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RESEARCH ARTICLE

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Design aspects of ring seine nets without pocket of Ratnagiri, Maharashtra

R.R. JADHAV, A.S. MOHITE AND T.G. KAZI

ABSTRACT

Ring seine was a very recent introduction in Ratnagiri and was operated mainly to catch oil sardine and mackerel shoals moving in the surface and column waters. The ring seine was operated from small fibre glass reinforced plastic (FRP) craft fitted without board motor (OBM). The design, construction and operational details of the ring seine without pocket operated from Ratnagiri have been described in this paper. The total length of the ring seine without pocket was in the range of 336.6 to 540 m with depth of 36 to 45 m. The webbing of the ring seines were made of polyamide (PA) knotted netting having mesh size of 14 to 20 mm. Ring seine without pocket were mostly operated near to the coast in the depth less than 30 m using the basic principle of encircling the shoal with the help of 8 to 12 crew members.

Key words : Design, Ring seine without pocket, Ring seine, Polyamide

INTRODUCTION

Marine fisheries sector of Ratnagiri has witnessed many technological innovations during the past decades. Ring seine was a very recent introduction in Ratnagiri and was operated mainly to catch oil sardine and mackerel shoals moving in the surface and column waters. Ring seines have been used by small scale fishermen and was operated from small craft made of fibre glass reinforced plastic (FRP) fitted with out board motor (OBM).

The Central Institute of Fisheries Technology (CIFT), Cochin developed and introduced ring seine in Kerala in the year 1982-83 (Panicker *et al*., 1985). Ring seine fishery of Kerala and other parts of India has been subjected to several studies (Balan *et al*., 1989; Anonymous, 1991; Rajan, 1993, Edwin and Hridaynathan, 1996 and Vijaykumaran and Chittibabu, 2005).

This paper presents the variations observed with respect to the design, material used, net dimensions, mesh size, etc of the ring seine without pocket. Rigging of the nets and method of operation have also been described.

MATERIALS AND METHODS

The present investigation was undertaken during the period August, 2009 to May, 2010. Structured schedule comprising of two major sections was formulated for the present study. The first section dealt with the particulars of the ring seine net operators of Ratnagiri and the vessel details were recorded according to Sreekrishna and Shenoy (2001) and the second section for the design and technical specifications of the net which was undertaken by physically sampling the unit and recording the data according to Sadanandan *et al*. (1975) and Hellevang (1971). The design of the gear was documented according to Nedelec (1975). Data was analyzed with the appropriate statistical procedures wherever required.

RESULTS AND ANALYSIS

The technical specifications of the ring seine without pocket operated from Ratnagiri are presented in Table 1 and its design is presented in Fig.1. The main parts of the net were the bunt (*Mand*), shoulder, main body, wing (*Kan*) on either sides of the bunt and selvedge (*Palgi*). Edwin and Hridaynathan (1996) reported that ring seine of Kerala has three main parts *viz.*, the central bunt portion (*adi vala*) and two wing portions (*kaivaram*) on either side of the bunt. The full length net was formed by joining a total of 20 to 27 number of rectangular pieces. The stretched height of all the sections of main webbing was same in the ring seine without pocket. The selvedge pieces with rigged floats and sinkers are laced to the respective sides of each sections of the main webbing separately by Polyamide (PA) twine of size 210D/4/3. The bunt part is located at one end of the net. At both ends of the net,

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Table 1 : Technical specifications of ring seine net without pocket operated from Ratnagiri

