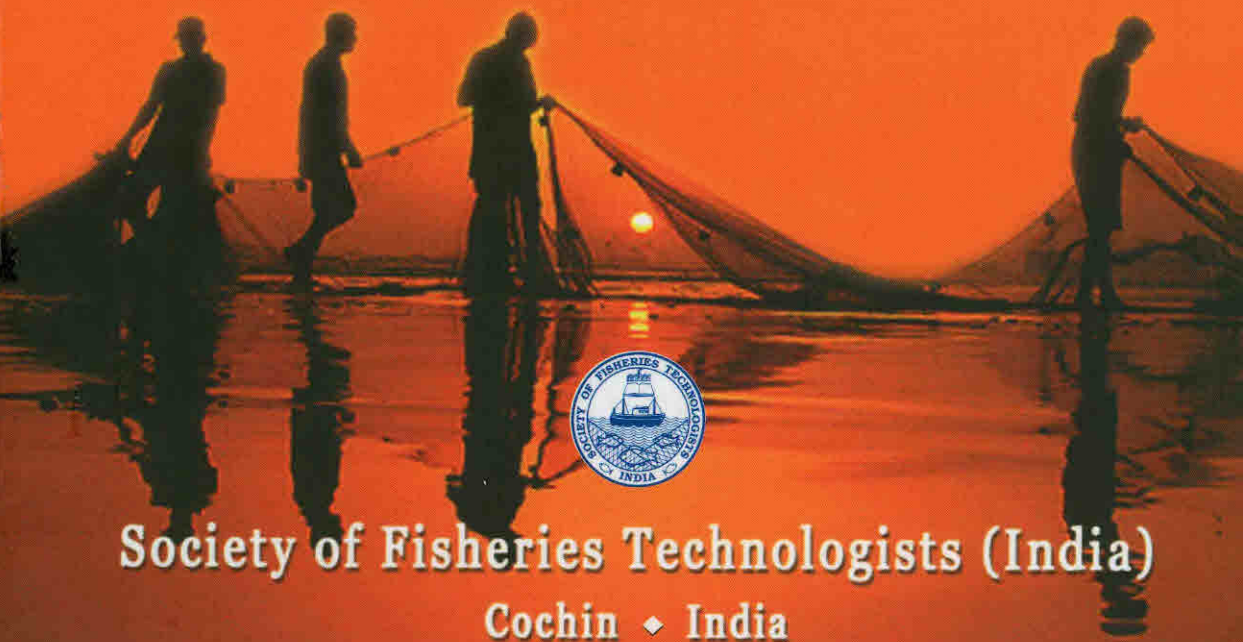
Coastal Fishery Resources of India

Conservation and Sustainable Utilisation



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Ring Seine for the Small Pelagic Fishery

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Introduction

The marine fisheries sector in India has witnessed a phenomenal growth during the last five decades both quantitatively and qualitatively. India ranks seventh in position, contributing about 2.72% (3.9 million tonnes including inland and marine production) to the world fish production for about 143.6 million t (FAO, 2009). The subsistence fisheries during the early 1950s produced about 0.5 million t, annually (Srinath, 2003). At present, the marine fish landings of India is about 3.21 million t with an increase of about 11.3%, compared to the estimate of the previous year (CMFRI, 2009). Out of this production, mechanized sector contributed 74%, followed by motorized (22%) and artisanal sectors (4%), during 2008. Out of marine landings, pelagic resources contributed 71% of the total marine production of Kerala (CMFRI, 2009). Major resources contributing to the pelagic landings were oil sardine (54%), mackerel (13%), carangids (9%), anchovies (6%), tunas (5%), ribbonfishes (4%), seerfishes (2%) and lesser sardines (2%). Ring seine is the most important gear employed for harvesting small pelagic resources like sardines, mackerel and anchovies in the southwest coast of India, especially along the Kerala coast. In Kerala, 86% of oil sardine, 71% of lesser sardines and 67% of mackerel landings were contributed by the ring seine fishery.

Central Institute of Fisheries Technology (CIFT), Cochin developed and introduced a mini purse seine which came to be known as ring seine, for operation from the traditional motorized craft, during 1982-83, as an efficient alternative gear for operation from the traditional boat seine craft *thangu vallom* (Panicker *et al.*, 1985). The uncontrolled increase in fishing effort, in terms of number of fishing units, dimensions of the gear and size and horsepower of the craft, accompanying increasing investment requirements and increase in the proportion of juveniles and sub-adults in the commercial landings have been major concerns in the ring seine fishery (Singh *et al.*, 2007; Kurup *et al.*, 2009). In this paper, the present

status of the technology of ring seine fishing system and the prevalence of juveniles and sub-adults in commercial landings are discussed, based on investigations in the Chellanam area (Ernakulam, Kerala), in the context of the need for development and adoption of a standard design of ring seine, for responsible harvesting of small pelagic resources.

