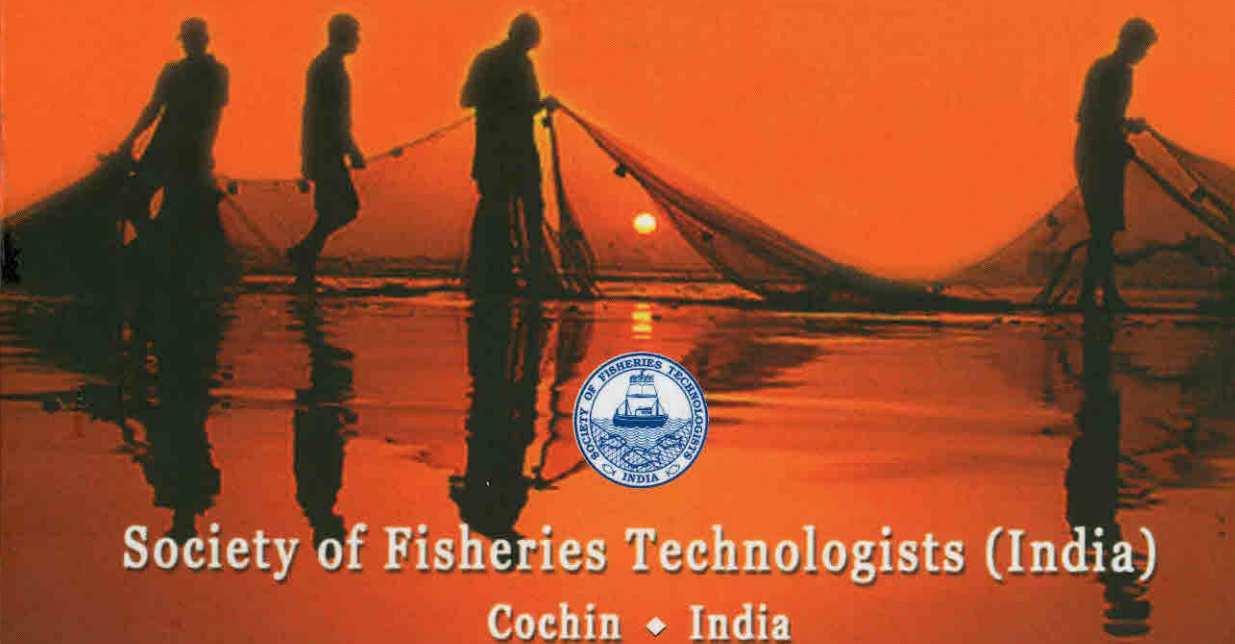
Coastal Fishery Resources of India

Conservation and Sustainable Utilisation



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Improved Large Mesh Purse Seine for Small-scale Mechanised Sector

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Introduction

Purse seining is one of the most efficient and advanced commercial fishing methods. It is aimed mainly at catching dense, mobile schools of pelagic fish and includes all the elements of searching, hunting and capture. A purse seine is made of a long wall of netting framed with float line and lead line having purse rings hanging from the lower edge of the gear, through which runs a purse line made from steel wire or rope which facilitate the pursing of the net. Purse seining accounts for over 30% of the world fish landings (Ben-Yami, 1994a).

Purse seining experiments were conducted in India by the erstwhile Indo-Norwegian Project as early as 1954 (Oommen, 1989). Purse seining was introduced in Goa in 1957 (Sadanandan *et al.*, 1975). Purse seining in the commercial small-scale mechanised sector was started in India in 1974, with the technical assistance of Indo-Norwegian Project (Mukundan and Hakkim, 1980). The purse seines mainly target near shore pelagic shoals like sardines and mackerels and use mesh sizes ranging from 18 to 22 mm. Description of the purse seines and their operation have been given by Verghese (1973), Ben-Yami (1974), Verghese (1976), Ben-Yami (1994a; 1994b), Hameed and Boopendranath (2000), Pravin *et al.* (2008), Pravin (2009), Pravin and Meenakumari (2010a; 2010b) and others.

In this paper, the design details and operational performance of an improved large mesh purse seine introduced for the small-scale mechanised sector are discussed.