Webbing	A (bunt)	B (shoulder)	C (main webbing)	D (wing)	E (choke)	F (selvedge of main webbing at float line)	G (selvedge of main webbing at lead line)	H (selvedge of bunt at float line)	I (selvedge of bunt at lead line)
Number of sections	1	1	18-26 (21.5 ± 1.08)	1	-- --	-- --	-- --	-- --	-- --
Material	PA	PA	PA	PE	PP	PE	PE	PP	PP
Type of knot	Trawl	Trawl	Trawl	Trawl	Trawl	Trawl	Trawl	Trawl	Trawl
No. of twine	210/5/3	210/2/3	210/2/3	1-1.5 mm	3 mm	1.5 mm	2.5 mm	2-3 mm	3-4 mm
Stretched mesh size (mm)	14-20 (16 ± 1.08)	14	16-20 (17 ± 0.52)	18-30 (24 ± 3.2)	150-180 (170 ± 6.32)	20-30 (25 ± 2.23)	56-120 (103 ± 12.01)	20-30 (24 ± 2.45)	60-120 (104 ± 11.22)
No. of meshes in length	1100-1400 (1277 ± 59.36)	1800	135-1800 (1788 ± 120.99)	540-2100 (918 ± 369.86)	102 × 43 × 6 (±15.05 × 11.59 × 0.22)	12984-29700 (19024 ± 2826.74)	3132-6118 (4800 ± 485.76)	320-840 (560 ± 103.34)	95-235 (137 ± 23.10)
No. of meshes in depth	81 0-2314 (1893 ± 239.33)	2914	1800-3214 (2400 ± 172.06)	1800-2500 (1518 ± 340.33)	-- --	6-20 (12 ± 3.27)	11-17 (13 ± 1.12)	7-20 (12 ± 3.12)	11-14 (12 ± 0.68)
Stretched length (m)	16.2-28.8 (20.44 ± 2.21)	25.2	25.2-32.4 (30.40 ± 1.62)	16.2-37.8 (22.05 ± 5.26)	-- --	324.6-546.6 (425.52 ± 40.93)	342.6-570 (445.14 ± 41.91)	9.6-16.8 (12.48 ± 1.35)	10.5-17.7 (13.38 ± 0.35)
Stretched depth (m)	16.2-36 (30.30 ± 2.88)	40.80	36-45 (40.80 ± 1.4)	32.4-45 (36.45 ± 2.97)	-- --	0.15-0.4 (0.27 ± 0.05)	0.95-1.68 (1.35 ± 0.15)	0.14-0.4 (0.27 ± 0.05)	0.78-1.70 (1.32 ± 0.17)
Hanging coefficient at float line	0.5-0.63 (0.57 ± 0.02)	0.66	0.50-0.80 (0.64 ± 0.02)	0.58-0.81 (0.72 ± 0.05)	-- --	-- --	-- --	0.93-0.96 (0.94 ± 0.00)	-- --
Hanging coefficient at lead line	0.53-0.68 (0.62 ± 0.02)	0.7	0.52-0.83 (0.67 ± 0.03)	0.61-0.87 (0.77 ± 0.05)	-- --	-- --	0.96-0.98 (0.97 ± 0.00)	-- --	0.94-0.96 (0.95 ± 0.00)
Vertical hanging coefficient	0.82	0.75	0.76	0.69	-- --	-- --	-- --	-- --	-- --

Table 1 contd....

Ropes and Lines

Ropes and Lines	Float line (a)	Lead line (b)	Line of ring bridle attachments (c)	Purse line (d)	Bridle of Choke (e)	Ring bridle (f)	Tow line	Lifting line	Lacing twine for joining main webbing sections
Material	PE	PP	PP	PP	PP	PP	PP	PP	PE
Diameter (mm)	10	8	8-10 (8.33 ± 0.33)	20-24 (20.67 ± 0.66)	8-14 (10.00 ± 1.26)	8-10 (8.33 ± 0.33)	10-24 (16.80 ± 2.62)	8	1
Length (m)	336.6-540 (444.57 ± 35.89)	355.5-564.3 (463.35 ± 37.95)	355.5-564.3 (463.35 ± 37.95)	450-715.56 (574.61 ± 52.07)	1-1.2 (1.07 ± 0.04)	5.5-9 (0.08 ± 0.55)	45-100 (76.67 ± 9.62)	7.8-21 (13.70 ± 2.09)	-- --

