14.13 kg h^{-1}).

Narayanappa *et al.* (1982) while reviewing trawl fishing off Kakinada stated that the 5 yearly catch rate (1977-81 period) is 15.16 kg h^{-1} on average out of which 2.46 kg were prawns and 12.7 kg fish. The catch h^{-1} was maximum in 1979 (17.73 kg) and minimum during 1978 (8.2 kg). They observed 14.8 kg h^{-1} for bulged-belly net during the same period. Compared to this the catch rate in twin-trawls was highly significant. Thus it appears that twin-trawls are more efficient for bottom fishes. The wider mouth opening coupled with better efficiency of the two small trawls to negotiate the contours of sea bed may be the reason for their better efficiency (Hughes, 1982).

The lesser resistance offered by two small nets reveals the scope for increasing the net size. These studies have revealed the potentialities of this method. Improvement in size and other technological features of the gear, extending the area of operation to deeper waters form the next part of the study.

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