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Materials and Methods

The conventional purse seine was re-designed and the netting sections of 18 mm mesh sizes were replaced with large mesh panels of 45 mm mesh size. The design of improved large mesh purse seine developed for small-scale mechanised sector is given in Fig. 1. The gear was fabricated by joining 80 rectangular pieces of polyamide (PA) netting. The length of the net is 1000 m and the depth is 72 m. Polypropylene (PP) ropes of 12 mm dia and 10 mm dia were used for the head rope and foot rope, respectively. The bridles were made up of 12 mm dia PP double rope. The main netting was made up of PA multifilament netting of 210dx4x3 twine size and 45 mm mesh size. Upper selvedge attached to the head rope was made of polyethylene (PE) netting (45 mm mesh size and 1.5 mm dia twine), 7 meshes in depth. Lower selvedge of PE netting (80 mm mesh size and 1.5 mm dia twine size) attached to foot rope was 11 meshes in depth. After lacing the selvage pieces to the main netting, the side meshes were loosely hung on hanging lines, at a fixed ratio. The bunt was made up of three pieces of PA multifilament netting of twine size 210dx6x3 and mesh size 30 mm. The hanging coefficients given on float line and lead line were 0.7 and 0.76, respectively. A total of 6000 numbers of spindle shaped plastic floats of 15 cm in length and lead sinkers of 200 g each (total weighing 1000 kg) were evenly distributed on the head rope and the foot rope, respectively. Sixty-five numbers of circular brass rings each weighing 1.3 kg were attached to the foot rope and polypropylene (PP) purse line rope of 24 mm dia, passing through the brass rings, were used in the pursing arrangement.

The improved large mesh purse seine net was operated onboard a 18 m L_{OA} purse seiner, having 102 hp main engine, belonging to a fishermen cooperative society, the Manassery Matsya Thozhilali Khema Sahakarana Sangam. The general deck layout of the purse seiner is given in Fig. 2. The wheelhouse is located in the mid-deck and the aft of the boat was used for storing the net. The purse line gallows are positioned in the port side in the mid-ship. The purse seine drum is located in the forward starboard side. Echosounder and GPS were available for navigation and VHF radiotelephone and mobile phones were used for communication.

Fishing operations, targeting large mackerel, horse mackerel, pomfrets, seerfishes, carangids and other pelagic fishes were conducted, off Cochin, between 18 and 108 m depth. Data on the landings, operational expenditure and returns were collected, during 2005-06. Standard techniques were used for statistical analysis.