Other accesaries

Other Accesaries	Floats		Leads	Rings
	Unda	Apple		
Total number	655-780 (754.00 ± 28.17)	2600-4400 (3887.00 ± 2821.2)	2083-4912 (3585.00 ± 519.71)	40-63 (51.33 ± 3.00)
Material	EVA	PL	PB	Galvanized iron / brass
Shape	Spindle	Circular	Spindle	Circular
Length (mm)	120	55	38	-- --
Diameter (mm)	83	78	30	100
Thickness (mm)	30	28	5	20
Weight in air (kg) / piece	110	40	0.20	0.80-2.50

Name of gear:	Ring seine (minipurse seine)	Vessel:	Ring seiner
Type of gear:	Ring seine without pocket	Length over all (LOA):	10.9-13 m (11.80 ± 0.62 m)
Length of float line:	336.6-540 m (444.57 ± 35.89 m)	Gross tonnage:	5-5.65 t (5.35 ± 0.19 t)
Total number of sections:	20-27 (23 ± 1.57)	Engine power:	9.9 hp
Depth of stretched netting:	36-45 m (41.70 ± 1.57 m)		

choke with bridles were provided with thicker twines of Polypropylene (PP) 3 mm diameter and large meshes of 150 to 180 mm.

Edwin and Hridaynathan (2006) reported that the ring seine (*thanguvala)* of Ernakulam and Alleppey region of Kerala had length of 300 to 500 m and a depth of 30 to 60 m. The length of the ring seine operated from Ratnagiri was in the range of 336.6 to 540 m with depth of 36 to 45 m.

The ring seines operated from Ratnagiri are made of PA knotted webbing for the main body and bunt. The material used for the selvedge meshes of ring seines are of polyethylene (PE) of diameter 1.5 to 2.5 mm. The float line and lead line was made of polypropylene (PP). On the contrary, Edwin and Hridaynathan (1996) reported that knotless nylon webbing was used for the construction of the traditional *thanguvala* in the Alleppey region of Kerala. Edwin and Hridaynathan (2006) reported that in Ernakulum and Alleppey region of Kerala material used for construction earlier was cotton (1298 Tex, 1 strand, 5 threads). By the time the ring seine was introduced the material was PA knotless webbing (Tex 155).

In Ratnagiri, variation was observed in mesh size of each section of ring seine. The mesh size used for main webbing and bunt was 16 to 20 mm and 14 to 20 mm, respectively. Similar mesh size of 15-20 mm for ring seine was observed by Vijaykumaran and Chittibabu (2005) in Orissa. Edwin and Hridaynathan (2006) reported that the mesh size of the *thanguvala* of Kerala was 18-22 mm. The observations of Edwin and Hridaynathan (2006) were almost similar to the mesh sizes recorded during the present study for the ring seines operated from Ratnagiri.

Prado (1990) stated the actual height of a mounted (rigged or hung) net depended on the stretched height and the hanging ratio. He stated that, the actual depth or height can be considered equal to roughly 50% of the stretched depth of the seine at its extremities, and 60% near the centre of the net. The mounted height or working depth of bunt of ring seines observed during the present study was in the range of 82% of stretched netting, main webbing was 76% of stretched netting and wing was 69% of stretched netting (Graph 1). The observations during the present study for ring seines were higher than that recommended by Prado (1990).

The hanging coefficient was greater on the leadline than on the floatline. The hanging coefficient also varied along the length of the floatline and leadline. The hanging coefficient at floatline was in the range of was 0.57 to 0.72 for bunt while along the lead line was 0.62 to 0.77. Panicker *et al.* (1985) recorded the hanging coefficient of ring seine of Chellanam, Kerala, the hanging coefficient

