On the Comparative Efficiency of 'V' Shaped and Rectangular Flat Otter Boards for Trawling off Veraval, North West Coast of India

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V shaped all steel boards, with their inherent stability to tide over obstacles and mud, interchangeability of starboard and portside boards, are found to be superior to conventional flat rectangular boards for bottom trawling. These are cheaper in construction,offer less resistance and give longer service. Comparative trials with the two types of boards showed significant difference in tension between the boards but not in catch or horizontal opening.

Flat rectangular otter boards of wood and steel constructions are the exclusive type in use as the horizontal spreading device for commercial otter trawling along Saurashtra coast. The relative efficiency of different types of otter boards like oval, horizontal, curved and flat rectangular have been studied by Kuriyan *et al.* (1964), Mukundan *et al.* (1967), Narayanappa (1968), Satyanarayana & Mukundan (1963) and Deshpande *et al.* (1970) at Cochin/Kakinada/Veraval. The effectiveness of 'V' shaped otter boards were studied in Kakinada by Satyanarayana *et al.* (1978) and the performance is reported to be better than vertically and horizontally curved otter boards.

'V' shaped boards of all-steel contruction are in extensive use for commercial trawling elsewhere in the world since its introduction in Taiwan, Formosa in 1957 by Capt. Loo Chi Hu (Anon 1961). The main advantage of the design is that it allows the board to orientate itself to any position according to the force working upon it, thereby remaining inherently stable. The board will ride over obstacles and mud which would spell disaster to an all-flat board (Anon, 1961). The authors have studied the comparative performance of 'V' shaped boards from a medium size trawler *Fishtech viii* (15.2 m OAL with 165 h. p. engine).

Materials and Methods

'V' shaped steel otter boards with an over all dimension of 1500 mm length and 890 mm breadth and 125 kg weight and flat rectangular boards of wood and steel construction described by Kuriyan *et al.* (1964) with 1524 mm length and 762 mm breadth and 100 kg weight were used for the studies (Table 1). Design details of 'V' shaped boards are given in Figs. 1 and 2 and Table 4. A 32 m large mesh demersal trawl described by Kunjipalu *et al.* (1979) was used for the experiments. Double bridles of 5 m length were used in combination with the nets. The two types of otter boards were operated consecutively to give equal chances and a statistical rotation was maintained throughout the experiments. Fishing operations were conducted off Veraval during 1979–1980.

Twenty five observations were carried out in the depth range of 27-47 m with a scope ratio of 1:5 at a trawling speed of 2.5 knots per hour keeping the engine r.p.m. at 1250. The horizontal spread between the boards was estimated by the method of Benyami (1959) and Deshpande (1960) and the tension on the warp was measured by using a mechanical tension meter described by Satyanarayana & Nair (1965).

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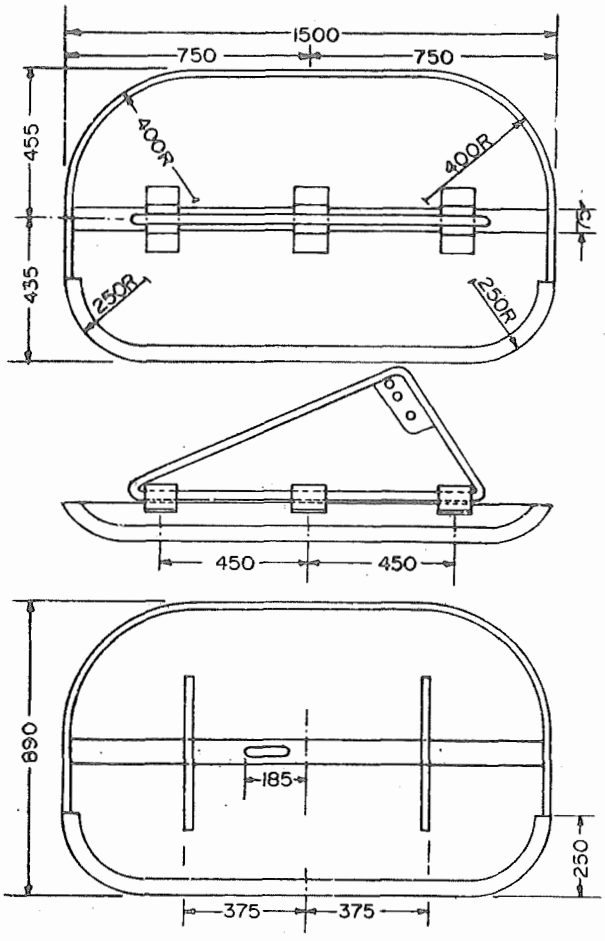

Fig. 1. Design details of 1500 x 890 'v' shaped otter board (measurements in mm)