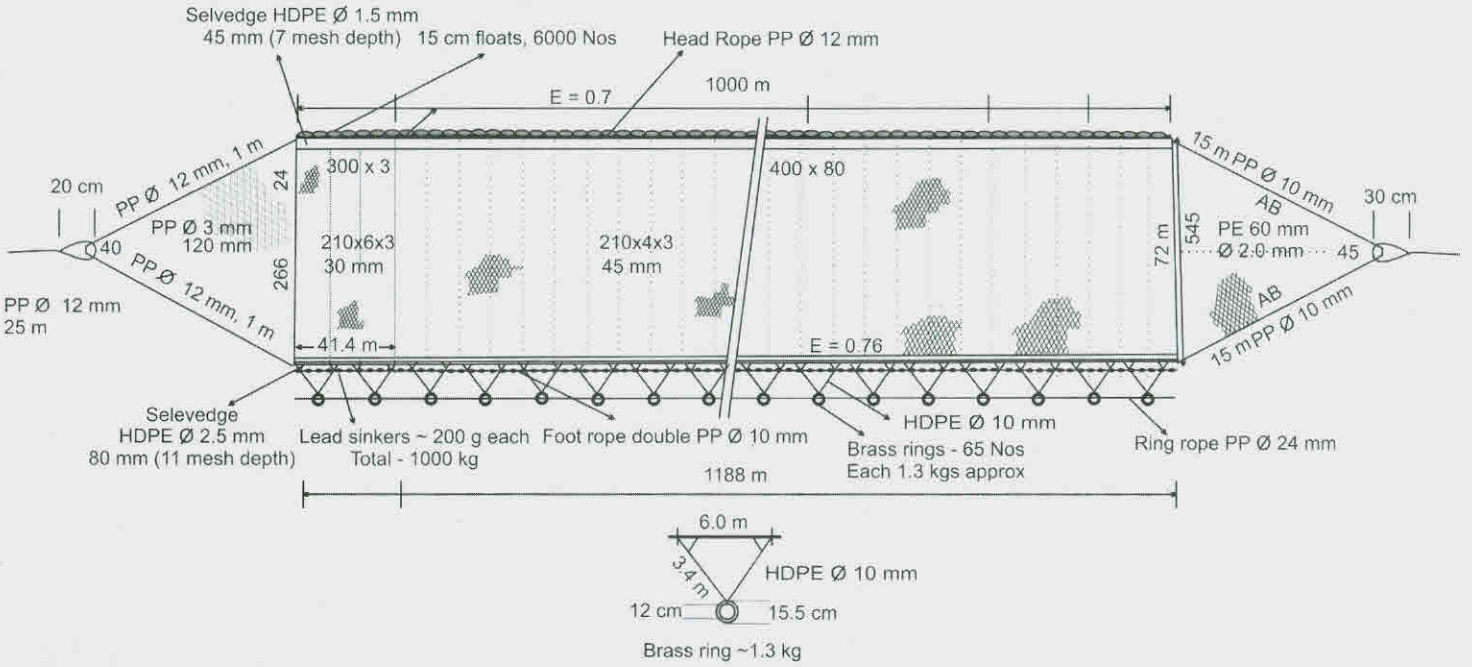

Fig. 1: Design details of large mesh purse seine

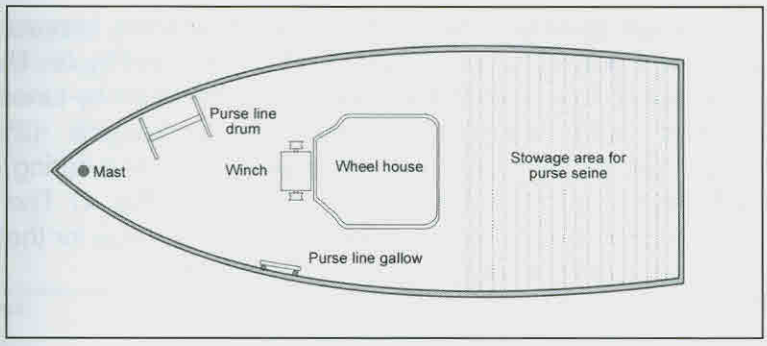

Fig. 2: Deck layout of the purse seiner

Results and Discussion

Single boat purse seining with the aid of a skiff, targeting mainly sardines and mackerel, are practiced off Cochin. As the purse seine net is very large and heavy, about 20 crew members are required for the fishing operations. Shooting of the purse seine net is done from the stern side of the vessel which has a smooth gunwale to avoid any fouling of the net. The hauling of the net is done usually from the port side of the vessel. The fish shoals in the inshore areas are easily detected by the visual observation from an elevated point in the boat. After the location of the shoal, the end of the net where bridle and buoys are provided, along with one end of the purse seine is given to the skiff and the vessel moves forward at maximum speed releasing the net and encircling the shoal at the quickest possible time. During this process, the purse line, which is coiled on the winch drum, is also released. After the fish shoal is completely encircled, the purse line end which was with the skiff is taken back to the main vessel. The two ends of the pursed line are then pulled fast with the help of the purse line winch. After pursing the bottom, the gallow is reversed on the deck, the purse rings are arranged, the engine stopped and the net is hauled up by the fishermen manually, by pulling the lead line, float line and netting, at the same time. As soon as the ropes and major portion of the netting are hauled inside, the catch concentrated in the bunt end, are brailed in using a scoop net. The fish is stored on the deck for single day fishing and stored in the fish hold with ice, for multiday fishing.

The vessel was out at sea for 58 days, fishing was carried out for 50 days and 56 sets were taken, during the period of observations. The month wise operational details, catch and price realised are given in Table 1. About 121 t of fishes were landed and the value realised from the catch

Table 1: Details of fishing operations of improved large mesh purse seine, during 2005-06

