

Comparative Fishing Efficiency of Lobster Traps

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Fishing efficiency of lobster traps relies on various factors like design, shape and material of the trap and bait used. Investigations on suitable design for lobster trap was attempted using six different designs such as rectangular with synthetic webbing, rectangular with steel wire, hemispherical, circular, semi-cylindrical and trapezoidal. The fishing efficiency of the traps differed significantly ($p < 0.01$). Semi-cylindrical trap performed well by trapping 53 numbers of lobsters in 30 fishing operations.

Key words: Lobster trap, trap design, bait, comparative efficiency

Trap is a selective fishing gear suitable for capturing the ideal size groups of target species. It is a conventional and versatile gear and is a suitable device to fish even in rough fishing ground with rocks and corals (Rajan & Meenakumari, 1982). It is generally used in small-scale fishery. (Buesa, 1965; George, 1973). Colachal trap made of palmyra leaf-stalk is used as traditional gear in south-west coast of India (Miyamota & Shariff, 1961). Bio-degradable nature of this trap leads to quick damage and short life. Catching ability of the traps mainly depends on the shape of the trap, though various other factors also influence it (Munro, 1974; Recksiek *et al.*, 1991). Among different designs of lobster traps, Canadian parlor cum bedroom trap has been found to perform better over the Scottish creels and Cornish ink-well traps (Bruin, 1980). Australian pots and rectangular pots were reported to be more efficient than ink-well pots to catch lobsters (Rajan & Meenakumari, 1982). Rajan *et al.* (1988) reported that trap of semi-cylindrical shape performed better than traditional traps used by fishermen of south-west coast of India. The present study deals with the comparative fishing efficiency of six different designs of traps having equal volume.

Materials and Methods

Six different designs of traps with a volume of 0.225 m^3 each were fabricated in triplicates. The traps varied from one another in shape. They were rectangular box with synthetic webbing as covering material (A), rectangular box (B), hemispherical trap (C), circular trap (D), semi-cylindrical trap (E) and trapezoidal trap (F). All the traps had iron framework made up of 10 mm mild steel (MS) rods. In design A, polyethylene (PE) webbing having 60 mm mesh size and 1 mm twine size was used as external covering material over the iron framework and nylon webbing of 11 mm mesh size was used around the funnel. In other traps, MS wire mesh with rectangular mesh of size $50 \times 25 \text{ mm}$ (wire dia, 1 mm) was used as covering material. Wire mesh was suitably cut according to the design of the trap and welded to the iron framework. All the traps were provided with a truncated funnel, having slight downward curvature at the rear end in order to prevent the escapement of the trapped lobsters. The diameter of outer and inner rings of the funnel were 300 mm and 120 mm, respectively and the rings were interconnected with 24 numbers of MS rods bent in suitable shape. All the traps had the mouth at the side except trap C where mouth was at the top. To facilitate placing

of bait and removal of entrapped lobsters, a vent was provided at the rear end in all the traps. The traps thus made were coated with epoxy resin to avoid corrosion.

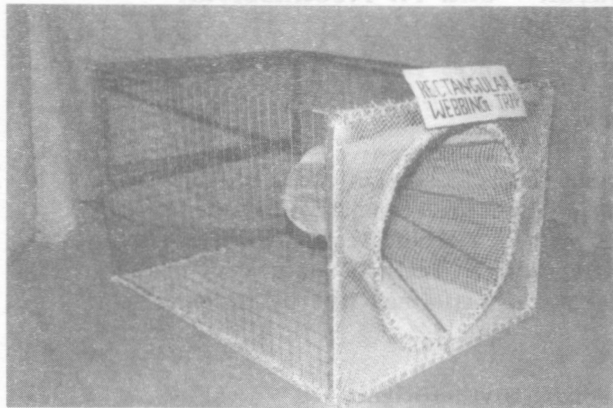


Fig. 1. Rectangular Box trap with synthetic webbing (A)

The framework of trap A was rectangular with the dimensions of 750x600x500 mm and the base area of 0.45 m² (Fig. 1). Trap B was identical to trap A in all respects and differed only in covering material used (Fig. 2).