Materials and Methods

The study was conducted as a part of the benchmark survey on ring seine fishery of Chellanam under National Agricultural Innovation Project on *Responsible Harvesting and Utilization of Selected Small Pelagics and Fresh water Fishes*, to assess the present status of the ring seine fishing systems and their operation (CIFT, 2008). Chellanam is a progressive fishing village in the southern part of Ernakulam district (Kerala state, India) and an important centre of traditional ring seine activity. Three separate pre-tested schedules were used for collecting information on craft and gear and on operational expenditure. The data pertaining to the study were collected from twenty ring seine units operating mackerel-sardine ring seine locally known as *thanguvala* and anchovy ring seine known as *choodavala*. A total of 70 fishermen were interviewed out of 2701 registered fishermen of the Chellanam Kandakadavu Fishermen Welfare Development Cooperative Society (CKFDWCS). Representative commercial *thanguvala* and *choodavala* designs were surveyed and details collected. The proportion of juveniles in the ring seine landings were determined, based on the length statistics of the random samples taken from the ring seine landings, at regular intervals, during March-June 2008.

Results and Discussion

Ring seine craft

The large plank-built craft from which the *thangu vala* (ring seines for sardines and mackerel) is operated is locally known as *thanguvallom*. The L_{OA} of large *thanguvallom* used for *thangu vala* operation, varied from 19.8 to 25.9 m, breadth from 3.6 to 4.5 m and depth from 2.1 to 3.4 m and the vessels were powered by inboard diesel engine. Medium size boats with a length range of 10.7-13.7 m known as *vallom*, are used as carrier vessels for transporting the catch from the main ring seine vessel to the landing centre. Smaller vessels in the length range of 13.7-18.3 m known as *vallom* using OBMs were widely used for operating *chooda vala* (ring seine for anchovies) in the Chellanam area.

The *thanguvallom* fitted with marine diesel engines of ALM 370, ALM 400, ALM 402 and ALM 412 (Ashok Leyland, Chennai) are widely used

in Chellanam area and such vessels of 25 m and above are operated in deeper waters along with the 12 m carrier vessel. The carrier vessels were fitted with either one engine of 25 hp or two engines of 9.9, 25 or 40 hp or three engines of 9.9 hp. Diesel engines were fitted in the mid-section of the craft and the rest of the deck space was utilized for storage of fish and fishing gear. Small purse line winches are used to facilitate closing of the gear, after encircling. The *chooda vala* were operated from smaller crafts powered by either inboard diesel engines or OBMs.

Ring seines

Two types of ring seines were operated in Chellanam area. The first type known as the *thangu vala* has a mesh size of 20 mm, hung length ranging from 600 to 1010 m and hung depth ranging from 83 to 105 m, weight ranging from 1500 to over 2500 kg and is used to harvest the pelagic shoaling fishes like the sardines and mackerel. The second type, the *chooda vala* or the *disco vala* has a mesh size of 8-10 mm, hung length ranging from 250 to 500 m, hung depth ranging from 45 to 75 m and is mainly used to harvest anchovies. It is operated within the limit of 50 m. The gear has a roughly rectangular shape, except for the extreme ends where the depth decreases.

Juveniles in ring seine landings

Juveniles are mainly caught in *chooda vala*, as the mesh size of the gear is small (8-10 mm) and the gear is operated in the inshore waters. The incidence of juveniles in *chooda vala* units was observed to be in the range of 20-33% and in *thangu vala* units, the incidence of juveniles was in the range of 5-15%. During the period of observations, the small sardines were sold at Rs. 2-4 per kg, medium size sardines at Rs. 4-6 per kg and large size sardines at Rs. 8-10 per kg, in Chellanam. Sardines and anchovies together accounted for nearly 70% of the total catch of juveniles and sub-adults landed by ring seiners of Chellanam and the rest were contributed by mackerel and shrimps. The juveniles of sardines and anchovies were landed mainly during the months from September to December. The juveniles of mackerel were usually landed during monsoon season and the fishermen get moderate prices, as the quantity landed is less.

