Design and general characteristics of ‘Ghan Dol’ (Four Seam Trawl) operated from Ratnagiri, India

Vaibhav G Yewale, Sushil C Kamble, Tousif G Kazi, Rajiv H Rathod and Sagar A Joshi

Abstract
A study on design characteristics of four seam locally known ‘Ghan Dol’, trawl operated from Ratnagiri, Maharashtra showed that, five belly sections Ghan Dol trawl net had overall length ranged from 25.5140 ± 0.0350 m to 30.7500 ± 1.1094 m. Wings of the net were triangular in shape with an mesh size varied between 35-50 mm. Upper wing panel was larger than lower panel. Mesh sizes recorded for overhang section were almost same as that of wing section. The breadth, and mesh size were decreasing from first to last belly section, whereas average number of meshes per metre was increasing from first to last belly. Mesh sizes for belly section of the net have ranged from 25-50 mm. Cod end mesh size of trawl net operated from different landing centres was same with 20 mm size. In Ratnagiri, four seam trawl net was used mainly to catch shrimps.

Keywords: Ghan Dol, Four seam trawl, Shrimp trawl, Design

1. Introduction
Trawl is an important marine fishing gear, nearly 20 per cent of the marine fish landed in the world is caught by this gear [15]. It is very common and popular fishing method in all maritime nations of the world. It is funnel shaped towing gear, with net-webbing body closed on backside with cod end and with extended sides on front to form wings. These wings stretch out in front on either sides to form oval shaped mouth, which increases the swept area and guide the fish towards the cod end. It functions on the principle of catching fish by filtering water as the net is towed. Along Ratnagiri coast different trawl nets are used from the trawlers such as shrimp otter trawl are mainly used to catch the shrimps locally known as Ghan Dol, high opening bottom trawl (HOBTs) are operated to catch fishes locally known as Disco dol and fish cum shrimp otter trawl is operated to catch both fishes as well as shrimps locally known as Ghan sapat, Popat dol and Shankar-Parvati [6].

Variations in design and characteristics of trawler and trawl net are affected by geographical variation, species caught as well as experience and skill of the fisherman. The trawl nets used along the Ratnagiri coast are fabricated by local net braider [6] and the fabrication of the net is as per the individual requirement of fisherman and prevailing local practices without following any standard design or specifications but are largely based on the individual fishing experience [9]. Thus, variation in designs pattern and rigging practices are observed. Therefore, present study was undertaken to know the variations in design features trawl net operated along the Ratnagiri coast.

2. Material and Methods
Four main marine fish landing centres in the Ratnagiri namely the Jaigad (17° 18’ 03” N and 73° 13’ 16” E) and Kasarveli (17° 02’ 30” N 73° 17’ 54” E) situated at north of Ratnagiri, Mirkarwada (16° 59’ 42” N and 73° 16’ 14” E) situated in the Ratnagiri town, while the Purnagad (16° 48’ 41” N and 73° 18’ 00” E) situated south of Ratnagiri town were selected for the present study. The trawlers and trawl nets operated along the Ratnagiri coast from the selected stations were the sampling units for the present research work. Structured schedule comprising of two major sections was formulated. The first section was for vessel details and second for the details of trawl nets. The information included in the first section was recorded according to Sreekrishna and Shenoy (2001)[15] whereas the information in the second section

Correspondence
Sushil C Kamble
Gear Technician, Diploma in Fisheries Engineering, Shirgaon, Ratnagiri, Maharashtra, India
was collected according to Neethiselvan and Brucelee (2003) [10]. The collected data was analysed for the required parameters.

3. Results and Discussion

*Ghan Dol* is a local name for trawl net made up of upper, lower and two side panels joined together with four seams and used mainly to catch shrimps. The shrimp trawls used along the Thoothukkudi coast were with two seam (Neethiselvan and Brucelee, 2003) whereas the shrimp trawls used along the Ratnagiri coast were with four seams. Majority of this type of trawl nets were with five belly sections (76.19%) while only 23.81% were with six belly sections. Number of belly sections for shrimp trawl net as reported by various workers were two along the Cochin coast (Varghese *et al*., 1968; Mhalathkar and Jegadeesan, 1971), three along the Kakinada coast (Satyanarayana *et al*., 1972) and four along the Cochin coast (Perumal and Sreeram, 1964) as well as Veraval coast (Sivan *et al*., 1970). Function of belly section is to guide the captured organisms up to the cod end. Number of belly sections present for trawl net in others part of the country were less than that of number of belly sections for trawl nets operated along the coast of Ratnagiri. The reason for variation in the number of belly sections may be to achieve the higher mouth opening, which was possible only by increasing the number of belly sections to maintain the creasing or baiting ratio from wing section to cod end. In addition to this the increased belly sections may be playing a role in reduction of water resistance by filtering the water faster and indirectly helps in reduction of diesel consumption.