Fig. 2. Rectangular Box trap (B)

Trap C has a round bottom with base area and diameter of 0.71 m² and 950 mm, respectively. Additional MS rods were attached to the base to increase strength at the bottom. In this trap, mouth was provided by bending six wands at the top. The depth of the trap was 476 mm (Fig. 3). Trap D had upper and bottom rings of identical diameter (950 mm). Base area and the height of the trap were 0.71 m² and 317 mm, respectively. The upper and bottom rings of this trap were interconnected with 4 MS rods and reinforced with two rods across (Fig. 4).



Fig. 3. Hemispherical trap (C)

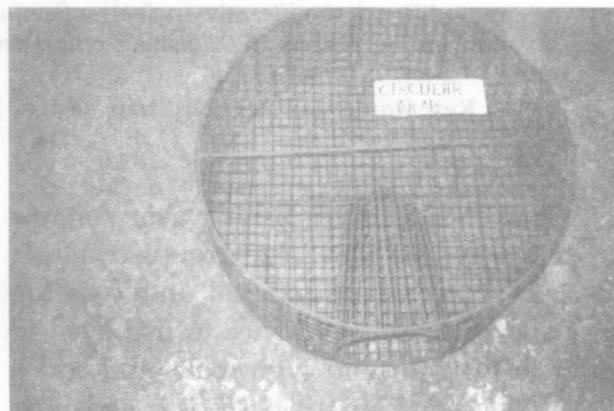


Fig. 4. Circular trap (D)

Trap E had a semi-cylindrical shape with length of 945 mm, breadth of 750 mm and height of 404 mm and base area of 0.71 m². This trap was made by bending two MS rods in semicircular manner and connecting them at fore and rear end of the rectangular base. These two rings were interconnected by welding a longitudinal rod at the top. Additional rods were welded across the base of the trap as reinforcement (Fig. 5). Trap F was made by connecting two rectangular frames, one at the top and another at the

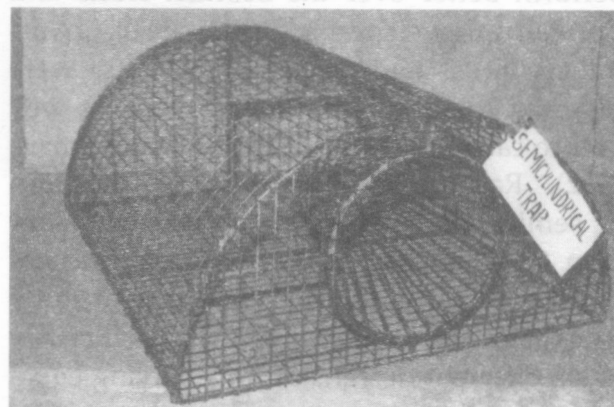


Fig. 5. Semi-cylindrical trap (E)

bottom with four vertical MS rods. The top frame had a dimension of 750x300 mm and the bottom frame 750x600 mm (Fig. 6).



Fig. 6. Trapezoidal trap (F)

All the experimental traps were tested at Enayam (8° 13' N; 77° 11'E) situated along the south-west coast of India, a well known fishing ground for spiny lobster fishery (Rajan *et al.*, 1985). Three traditional traps (T) popularly called as *Colachal* trap (Fig. 7), were used as control during comparative fishing experiments. Thirty fishing operations were carried out from January to April 1994.

All the traps were baited with 80-100 numbers of live brown mussel (*Perna indica*) prior to transportation to the fishing ground. Three batches of traps were deployed at the



Fig. 7. Traditional trap (T)

bottom at a depth of 3-8 m by skin diving in the sequence of A-C-D-B-E-F-T, at an interval of 4-6 m from each other. The position of trap in each batch was changed on rotational basis after every operation to minimize the sampling error. Traps were kept immersed for 24 h for every operation. At the end of each operation, data on number of lobsters caught and total length and weight of individual lobsters were recorded. The catch data were analyzed by ANOVA technique to find out the influence of design over the efficiency of the trap.