Najmudeen and Sathiadhas (2008) reported that juveniles of fishes caught in ring seines constitute oil sardine (30%) and mackerel (15%) of the total catch along the Kerala coast. The gross estimate shows that the annual economic loss due to juvenile fishing made by trawlers, purse

seiners, ring seiners and mini-trawlers together along the Indian coast was around USD 19,445 million whereas the annual revenue generated by these fishing units was only USD 836 million, causing a net deficit of USD 18,609 million per annum. The economic loss due to ring seiners with a fleet size of 2351 was USD 2037 million per annum and it ranked second in generating economic loss among the fishing units operated in Kerala coast. Among the juveniles landed, sardines account for the highest quantity and it is landed mainly in the months from August or early September (Balan, 1968 ; Kumaran *et al.*, 1992).

Increase in fishing effort in ring seine sector of Kerala

It is estimated that there has been an increase in the fishing effort by about 8 times between 1986 and 1994 (Balan and Andrews, 1995). A typical cotton *thanguvala* of the early sixties described by Kuriyan *et al.,* (1962) had a length of 42 m and a depth of 5.2 m. The mini-purse seine introduced by CIFT, during 1982-83, had an overall length of 250 m, and a depth of 15 m at the wing-ends and 33 m at the bunt (Panicker *et al.*, 1985). PA knotless netting of 18 mm mesh was used for construction. Although, the recommended number of ring seines, at the time of introduction, was 300 units, there has been a phenomenal increase in the number of ring seiners operating along the coast of Kerala. The number of ring seine nets in Kerala was estimated as 2259 in 1991 which increased slightly to 2277 in 1998 (SIFFS, 1992; 1999). The total number of ring seine units in Kerala in 1991 was 1738 consisting of 81% from plank canoes, 16% dug out canoes and 3% plywood canoes. The 1998 census showed a reduction of 6% in the number of ring seine units (SIFFS, 1999). A total of 1636 ring seine units were available in 1998, constituted by 75% plank built canoes, 15% plywood crafts and 10% dugout canoe units, showing a significant reduction in the dug out canoe units and increase in plywood canoe units. A significant development in this sector was the introduction of inboard diesel engine which was started in Ernakulam on experimental basis (SIFFS, 1999) (IBM ring seiners) and the trend has continued with increase in size of the craft and engine power. Operational economics of IBM ring seiners has been reported to be better and their environmental impact is considered to be less compared to OBM ring seiners (Kurup and Rajasree, 2003a, 2003b; Singh et al., 2007). A quick 'touch and count' survey of the anchored and hauled up vessels conducted during the trawl ban period in 2006 by the Project Management Cell, Department of Fisheries (DoF, 2006) gives the number of this category of the vessels in the state as 598.

In addition to the increase in number of units, there has been significant increase in overall dimensions of the ring seine, length of the craft and engine horsepower. The size of gear as reported by Edwin and Hridayanathan (1996) showed that average length of a *thanguvala* of Alleppey region was 630 m and depth 100 m with a mesh 18-20 mm. The *thanguvala* reported by D'Cruz (1998) showed that the *thanguvala* had much grown in dimensions. Boopendranath (2000) reported that ring seines operated in Chellanam area typically has a hung length of 585 m and a hung depth of 58 m. Large ring seines up to 900 m length and 90 m depth were reported by Srinath *et al.* (2004) from Thrissur District. In short, in the past twenty years, the ring seine has grown 3-4 times in dimensions, compared to the original design introduced by CIFT.

Contribution of OBM and IBM ring seiners in the marine fish production of Kerala, during 1997-2005 are presented in Table 1. During 2005, ring seine sector contributed nearly 50% of the total marine fish production in Kerala.

Table 1: Production and percentage contribution of OBM and IBM ring seiners in marine fish production of Kerala (1997-2005)

Year	IBM ring seiners		OBM ring seiners	
	Production (t)	Contribution to marine fish production (%)	Production (t)	Contribution to marine fish production (%)
1997	0	0	163335	28.42
1998	0	0	171325	31.57
1999	0	0	234272	40.34
2000	0	0	247943	41.04
2001	154	0.03	191877	37.32
2002	18985	3.22	204922	34.76
2003	27150	4.36	233001	37.38
2004	83689	13.57	205018	33.24
2005	102297	19.08	163245	30.44

Source: CMFRI statistics; adapted from Singh *et al.* (2007)

Standard ring seine design for commercial operations

Fishing trails conducted by Misund *et al.*, (1992) with large mesh netting in the last wing of the purse seine showed that neither herring nor mackerel escaped through the net either during day or night. It was observed that the use of large mesh sections in the wing-ends of the

ring seine reduces the bulk onboard fishing vessel and invariably reduces the fabrication cost of the gear (Edwin and Hridayanathan, 2003). Earlier studies has shown that the escape of small pelagics is near the bunt region where gilling of fish is observed (Edwin and Hridayanathan, 2003). The observations made in the same study show that there exists a selection after pursing in the large mesh ring seines used in the Kerala coast.