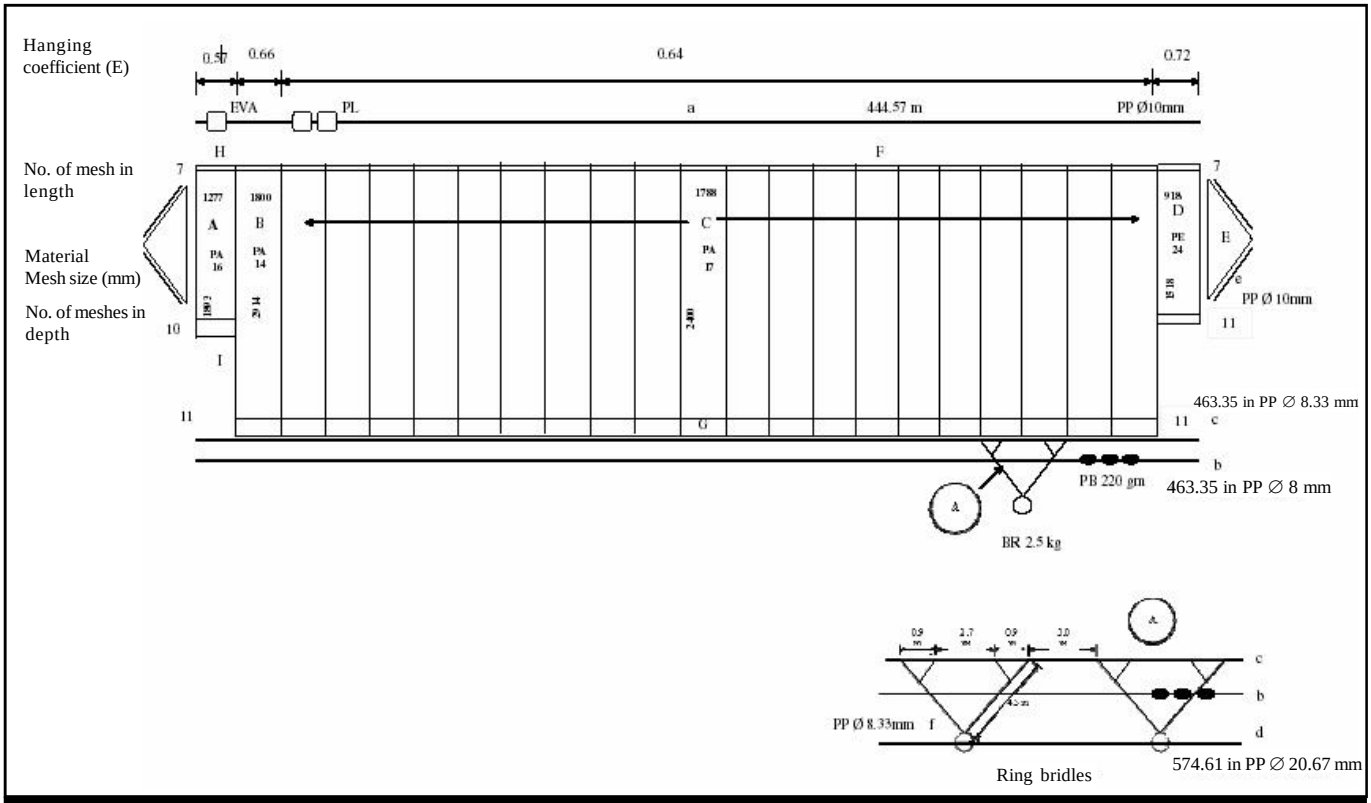


Fig. 2 : Design of ring seine net without pocket operated from Ratnagiri

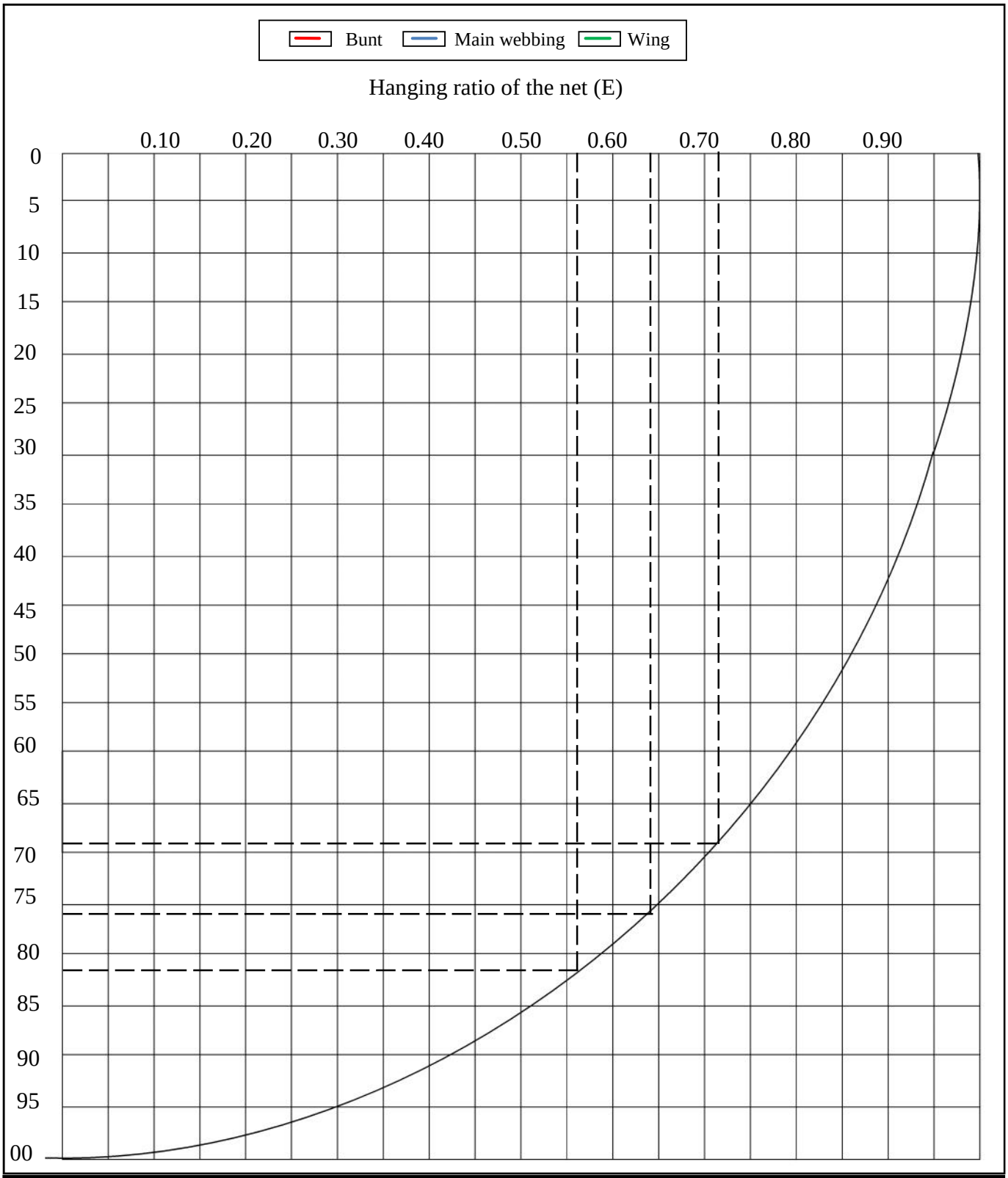
was greater on the foot rope than on the head rope. The hanging coefficient was 0.6 for the head rope and 0.65 for the foot rope. The observations recorded during the present study for hanging coefficient of ring seines of Ratnagiri were on the higher side as compared to the observations by Panicker *et al.* (1985) for ring seines of Kerala.

Average surface area covered (Prado, 1990) by the ring seine net without pocket of Ratnagiri was 13781.83 m^2 and the approximate volume surrounded by the net (Ben-Yami, 1994) at the end of the set, when the leadline reaches the full working depth of the net was 4,92,912.04 m^3.

The depth of the bunt portion of the ring seines operated from Ratnagiri was only 6.80% of the total length of the net. On the contrary, Edwin and Hridaynathan (1996) reported that the depth of the bunt portion of ring seine used in Alleppey and Cochin was only about 10% of the total length of the net and as such was higher than that observed during the present study. According to Donald (1930), the stretched depth of ring nets of California was about 15% of the length. Prado (1990) stated the minimum depth of the seine was 10% of the length. The average depth of the ring seine operated from Ratnagiri was 9.38% of the average length of the net, which were less than that recorded by Donald (1930) and Prado (1990).

