

# ENGINEERING INSIGHTS INTO MARINE DRIFT GILL NETS OPERATED ALONG THE COAST OF RATNAGIRI, M.S., INDIA

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**Abstract** – The study provided a comprehensive study of the fishing gear locally known as “*Vahilyachi jal*” offering insights into its design, construction and application for targeting mackerel, pomfret, seer fish, and tuna. The gear’s specifications cover a range of features, including main webbing mesh sizes ranging from 52 to 150 mm to target different group of species, twine types comprising PA monofilament and multifilament. Dimensions such as hung length (47.25 to 108.57 m) and hung depth (4.25 to 11.74 m) are detailed, along with webbing color variations. The gear incorporates selvedge twine types (PE multi, PA multi, PA mono), head rope materials (PP), and float specifications, including circular and disc-shaped dimensions. Additionally, the study examines foot rope details, sinker types, and associated weights. The total fleet length ranged from 182 to 2560 m, with an operational depth of 10 to 73 m. The fishing craft used include non-mechanized boats, motorized FRP and wooden boats, and FRP mechanized boats, featuring engine horsepower from 9 to 50 HP. This detailed abstract provides a comprehensive summary of the “*Vahilyachi jal*” fishing gear, emphasizing its adaptability and functionality in diverse fishing scenarios.

## INTRODUCTION

Gill net is one of the important traditional gears, have been in use in near-shore waters throughout the world for centuries. The origin of gill net fishing cannot be traced with certainty. The design, construction, and operation of gill nets are so simple that it seems plausible that they may have been developed independently in different parts of the world. The earliest evidence came from herring drift nets of North Sea in the 11<sup>th</sup> and 12<sup>th</sup> centuries, and this was to become one of the most economically important of all gill net fisheries (Northridge, 1991). The first major breakthrough in the technical development of gill net fishery has been its netting material revolution and the second has been the mechanization of hauling work by the introduction of net haulers (Yamaha, 1979). Gill net is a highly energy efficient fishing gear which consume only 0.25 kg of fuel for catching 1kg of fish as compared to 0.8 kg by trawling (Gulbrandsen, 1986). It is also considered as a very selective gear as very few fishes

are caught in gill nets whose length differs from the optimum by more than 20% (Baranov, 1948).

Maharashtra state is one of the major marine states in India. It has 720 km coastal line spread all over the maritime districts *viz.* Thane, Mumbai, Raigad, Ratnagiri and Sindhudurg. The fish potential of state is estimated at 6.0 lakhs tonnes. The marine fish production during the year 2021-22 was 4.33 lakhs tonnes and its percentage to the state potential is 72%. The fishing fleet operating along the Maharashtra coast during the year 2021-22 comprised of 13,172 mechanized boats and 2,352 non mechanized boats. In Ratnagiri a total of 817 mechanized and 102 non-mechanized numbers of gill netters are in operation (Anon., 2022).

Many changes have taken place in the gillnets with respect to the material used, net dimensions, mesh size and mode of operation (Vijayan *et al.*, 1993) etc. Therefore, this research paper is an attempt with the objective of documenting the design and technical specifications of the marine drift gill nets operated from Ratnagiri.

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## MATERIALS AND METHODS

Five important fish landing centers from Ratnagiri city (16° 58' 57" N latitude and 73° 18' 43" E longitude) namely, Mirkarwada, Sakhartar, Bhagwati Bandar, Rajiwada and Karla were selected for the present study. Different types of marine drift gill nets operated by the various types of gill netters from the selected fish landing stations of Ratnagiri were undertaken as the sampling units for the present investigation. The detail information regarding design and construction of gill nets was undertaken by physical sampling of the units and by collecting information from gill net owners in the study area. Interview schedule was prepared in proper way to collect required information to satisfy the objectives of the present study. Structured data collection schedule formulated for the present study comprised of two major sections. The first section dealt with the particulars of gill net owner and the fishing vessel used for drift gill net operation. The second section dealt with the technical specifications, design aspects, rigging and the mode of operation of the marine drift gill nets used by the fishermen of Ratnagiri. The information included in the first section was recorded according to Sreekrishna and Shenoy (2001) whereas, the information in the second section was physically collected and recorded according to Thomas and Hridayanathan (2006).

## RESULTS AND DISCUSSION

The fishing gear locally known as “*Vahilyachi jal*” was identified in this study as a versatile gill net designed for targeting mackerel, pomfret, seer fish, and tuna. The detail specification of marine drift gill net operated from Ratnagiri is shown in Table 1. The gear exhibited a diverse set of specifications, starting with a main webbing mesh size ranging from 52 to 150 mm to capture variety of different species, utilizing both PA monofilament and multifilament twines with diameters ranging from 0.20 to 0.32 mm and specifications varying from 210×3×3 to 210×12×3. Similar type of observation was recorded by, Dar *et al.*, (2017) in which he studied drift gill net specifically used for catching seer fish in selected landing centres of Junagad district of Gujarat and he observed that, net having mesh size ranging between 60 to 160 mm and having specifications 210d×2×3 to 210d×12×3 were used according to mesh size. Gill nets of different mesh sizes ranging