In context of excessive fishing effort being expended in the ring seine fishery and the heavy incidence of juveniles in the catches as discussed above, a standard ring seine of length 600 m and depth 60 m with mesh size of 22 mm has been proposed for harvesting sardine and mackerel resources, off southwest coast was developed (Fig. 1). The design of the

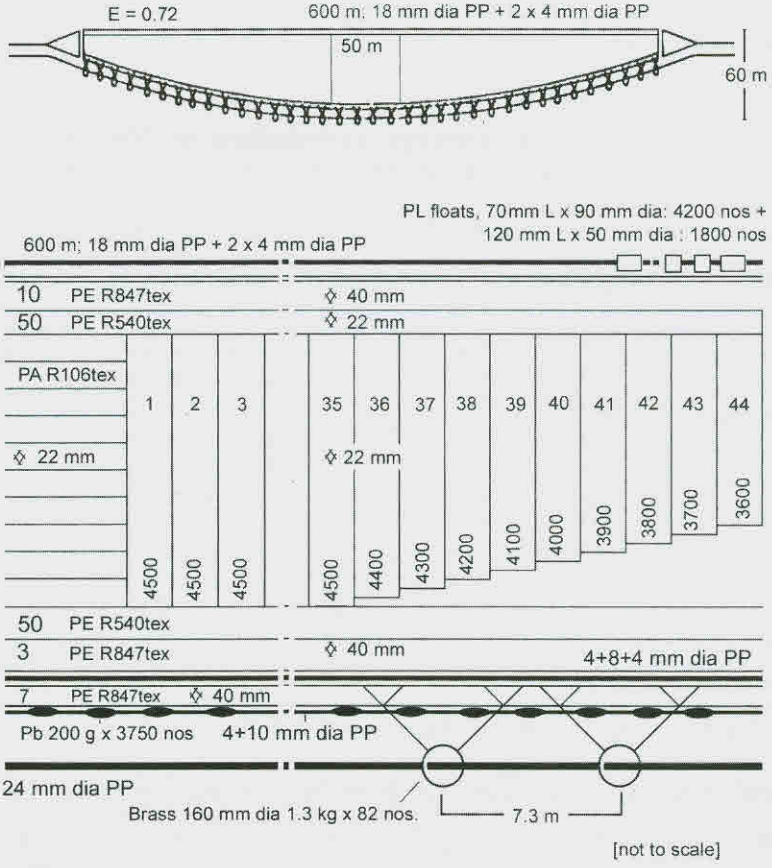

Fig. 1: Design of standard sardine-mackerel ring seine proposed for commercial small pelagic fishery

gear was arrived at, by right-sizing the dimensions of the gear and the mesh size for sardine-mackerel harvesting operations. Two such ring seines have been put to experimental operations, through Chellanam Kandakadavu Fishermen Welfare Development Cooperative Society (CKFDWCS), Chellanam.

The Expert Committee for the Registration of Fishing Vessels (Kurup *et al.*, 2009), recommended that mesh size for sardine-mackerel ring seines for both IBM and OBM categories be regulated at 22 mm or more in the bunt and main body and maximum dimension of the gear be limited to <600 m hung length and <60 m hung depth, for all new and replacement ring seines; and length overall and engine horse power for propulsion be limited to <20 m and <65 hp, respectively, for all new and replacement ring seine crafts. In the case of anchovy ring seines, the recommendation was to regulate the mesh size at 12 mm and limit the maximum dimension of the gear to <250 m hung length and <50 m hung depth, for all new and replacement constructions and to limit engine horsepower to 25 hp; Similar recommendation were given by the Expert Committee for Impact Assessment of Ban on Bottom Trawling Imposed along Kerala Coast (Singh *et al.*, 2007).

Conclusion

In view of the deleterious effect of unregulated increase in size and capacities of the craft, engine power and dimensions of fishing gear and changes in design parameters that have direct influence on the fishing power, the ring seine fishing unit need to be brought under a regime of standardisation and regulation. The adoption of ring seines of standard dimensions and large mesh size will facilitate equitable access to resources, control of fishing effort and juvenile mortality in ring seine operations, in addition to advantages of reduction in investment requirements on fishing gear.

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