Prado (1990) also stated the length of the seine was greater than or equal to 15 times the length of the seiner and minimum length and depth of the bunt was equal to the length of the seiner from which the net was operated. The average length of the ring seines of Ratnagiri was greater than 15 times the average length of seiner, whereas the average length and depth of the bunt was also greater than the average length of the vessel used to operate the net; the observations being in concurrence with Prado (1990).

PP single floatline of diameter 10 mm with floats of ethylene vinyl acetate (EVA) and plastic were used. The single leadline of PP of diameter 8 mm with lead sinkers of 200 g were used. The purseline of PP of diameter 20 to 24 mm was used to pass through the rings. The separate line for ring bridle attachment of 8 to 10 mm diameter is fixed on the bottom selvedges of the net on the fifth or sixth mesh from the leadline. Ring bridles are attached to this line. Galvanized iron or brass rings of 0.8 to 2.5 kg are used. Similar observations were recorded by Panicker *et al.* (1985) in Cellanam, Kerala for the mini-purse seine. The double head rope and foot rope of PP of 10 mm diameter were used with the airoplast floats and lead sinkers of 120 g in weight. The purse line was made of garfil of 12 mm diameter and rings of mild steel of 225 g were used.



Graph 1 : Mounted height of ring seine without pocket

Ring seines were operated from only single vessel and carrier vessel was used for catch displacement. Only FRP vessels were used in Ratnagiri for ring seine operation. The overall length (OAL) of the FRP ring seine vessels varied from 10.9 m to 13 m. The carrier vessel had an average length of 8.5 m and depth of 1.8 m. Edwin and

Hridayanathan (1997) reported that the ring seines in Kerala were operated from one or more large plank built canoes (OAL 12-24 m). Panicker *et al.* (1985) reported that in Chellanam, Kerala the operation of the ring seine required three *thanguvallams* including carrier vessel.

Vessels of ring seines were operated by OBM with 9.9 hp whereas a single cylinder auxiliary engine of 5 hp was fitted on the deck of the vessel for operation of the horizontal warping heads used for quick hauling of the purse line. Edwin and Hridayanathan (1996) reported that currently the large *thanguvalloms* in Kerala used two engines of 25 hp each or a 25 hp engine along with a 40 hp engine. In Ratnagiri, deck equipments used were a purse winch, a purse line reel, guiding blocks, a purse davit. Mobile phones are used for communication and to contact the carrier vessel.

The gear was operated using the basic principle of encircling the shoal. In Ratnagiri, the operation of the ring seine net was accomplished by use of one vessel with 8 to 12 crew members. Skiff was not used for the operation, as master float is used for holding one end of the net during encircling. Edwin and Hridayanathan (1996) described the operation of ring seines of south Kerala coast required 30 to 35 persons; the manpower used being more than double that observed during the present study in Ratnagiri. Ring seines were mostly operated from Ratnagiri near to the coast. On locating the shoal the craft quickly encircled the shoal by dropping the net. The bottom is pursed immediately by hauling the purse line with the help of an auxiliary engine. The catch is emptied and transferred to the carrier vessel for disposal. The carrier vessel was used only for catch disposal.

Ring seines with pocket were operated from Ratnagiri near the coast, generally in the depth less than 30 m. Sathiadhas *et al*. (1993) reported the ring seine was operated along the Kerala coast up to a depth of 45 m. The depth of operation of ring seines of Kerala was more than that of Ratnagiri. With the use of powerful engines and lack of substantial catch in the inshore waters fishermen of Cochin and Alleppey ventured to depth of up to 45 m during the day time and up to 55 m at night (Edwin and Hridaynathan, 1996).

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Address for correspondence :
A.S. MOHITE
Department of Fisheries Engineering,
College of Fisheries (Dr. B.S.K.K.V.),
Shirgaon, RATNAGIRI (M.S.) INDIA
E.mail : ashishmohite@gmail.com

Authors' affiliations :
R.R. JADHAV AND T.G. KAZI
College of Fisheries, (Dr. B.S.K.K.V.),
Shirgaon, RATNAGIRI (M.S.) INDIA

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