Results and Discussion

In general, catching efficiency of a lobster trap depends on its design (Munro, 1974; Recksiek *et al.* 1991). Trap design should suit local conditions such as nature of the ground, depth of the water and strength of tide, for successful operations. In addition to catching efficiency, features such as stability, durability, robustness and ease of handling are important in trap design.

Table 1. *Panulirus homarus* caught in various designs of traps

Trap design	No. of traps set	Total fishing operations	Lobsters caught		Mean carapace length (mm)	Mean total length (mm)	Mean weight (g)
			No.	Weight (kg)			
A	3	30	6	3.79	123.50±35.70	271.82±35.71	631.67±148.42
B	3	30	1	0.24	93.42	210.05	240.00
C	3	30	6	2.3	112.81±11.24	244.81±15.21	383.33±81.71
D	3	30	2	1.05	107.24±2.95	243.44±10.60	525.00±25.00
E	3	30	53	16.77	90.86±23.14	197.91±49.85	316.42±191.92
F	3	30	6	3.18	109.27±28.76	248.13±62.56	530.00±294.13
T	3	30	6	2.0	89.51±23.61	193.62±51.41	333.30±206.51
Overall	21	210	80	29.33	102.64±19.37	228.15±31.91	421.72±156.64

In the present study, during normal weather conditions all the traps, irrespective of the design, were equally stable on the sea bottom. However, during rough weather conditions, the traps A, B and F were found to be dislocated. This might be attributed to the smaller base area of these traps. Further, the poor stability of trap A was due to inadequate ballasting. Prudden (1951) has reported that trap designs less than 46 cm in height would reduce the tendency of the trap to overturn during operation. Therefore, relatively greater height and tapered upper edge might be the reason for the poor stability of trap F. Among the traps tested, trap E was identified as the best trap in view of easy handling and placement in the crevices. The advantages of trap E were its appropriate shape without projections and good stability. Though the traps D and B offered good stability over even bottom, the shape of these traps prevented their placement in crevices between the rocks. Disadvantages noted with respect to trap C, were (i) wastage of wire mesh during fabrication, (ii) requirement of comparatively more deck space to carry them to fishing ground and (iii) poor stability on uneven bottom.

The catch data revealed that the performance of the trap E was better than other traps as it could catch lobsters about 9 times more than traps A, C, F and T (Table 1). The catch from trap E was significantly high ($p < 0.01$) compared to other traps (Table 2). The difference in catching efficiency may be attributed to the variation in shape and stability of the traps (Rajan & Meenakumari, 1982). The catching ability of the traps A, C and F did not differ significantly from traditional trap (T). However, the total weight of lobsters caught in these traps was a little more

Table 2. Results of statistical analysis (ANOVA)

Source of variation	df	SS	MSS	F-ratio
Between replicates	2	32.09	16.045	
Between designs	6	681.238	113.539	2.137 ^{NS}
Error	12	123.90	10.325	10.996**

** Significant ($p < 0.01$) at % level; NS = Not significant

than that in the traditional trap. Meenakumari & Rajan (1985) reported that the entangling of legs of lobsters with the PE webbing of funnel would ultimately reduce the efficiency of the trap. However, this was prevented in the present study by providing an additional layer of nylon webbing with small meshes (11 mm) inside PE webbing having bigger meshes (60 mm). Poor catch obtained from trap B could be due to unfavorable orientation of traps to the burrows and poor stability and not due to entanglement of lobsters with webbing. Trap C with the top entrance showed poor performance (Temple, 1964; Rajan & Meenakumari, 1982). Among the traps tested, trap E with semi-cylindrical shape performed better in all respects. Hence, this trap can be recommended for commercial operation after suitably reducing its size.

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