# An Improved Bulged Belly Shrimp Trawl for Inshore Waters

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The effect of Tapering Jibs on a tested design of 15 m bulged belly trawl was studied. The net fitted with tapering jibs consistently landed better shrimp catches and recorded less resistance under tow compared to the control net.

The inshore waters of India, particularly the west coast, is heavily fished by shrimp trawlers. The stage has reached that catch per unit effort decreases as the number of fishing units increases (Narayanappa *et al.*, 1985). The solution may lie in the development of a more efficient and versatile design of trawl gear while judiciously restricting the increase in fishing units.

The design aspects of the trawl and integration of its various parts have been empirically studied (Satyanarayana & Nair, 1962; and Nair & George, 1964). Further studies towards the optimisation of various parts of the trawl have been undertaken by many workers. Investigations on the length of overhang (Nair *et al.*, 1971), belly depth (Mhalathkar & Jegatheesan, 1971), and effect of long wings (Satyanarayana *et al.*, 1976) have clearly shown that optimisation of the various parts of the trawl increases the gear efficiency. But enough attention has not, yet, been given on the desirable size and shape of jibs of shrimp trawls. The present study is an attempt to focus attention on this important aspect of trawl design.

## Materials and Methods

A tested design of 15 m bulged belly trawl (Mhalathkar, *et al.*, 1985) in combination with 114 x 57 cm flat rectangular otter boards, each weighing 50 kg (Mukundan, *et al.*, 1967), was taken up for the studies. Tapering Jibs (Fig.1) were fitted on to the experimental net while the control net was fitted with conventional jibs. The experiments were carried out during 1981-86, off Mormugao, latitude, 15°25′ to 15°35′ N and longitude, 73°45′ to 73°58′ E, at a depth range of 10-30 m, from the CIFT research vessel (10.97 m OAL) fitted with 65-83 hp Ashok Leyland - ALM 370 Engine. A total of 82 fishing trips were undertaken, logging

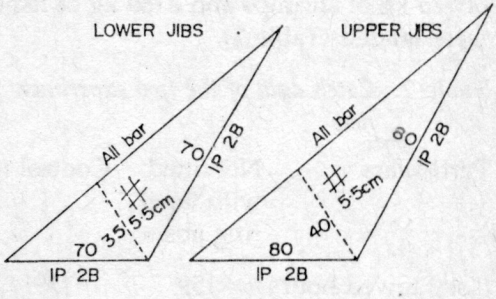


Fig. 1. Tapering Jibs

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159 towing hours for each net. The operational details are given in Table 1.

Table 1. *Operational details*

| Particulars of net | Net fitted with tapering jibs | Control net |
|---|---|---|
| Depth of operations, m | 10 - 30 | 10 - 30 |
| Warp paid out, m | 60 - 160 | 60 - 160 |
| Engine revolutions, rpm | 925 - 1100 | 925 - 1100 |
| Direction of tow | N; S | N; S |
| Average tension on both warps, kg | 432 | 450 |
| % increase of tension | — | 4.16 |

The nets were operated in regular rotation keeping other parameters constant during the comparative fishing operations. Warp tension was measured as described by Satyanarayana & Nair (1965).

**Results and Discussion**

Data were collected on catches of shrimps and fishes separately for comparing the efficiency of the two nets. A total of 275 kg of shrimps and 8180 kg of fishes were landed (Table 2).

Table 2. *Catch data of the two experimental nets*

| Particulars | Net fitted with tapering jibs | Control net |
|---|---|---|
| Total towed hours | 159 | 159 |
| No. of hauls taken | 160 | 160 |
| Shrimp catch, kg | 151 | 124 |
| Shrimp catch, kg/h | 0.95 | 0.78 |
| Fish catch, kg | 4366 | 3814 |
| Fish catch, kg/h | 27.46 | 23.98 |
| Total catch, kg | 4517 | 3938 |
| Total catch, kg/h | 28.40 | 24.76 |

The net fitted with tapering jibs caught 21.77% of shrimps and 14.47% of fishes more than the control net. 4.16% more tension was recorded in the conventional net (Table 1). The tapering jibs presumably have been instrumental in effecting a smooth flow of water thereby reducing the resistance of the net and helping to increase the swept area which accounted for the increased catch.

Experimental data were analysed statistically using the ANOVA technique after converting the catch figures to their logarithmic values. The ANOVA for total catch, prawn catch and fish catch are given in Tables 3, 4 & 5 respectively.

Table 3. *ANOVA table for total catch*

| Source | S.S. | df | M.S. | F |
|---|---|---|---|---|
| Total | 55.774084 | 299 | — | |
| Nets | 0.201865 | 1 | 0.201865 | 2.141 |
| Days | 34.545203 | 74 | 0.466826 | 4.951** |
| Hauls | 0.001530 | 1 | 0.001530 | 0.016 |
| Error | 21.025486 | 223 | 0.094285 | |

**P < 0.01

Table 4. *ANOVA table for prawn catch*

| Source | S.S. | df | M.S. | F |
|---|---|---|---|---|
| Total | 40.981621 | 299 | - | |
| Nets | 1.743868 | 1 | 1.742868 | 21.461** |
| Days | 19.939192 | 74 | 0.269449 | 3.316** |
| Hauls | 1.178497 | 1 | 1.178497 | 14.405** |
| Error | 18.12064 | 223 | 0.081256 | |

** P <0.01

It could be seen from the Table 4 that there is significant difference between the two nets as far as prawn catch is concerned.

Table 5. *ANOVA table for fish catch*

| Source | S.S. | df | M.S. | F |
|---|---|---|---|---|
| Total | 78.47035 | 299 | - | |
| Nets | 0.016403 | 1 | 0.016403 | 0.281 |
| Days | 65.143307 | 74 | 0.880315 | 15.221** |
| Hauls | 0.000002 | 1 | 0.000002 | 0.000034 |
| Error | 12.987323 | | 0.058234 | |

**$p < 0.01$

Net fitted with tapering jibs gave significantly higher prawn catch compared to the control net. It could also be seen that there is no significant difference between the nets at 5% level as far as total catch and fish catch are concerned. The between haul variations were not significant for fish and total catch, but it was significant in the case of prawn catch. Between days variations were highly significant in all the three cases.

The results have clearly indicated that the trawl fitted with tapering jibs is more effective for the capture of shrimps than the conventional net.

The authors express their sincere gratitude to Shri M.R.Nair, Director, Central Institute of Fisheries Technology, Kochi-29 for according permission to publish this paper. They are thankful to Shri P.A.Panicker, Head of Division(Gear) for the directions given and also grateful to Shri H.Krishna Iyer, Principal Scientist, for the statistical analysis of the data.

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