The length of the head and foot rope for the *Ghan Dol* trawl net operated along Ratnagiri has ranged between 18-22 m and 20-26 m respectively. The maximum head rope length was reported by Deshpande and Kartha (1964), Perumal (1966), and Kartha *et al*., (1990), which was nearer to that of the maximum head rope length recorded during the present study but the minimum head rope length reported by other workers (Deshpande and Kartha, 1964; Perumal and Sreeram, 1964; Sivan *et al*., 1970; Mhalathkar *et al*., 1983) was comparatively less than *Ghan Dol*. Length of the foot rope observed during present study was higher than the lengths observed in other studies along the Indian coast (Perumal, 1966; Satyanarayana *et al*., 1972; Kartha *et al*., 1990; Neethiselvan and Brucelee, 2003).

The highest average overall length of five belly sections trawl net recorded was 30.7500 ± 1.1094 m, whereas the lowest value recorded was 25.5150 ± 0.0350 m. Overall length of 13.7 and 21.2 m were reported by Deshpande and Kartha (1964) for four seam trawl nets operated along the Veraval coast, which seems to be too less than overall length of *Ghan Dol*, on the contrary Anon (1998) has reported the higher value of 34.2 m overall length for the four seam trawl designed by CIFT. The overall length of trawl net designed by CIFT was more because of the longer length of wing section. Floats used along the Ratnagiri coast for rigging the *Ghan Dol* net were high density polyethylene (HDPE) which are spherical in shape but the floats used along the Indian coast in other part of country were of aluminium alloy spherical floats (Perumal and Sreeram, 1964; Varghese *et al*., 1968; Sivan *et al*., 1970; Satyanarayana *et al*., 1972). Diameter of float reported by Satyanarayana *et al.* (1972) was 127 mm, which was similar as recorded that of during the present study. *Ghan Dol* was rigged with seven, nine, eleven, thirteen and fifteen floats. The dimensions of floats were 127, 152 and 203 mm. The weight of floats in air has ranged from 1.75-5.04 kg. Galvanised oval interlinked iron chain was used as sinkers for *Ghan Dol*, similarly as that reported by Perumal and Sreeram (1964) but lead spindle shape sinkers were also reported by many workers (Varghese *et al*., 1968; Sivan *et al*., 1970; Satyanarayana *et al*., 1972).

![Fig 1: Schematic diagram of designed Ghan Dol with five belly sections](image-url)
Average values of all measurements recorded on wing section were not significantly different between the stations. The minimum mesh size of 35 mm was recorded at Mirkarwada while the maximum mesh size of 50 mm was observed at all the stations. All maximum values of number of meshes along breadth and outer length of upper as well as lower panels of wings were recorded at Mirkarwada as the maximum length and breadth values for both panels were also recorded at this station only. In addition to this minimum mesh size was also recorded at this station. Therefore, the average number of meshes per metre recorded at Mirkarwada for wing sections were comparatively more than that of average number of meshes per metre recorded at other stations. Mesh sizes recorded for wing section of four seam trawl were 75 mm (Perumal and Sreeram, 1964; Perumal, 1966), 80 mm (Sivan reported for wing section of four seam trawl were 75 mm meshes per metre recorded at other stations. Mesh sizes were comparatively more than that of average number of meshes per metre recorded at Mirkarwada. Minimum mesh size was also recorded at this station. Therefore, the average number of meshes per metre recorded at Mirkarwada for wing sections were comparatively more than that of average number of meshes per metre recorded at other stations. Mesh sizes reported for wing section of four seam trawl were 75 mm (Perumal and Sreeram, 1964; Perumal, 1966), 80 mm (Sivan et al., 1970), 38-50.8 mm (Mhalathkar and Jegadeesan, 1971) and 35-90 mm (Mhalathkar et al., 1983). The maximum mesh size recorded for the belly sections of Ghan Dol were of higher magnitude than the mesh size reported for the belly sections by Perumal and Sreeram (1964) but were in accordance with mesh size reported by Mhalathkar and Jegadeesan (1971).

The number of meshes along the breadth of different belly sections as reported by various workers (Deshpande and Kartha, 1964; Perumal and Sreeram, 1964; Perumal, 1966; Sivan et al., 1970; Mhalathkar and Jegadeesan, 1971; Satyanarayana et al., 1972; Mhalathkar et al., 1983) for trawl net operated along the Indian coast were with lower values than the number of meshes recorded for different belly sections of Ghan Dol. The number of meshes along length for the first belly sections as reported by Varghese et al. (1968), Mhalathkar and Jegadeesan (1971) and Satyanarayana et al. (1972) were more in number than the number of meshes recorded along length during the present study while number of meshes reported by Mhalathkar and Jegadeesan (1971) were same as that recorded during the present study. Number of meshes along length for the remaining belly sections of trawl net operated along the Indian coast (Perumal, 1966; Sivan et al., 1970; Satyanarayana et al., 1972; Mhalathkar et al., 1983) were with lower values than the number of meshes observed along length of belly sections for trawl nets operated along the Ratnagiri coast. This was due to the mesh size reported for the belly sections by them were with higher magnitude.