from 20 to 170 mm targeted at different groups of fishes were prevalent along the coast of Pulicat, Tamil Nadu, India (Mariappan *et al.*, 2019). The hanging coefficients, crucial for effective deployment. Present investigation, showed a horizontal hanging coefficient (E) was ranged in between 0.40 and 0.67, and a vertical hanging coefficient ( $1-E^2$ ) ranging from 0.73 to 0.91. The gear's dimensions included a hung length spanning 47.25 to 108.57 m and a hung depth of 4.25 to 11.74 m. Additionally, the total hung depth, incorporating the selvedge, was observed between 4.41 and 11.92 m. Design specifications of gill net operated along the lower stretches of Vembanad Wetlands, Kerala, was studied by Ajay and Amrutha (2021) and they found that, gill net constructed in Vembanad Lake were of monofilament as well as of multifilament Nylon (PA) and net overall length was in between 25 to 55 m with a hung depth of 2 to 3 m.

Sitarama Rao *et al.* (1980) studied the effect of white, green, blue and yellow coloured drift gill nets on their catching efficiency of the species like *Scomberomorus guttatus*, *Scomberomorus commerson*, *Scomberomorus lineolatus*, *parastomateus niger*, *Euthynnus affinis* and *Carcharius melanopterus*. Their study revealed that, white nets were more effective for *S. guttatus* while the coloured ones caught more of *P. niger*. The catching rate was different for different coloured nets. *P. niger* was caught more in green nets. Similar observation was recorded in Ratnagiri, where, the webbing of drift gill nets, itself exhibited a range of colors, from colorless to light green, green, and brown. Colourless gill nets were used for mackerel fishing, light green to catch pomfret and dark green and brown colour was preferred to catch seer fish. On the contrary, yellow and white coloured gill nets were found more effective for hilsa and pomfret by Mohan Rajan and George Mathai (1988) off Saurashtra coast and same colour for gill net webbing construction was recommended by Kunjipalu *et al.* (1984).

The selvedge twine types comprised PE multi, PA multi, and PA mono, with diameters ranging from 1 to 2 mm. The head rope along with floats and foot rope along with sinkers plays crucial role in drift net stability under water. Dar *et al.*, (2017) reported PP head rope of 9 mm diameter and expanded PVC of 4 to 12 in number per net as floats and circular concrete sinkers of 2 to 8 number per net in his study in Junagad district of Gujarat. On the other hand, in Ratnagiri, head rope was made of PP and had a diameter varying between 3 and 8 mm. Floats

were crafted from plastic or PVC, with circular dimensions of 55 to 80 mm or disc-shaped dimensions of 70 to 140 mm in diameter and 15 to 20 mm in thickness. The foot rope, also made of PP, had a diameter of 3 to 4 mm. The sinker, essential for maintaining depth, was disc-shaped and composed of cement, with dimensions ranging from 70 to 140 mm in diameter and 15 to 20 mm in thickness, and a weight spanning 150 to 500 g. The total fleet length ranged from 182 to 2560 m, with an operational depth of water between 10 and 73 m. Design of drift gill nets operated in Bhayandar estuary was studied by Pradhan *et al.* (2017). They reported that, the drift gill net was fabricated using PA multifilament of 0.23 to 0.26 mm diameter twine with average mesh size of 90 mm. Hung length and hung depth was varied in between 38 to 53 m and 4.62 to 7.22 m respectively with a total fleet length of 65 to 80 m. Even they reported that, 10 to 12 number of plastic or FRP floats were used on head rope and stone or cement brick (300 to 400 g) of same number was

used as sinker on foot rope and operational water depth was 10 to 12 m. During present study it was calculated that, the ratio of twine size and mesh for PA multifilament drift gill nets was 0.01 while for PA monofilament used for target species like mackerel, pomfret fish gill nets, the twine size-mesh size ratio ranged between 0.002 and 0.005.

The design and rigging of different marine gill nets were examined during present study to find out the distribution of floats. It was found that, in multifilament gill net specially used for seer fish, the floats were spaced at an average distance of 90% of the total hung depth. Whereas, in monofilament gill nets with a target species like mackerel and pomfret, the distance was ranged in from 38.36 to 69.87 % of the total hung depth.