	August, 2005	September, 2005	October, 2005	January, 2006	February, 2006	March, 2006	April, 2006	May, 2006	Grand total
Days out at sea	10	25	5	2	4	3	1	8	58
Days fished	8	20	5	2	4	3	1	7	50
No. of sets	8	25	5	2	4	3	1	8	56
Depth range, m	25-68	15-119	18-108	30-34	25-40	23-27	40-49	25-43	18-119
Species-wise catch, kg									
Carangoides malabaricus	2000							480	2480
Euthynnus affinis	320	5480			1600			13320	20720
Katsuwonus pelamis	400						1200		1600
Megalaspis cordyla				3400					3400
Parastromateus niger				3600	760	560			4920
Rastrelliger kanagurta	11200	56000	7800			1200		9000	85200
Sardinella longiceps	960								960
Thunnus albacares	1440								1440
Total catch, kg	16320	61480	7800	7000	2360	1760	1200	22800	120720
Catch per set, kg	610	312	12296	3500	590	587	1200	2850	1951
Price realised, Rs.	574400	2377000	312000	409000	108400	98400	25200	705000	4609400

The operation of conventional purse seiners is usually limited to coastal waters below 20 m depth, mostly targeting sardines and mackerels. The depth-wise details of catch of major varieties of fish are given in Table 2. It can be seen that though Indian mackerel were caught in a wide depth range, maximum landings were in the shallow regions within 50 m depth. Skipjack tuna and little tunnies were caught in all the depths fished, whereas yellowfin tuna were caught beyond 50 m depth. For deep sea operations, the purse seine vessels will have to equip themselves with fish hold and also be prepared to go for long multi-day trips. Traditionally, purse seiners go for single day fishing only. The fish hold of the vessel '*Mosha*' was modified for storing ice and was also equipped with echosounder, GPS and VHF, to facilitate deep sea fishing operations. However, the vessel carried out mostly single day fishing, due to reluctance of the crew to undertake multi-day trips.

Economics of operation of purse seiners in India have been reported by Verghese (1976), Panikkar *et al.* (1990) and Panikkar *et al.* (1991). The indicative economics of operation of the vessel with the improved large mesh purse seine for the period 2005-06 is shown in Table 3. The craft utilized an average of 200 litres of fuel per trip. The main expense in operational costs was the fuel (52%), followed by crew wages (34%). The

gross revenue during the period was Rs. 4.2 million and the net profit was about Rs. 0.4 million.

Table 2: Depth-wise landings (kg) of large mesh purse seine, during 2005-06

Fish groups	<50 m	50-100 m	>100 m	Total
Carangids	2480	0	0	2480
Yellowfin tuna	0	1440	0	1440
Other tunas	21760	560	0	22320
Horse mackerel	3400	0	0	3400
Black pomfret	4920	0	0	4920
Mackerel	80800	3600	800	85200
Misc. fishes	960	0	0	960
Total	**114320**	**5600**	**800**	**120720**

Table 3: Indicative economics of improved large mesh purse seine operations, during 2005-06

	Item	Rs.
A.	**Fixed capital**	
	Craft	2500000
	Gear	1600000
	Engine	100000
	Sub-total	**4200000**
B.	**Annual fixed costs**	
	Depreciation craft (@15 %)	2515000
	Depreciation gear (@40 %)	640000
	Sub-total	**3155000**
C.	**Operational costs**	
	Fuel	324800
	Ice	35000
	Wages	215840
	Ration	34800
	Miscellaneous costs	15000
	Sub-total	**625440**
D.	**Revenue (1800 kg per day x 58 days @ Rs. 40/- per kg**	**4176000**
E.	**Net profit [D-(B+C)]**	**395560**

Conclusion

The change-over of mesh sizes in the purse seine from the conventional 20 mm to 45 mm mesh size has shown good results and has been able to land larger size classes of high value species. Adoption of the large mesh purse seine and shifting operations to deeper waters targeting tunas and other large pelagic fishes would ease the fishing pressure in the intensively fished coastal waters. Further, the large meshes will facilitate escapement of juveniles. Introduction of the large mesh purse seines has led to the revival of small mechanised purse seine fishery and all the 24 purse seiners based at Cochin Fisheries Harbour have changed over to 45 mm mesh size purse seines and started operations in deeper waters targeting skipjack tuna, little tuna, carangids, black pomfrets, horse mackerel, barracudas, seerfishes and mackerel. Use of power block for hauling the purse seine could further enhance the fishing efficiency, increase the number of sets per day and reduce the labour required for operations. However, precautionary approach is required in regulating the number of purse seiners and capacities of individual seiners, to ensure sustainability of the resources.

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