Cod end in local language is known as cattan, with a narrow rectangular end of the trawl usually with heavy construction of small meshes. It is closed and held at extreme end with a rope. The mesh sizes of the cod end section for the Ghan Dol operated from different landing centre was 20 mm. Mesh sizes reported for the cod end section of four seam trawl were 25-31 mm (Deshpande and Kartha, 1964), 25 mm (Perumal and Sreeram, 1964; Perumal, 1966; Satyanarayana et al., 1972; Mhalathkar et al., 1983), 40 mm (Sivan et al., 1970) and 25.4 mm (Varghese et al., 1968; Mhalathkar and Jegadeesan, 1971). Mesh size recorded for the cod end sections of Ghan Dol operated along the coast of Ratnagiri were of lower magnitude as compared to the mesh size reported along the Indian coast. Five or six side panels were recorded for the Ghan Dol operated from the coast of Ratnagiri which was running through wing, overhang and up to the third or fourth belly sections. The side panels for four seam trawl net operated along the Indian coast were running through wing, overhang and up to the cod end thus the number of side panels were more than number of side panels recorded during the present study. Number of side panels for the shrimp trawl net as
reported by various workers were four (Perumal, 1966; Varghese et al., 1968; Sivan et al., 1970; Mhalathkar and Jegadeesan, 1971) and five (Perumal and Sreeram, 1964; Satyanarayana et al., 1972; Mhalathkar et al., 1983). Minimum of 23 numbers of meshes per metre were recorded for first side panel while maximum value of 33 numbers of meshes per metre square were recorded for fifth side panel. Mhalathkar and Jegadeesan (1971) as well as Satyanarayana et al. (1972) have reported higher values for number of meshes along the length of second side panel as compared to number recorded during present study while lesser number of meshes than recorded during the present study were also reported by other workers (Perumal and Sreeram, 1964; Perumal, 1966; Varghese et al., 1968; Sivan et al., 1970; Mhalathkar et al., 1983). The number of meshes along length of third side panel as reported by Varghese et al. (1968), Mhalathkar and Jegadeesan (1971) and Satyanarayana et al. (1972) as well as for fourth side panel as reported by Perumal and Sreeram (1964) were with more number than the present study. Rest all reported number of meshes per metre square of side panel were with lesser number (Perumal, 1966; Sivan et al., 1970; Mhalathkar et al., 1983). Number of meshes along depth reported by many workers for third, fourth and fifth panels were with lower values as compared to number of meshes recorded during the present study. Length of second side panel and number of meshes along the length of second side panel were significantly different from the standard net of FAO (1978). Length of first and second side panel was significantly different from the standard net design recommended by CIFT (1998).

All measurements observed for side panel sections of six belly sections trawl were with higher values than the same measurements observed in five belly sections Ghan Dol, as the mesh sizes recorded for six belly sections net were larger than mesh sizes of the five belly sections trawl net. In case of six belly sections trawl net the number of meshes along length of second side panel were significantly different from the standard net of FAO (1965). Length as well as number of meshes along length of second side panel was also significantly different from the standard net of FAO (1978). The length and number of meshes along the length of first and second side panel were significantly different from the standard net of CIFT (1998).

### Table 1: Details of specifications of designed Ghan Dol with five belly sections

<table>
<thead>
<tr>
<th>Material</th>
<th>Type of knot</th>
<th>Twine size (mm)</th>
<th>Stretched mesh (mm)</th>
<th>Upper edge</th>
<th>Lower edge</th>
<th>Length</th>
<th>Foot rope length</th>
<th>Head rope length</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density polyethylene (HDPE)</td>
<td>Single trawl knot</td>
<td>3/3 or 2/3</td>
<td>40 40 40 35 30 25 20 20 40 40 40 35 30</td>
<td>110 76 446 380 300 225 147 90 76 76 174 144 140 100 101 106 80 140</td>
<td>- - 380 300 225 147 90 76 76 174 110 92 82 1</td>
<td>155 140 52 106 80 140 144 130 190 102 101 106 80 140</td>
<td>-20-26 m</td>
<td>18-22m</td>
</tr>
</tbody>
</table>

### 4. Conclusion

In general it can be concluded that the mesh sizes recorded during the present study for all the sections of Ghan Dol were smaller than the mesh sizes reported elsewhere in India or other parts of world. Therefore, the number of meshes along length and breadths of different sections of Ghan Dol were also more. The larger mesh size trawl net operated elsewhere along the Indian coast were more efficient in catching fish than shrimp, but the Ghan Dol is specifically designed to catch shrimp. The catch composition of this net was not recorded during the present study. Thus, efficiency of this net to catch shrimp or fish cannot be said, but mesh sizes recorded for Ghan Dol indicates that the net is primarily fabricated for shrimp. The six belly sections Ghan Dol was with larger mesh size than the five belly sections Ghan Dol and the sixth additional belly might have been used to increase the actual vertical opening of net. Therefore, it can be concluded that the fisherman are modifying their nets to capture the off bottom fishes along with shrimp to increase the income as shrimp catches are deceasing over a period of few decade.

### 5. Acknowledgement

The authors wish to thank the authorities of College of Fisheries, Ratnagiri (Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli) for providing necessary facilities, their kind encouragements and guidance during the course of the investigation.

### 6. References