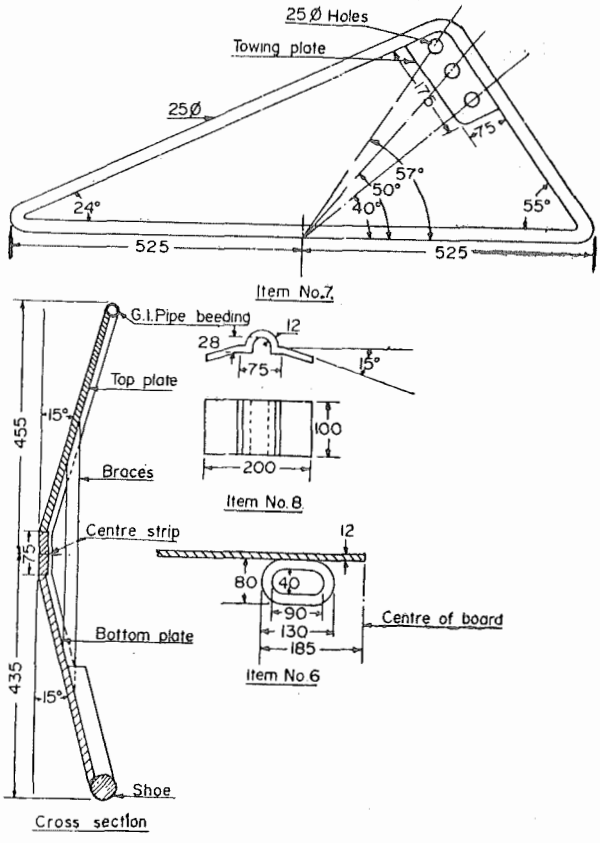

Fig. 2. Details of parts (measurements in mm)

Results and Discussion

Total catch of 1594 kg and 1921.5 kg were obtained respectively in nets with rectangular flat and V shaped boards. The operational details are given in Table 2 and details of catch in Table 3. To ascertain significance if any for the type of otter boards on the catch, horizontal opening and towing tension, the data were analysed based on analysis of variance by converting to logarithmic values. The 'F' values for (1, 24) degrees of freedom for horizontal opening, total catch, catch of cephalopods, ribbon fish and miscellaneous fishes were 1.0, 3.59, 3.05, 2.64 and 1.71 respectively indicating no significant difference with respect to type of boards. Except for horizontal opening, the between days variation, was significant in the above data. With an 'F' value of 9.5, warp tension developed by the two boards showed significance at 1% level.

The lower warp tension in spite of increase in surface area (9.4%) and weight (25%)

Table 1. *Specifications of otter boards*

Type of otter boards	Material	Length mm	Breadth mm	Area m^2	Weight in air, kg
'V' shaped	Steel	1500	890	1.270	125.0
Rectangular flat	Wood and steel	1524	762	1.161	100.0

Table 2. *Details of fishing operations*

Type of otter board	Trawl net	Depth of operation m	Warp length m	No. of hauls	Towing time h	Towing speed knots	Average horizontal spread between otter boards m	Warp tension kg
'V' shaped	32 m large mesh trawl	27–47	135–255	25	25.0	2.5	17.85	591.92
Rectangular flat	,,	,,	,,	,,	,,	,,	17.86	609.16

Table 3. *Details of catch*

Type of otter board	Catch per unit effort (catch in kg/h)				
	Quality fish	Ribbon fish	Cephalopods	Miscellaneous fish	Total catch
'V' shaped	7.22	33.88	3.54	32.22	76.86
Rectangular flat	6.50	25.20	2.48	29.58	63.76

Table 4. *Details of 'V' shaped otter boards*

Description	Size mm	Length mm	Number	Material	Wt. kg
Top plate	5 thick	1500 x 410	1	M.S.	22
G.I. pipe beeding	15 diameter	2500	1	G.I.	5
Centre strip	75 x 12	1500	1	M.S.	10
Bottom plate	10 thick	1500 x 380	1	,,	46
Shoe rod	50 diameter	1750	1	,,	26
Bridle attachment	20 diameter	Ring	1	,,	2
Bracket	25 diameter	2450	1	,,	8
Clamps	100 x 12	200	3	,,	3
Towing plate	75 x 20	175	1	,,	1
G. I. pipe braces	15 diameter	500	2	G.I.	2
				Total weight per board	125 kg

of V shaped boards indicates hydrodynamic efficiency of V shaped boards. This is advantageous for the better utilization of the vessel's engine power as it enables a higher trawling speed without additional increase in engine out-put. The lack of corresponding increase in horizontal spread commensurate with large surface area indicates the lesser spreading force developed by V shaped boards. A better bottom (ground) contact with least flying effect is essential for stability and efficiency of otter boards in bottom trawling. Flat rectangular otter boards required constant ground contact and hence make it unsuitable for uneven and rocky grounds. If it fails to get ground contact the conventional flat boards spell dangers like falling flat and flying in water which causes instability, over spreading of the net mouth and fouling of the gear. Moreover in soft muddy grounds the conventional rectangular flat boards have a tendency to dig into the mud (Brett, 1962, Anon, 1974). In contrast, slighty smaller ground contact is sufficient for 'V' shaped boards to maintain equilibrium as the design features make it inherently stable. The 'V' section is said to prevent the door digging into soft mud and manoeuvring is improved. Besides, 'V' shaped boards are efficient in rough and uneven grounds as they are able to ride over obstacles and mud (Brett, 1962, Anon, 1974). The fishing grounds in the inshore waters on the Saurashtra coast are rocky and muddy interspersed with shell and pebbles. Hence V shaped boards are more suitable for trawling along the Saurashtra coast. They are more suitable for fish trawling in combination with demersal trawl for off bottom and demersal fishes as the grounds are well known for demersal fishes rather than for prawns.

By effecting slight changes in the present design it is possible to have interchangeable boards as tried elsewhere (Brett, 1962, Anon, 1974). This is an added advantage as the same board can be used either at starboard side or portside by changing the towing brackets to avoid uneven wear of the keel (Anon, 1974).

The V shaped all-steel boards are relatively cheaper when compared with the wood and steel combination boards and are known to give long overall life.

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