The fishing craft employed in conjunction with this gear encompassed a variety of vessels, including traditional non mechanized dug-out canoes, wooden boats, motorized FRP and wooden boats, and FRP mechanized boats. The horsepower of the

**Table 1.** Specification of marine drift gill net operated from Ratnagir

Local name	<i>Vahilyachi jal</i>
Target species	<i>Mackerel, Pomfret Seer fish, Tuna</i>
Main webbing mesh size (mm)	52-150
Twine type	PA mono or multifilament
Twine specification/ diameter (mm)	Monofilament : 0.20-0.32 Multifilament : 210×3×3 to 210×12×3
Horizontal hanging coefficient (E)	0.40-0.67
Vertical hanging coefficient (1-E2)	0.73-0.91
Hung length (m)	47.25-108.57
Hung depth (m)	4.25-11.74
Colour of webbing	Colourless/light green/Green/Brown
Selvedge Twine type	PE multi/PA multi/PA mono
Selvedge specification/ diameter (mm)	Monofilament : 1-2 Multifilament : 210×2×3
Total hung depth (m)	4.41-11.92
Head rope material	PP
Head rope diameter (mm)	3-8
Float material	Plastic/PVC
Float dimensions (mm)	Circular : 55-80/65×17 Disc shaped : Diameter :70-140 Thickness : 15-20
Foot rope material	PP
Foot rope diameter (mm)	3-4
Sinker type material and dimension	Cement (Disc shaped) Diameter : 70 to 140 Thickness : 15-20
Sinker weight (g)	150 to 500
Total fleet length (m)	182-2560
Depth of operation (m)	10-73
Fishing craft	Dug-out canoe, Wooden, FRP motorized and wooden, FRP mechanized
Horse power of the engine (HP)	Nil-50

engines of motorized and mechanized boats ranged from 9 to 50 HP, reflecting the adaptability of this fishing gear across different types of fishing vessels and operational requirements. This detailed description provides a comprehensive overview of the drift gill net “*Vahilyachi jal*” fishing gear, shedding light on its design, construction and its operation in marine fishing conditions.

### CONCLUSION

The documented information on the design and construction characteristics of marine drift gill nets of Ratnagiri, Maharashtra would serve as a base line information for the constructional and technological modifications of these gill nets may undergo to increase their efficiency in the coming years.

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**Conflict of Interest:** None

### REFERENCES

- Ajay V.S. and Amrutha Krishnan, R. 2021. Design Characteristics and Specifications of Gill Net Operated Along the Lower Stretches of Vembanad Wetlands, Kerala, India. *J Aquac Res Development*. 12: 649.
- Anon., 2022. Fish production report, 2021-2022. Department of Fisheries, Govt. of Maharashtra, Mumbai: 182 p.
- Baranov, F.I. 1948. Theory of fishing with gill nets, In: *Theory and Assessment of Fishing Gear* (Translated from Russian), Maple, Out: 45 p.
- Dar, S.A., Desai, A.Y., Sayani, A.N. and Sharma, J. 2017. Design features of Seer fish gill nets operated by OBM along the selected landing centres of Junagadh District, Gujarat. *Bull. Env. Pharmacol. Life Sci.* 6(7): 101-105
- Gulbrandsen, O. 1986. Reducing fuel costs in small scale fishing boats, BOBP/WP/27. *Bay of Bengal Programme*. Madras: 18 p.
- Kunjipalu, K.K., Boopendranath, M.R., Kuttappan, A.C. Subramonia, Pillai, N., Gopalakrishnan, K. and Kesavan Nair, A.K. 1984. Studies on the effect of colour of webbing on the efficiency of gill nets for hilsa and pomfret off Veraval, *Fishery Technology*. 21: 51-56.
- Mariappan, S., Kalaiarasan, M. and Felix, S. 2019. Design and technical specifications of marine gill nets of Pulicat, Tamil Nadu, India. *Journal of Entomology and Zoology Studies*. 7(4): 220-223.
- Mohan Rajan, K.V. and George Mathai, P. 1988. Operation of coloured gill nets off Saurashtra coast. *Fishing Chimes*. 8(2): 30-37.
- Northridge, S.P. 1991. Drift net fisheries and their impact on non-target species: A worldwide review. *FAO Fisheries Technical Paper*, 320. Rome, FAO: 115p.
- Pradhan, S.K., Abuthagir Ibrahima, S., Kamat, S.S., Nakhawa, A.D. and Shenoy, L. 2017. Design and catch composition of drift gill net in Bhayandar estuary, Maharashtra. *J. Indian Fish. Assoc.* 44 (2): 15-24.
- Sitarama Rao, J., Percy Dawson and Sreekrishna, Y. 1980. Effect of colour on the catch of gill nets. *Fishery Technology*. 17: 75-77.
- Sreekrishna, Y. and Shenoy, L. 2001. Fishing gear and craft technology. Directorate of Information and Publication of Agriculture. Indian Council of Agricultural Research, New Delhi: 242 p.
- Thomas, S.N. and Hridayanathan, C. 2006. Design and general characteristics of marine gill nets of Kerala. *Fishery Technology*. 43 (1): 17-36.
- Vijayan V., Varghese, M.D., Edwin, L., Thomas, S.N. and George, V.C. 1993. Coastal gill nets of Kerala-Changes in three decades, In: *Low Energy Fishing. Fisheries Technology* (Special Issue on Low Energy Fishing) Society of Fisheries Technologists, India: 170-176.
- Yamaha, 1979. Fundamental knowledge of gill net fishing. *Yamaha Fishery Journal*. 6: 50-51.