PURSE-SEINE AND BOAT-SEINE (*THANGU VALA*) FISHERY FOR THE OIL SARDINE OFF COCHIN-1968-1971

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ABSTRACT

The data on the catches, fishing effort, length and sex composition relating to the purse seine fishery for the oil sardine, *Sardinella longiceps* Val. off Cochin, during the three seasons from 1968-69 to 1970-71 are presented. A comparison of catch rates of the sardine landed by this gear with those of the boat seine *thangu vala* during the same period has been made. A comparative study of the length range, the modal and the mean length distributions of the oil sardine catches obtained in the two gear revealed a fairly good similarity. Application of Chi-square test on the sex composition data of the sardine shoals fished by purse seine during 1969-71 indicated that there was no significant dominance of either sex.

INTRODUCTION

The exploitation of the oil sardine fishery around Cochin has hitherto depended solely on the use of traditional gear such as ***thaugu vala*** and ***chala vala*** Recently, the purse seine was introduced in this area by the Indo-Norwegian Project for the oil sardine and mackerel fisheries. The traditional gear are usually operated from close inshore to about 16 m depth. Generally, the purse seiners also operate within the same depth range; but, occasionally the operations extend up to 20 m depth.

This paper embodies the results of a comparative study of the operation of the purse seine and ***thangu vala*** for the exploitation of the oil sardine along with studies on such biological aspects as the size, sex composition, etc.

MATERIAL AND METHODS

Regular oil sardine samples, of at least 50 fish each, were collected from the purse seine catches on every fishing day at Cochin from 1969. Total length, mean length, body weight, stages of maturation and sex composition were noted. Catch details such as depth of fishing, duration of operation of the gear and number of hauls were collected from the log of the fishing vessels.

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THE FISHERY

The purse seine employed aboard the 36 foot vessels (M2/M3) measures 320 m in length and 20–28[1]m in width. It is made of nylon knotless webbing and is provided with a thick twined bunt at one end. The head rope and foot rope made of terylene measured 320 m and 330 m respectively in length and the purse line was about 500 m in length. Details of the mode of fishing and dimensions of this net are given by Menon (1970). The design and operation of thangu vala are described by Kuriyan, George and Menon (1962).

TABLE 1. *Oil sardine catches of Purse seine (Indo-Norwegian Project) from 1968 to 1971, off Cochin.*

Months		Oil sardine (kg.)	Catch per haul (kg.)	Catch per hour (kg.)
September	1968	864.0	432.0	216.00
Oct.	,,	26737.0	1273.2	656.12
Nov.	,,	10099.0	561.1	294.17
Dec.	,,	16186.0	899.2	553.36
January	1969	22179.0	1056.1	603.51
Feb.	,,	2303.0	191 9	112.34
	Total	78368.0	Monthly average 851.8	Monthly average 473.29
October	1969	25978.0	1731.9	731.77
November	,,	31618.0	1129.2	715.14
December	,,	13054.0	543.9	362.60
January	1970	25743.0	1430.2	725.15
February	,,	30174.0	2155.3	815.51
March	,,	24202.0	968.1	562.83
April	,,	20965.0	1397.7	742.12
May	,,	3790.0	758.0	505.33
	Total	182524.0	1267.5	659.53
October	1970	15788.0	1754.2	853.40
November	,,	24953.0	1134.2	594.11
December	,,	15236.0	896.2	534.59
January	1971	5500.0	785.7	323.52
February	,,	14554.0	519.8	312.98
March	,,	21966.0	523.0	327.85
April	,,	12091.0	287.9	177.15
May	,,	7332.0	1466.4	733.20
	Total	117420.0	682.7	394.36

[1] At the deepest region in the middle of the seine, it is 28 m wide.

Traditionally, the sardine fishery by *thangu vala* is from August to April. Either due to the poor availability of the oil sardine shoals in the usual fishing areas or the inclement weather affecting the fishing operations, due to the catches are usually poor between May and September. The Indo-Norwegian Project purse seines were generally operated from October to May, off Cochin.

The details of the purse seine catch, catch per haul and catch per hour are furnished in Table 1; those pertaining to thangu vala for the same period are furnished in Table 2. For comparison of effort, the catch per haul of the purse seine and catch per unit of *thangu vala* have been used.

The sardine catches

In the 1968-69 season, the purse seine fishery began in September and ended in February (Table 1). The monthly catch per haul varied from 1919. to 1273.2 kg, the highest (1273.2 kg) being in October. The monthly catch per hour was on an average about 500 kg. In the 1969-70 season, the fihsery began in October with good landings. The highest annual catch per effort was obtained during this season; the catches remained good throughout the season excepting in May. The monthly catch per haul ranged from 543.9 to 2155.3 kg, the highest being in February; monthly catch per hour also was the highest during that month. In 1970-71 season, the fishery was moderate. The heaviest catch was made in November, the highest catch per haul (1754.2 kg) and the highest hatch per hour (853.4 kg.) being in October.

The catch and catch per unit of oil sardine in *thangu vala* off Cochin were very poor between May and August during the three seasons studied (Table 2).

TABLE 2. *Monthly catch and effort (kg) of oil sardine of* thangu vala *from 1968-69 to 1970-71, off Cochin.*

Months	1968-69 season			1969-70 season			1970-71 season		
	Total catch	No. of units	Catch per unit	Total catch	No. of units	Catch per unit	Total catch	No. of units	Catch per unit
June	22,468	679	33.0	51,705	954	54.2	7,340	744	9.9
July	138,355	1516	91.3	140,342	1020	137.6	74,154	1,188	62.4
Aug.	2,429	1412	1.7	13,437	957	14.0	239,963	1,364	175.9
Sept.	155,373	668	232.6	141,678	646	219.3	276,395	1,099	251.5
Oct.	343,497	719	477.7	333,228	1053	316.5	225,340	1,070	210.6
Nov.	190,274	652	291.8	432,421	1052	411.0	657,570	1,210	543.4
Dec.	191,300	675	283 4	30,903	419	73.8	642,660	1,528	520.6
Jan.	235,119	605	388.6	63,4 2	380	166.9	990,379	1,348	734.7
Feb.	144,829	540	268.2	217,399	714	304 5	389,096	1,250	311.3
Mar.	37,078	206	180.0	171,203	733	233.6	181,734	1,200	151.4
Apr.	85,277	325	262.4	4,250	128	33.2	101,215	1,271	79.6
May	45,333	314	144.4	8,550	192	44.5	139,789	1,038	134.7
Total	1591,332	8,311	191.5	1608,528	8,248	195.0	3925,635	14,310	274.3

During 1968-69, the catch per unit ranged from 1.7 to 477.7 kg. In 1969-70, catch per unit was fairly good from September to March excepting in December and January. In 1970-71, it was remarkably good from September to February made in and yielded the highest figure for catch per unit (734.7 kg), in January.

The catch per haul of purse seine and catch per unit of *thangu vala* were fairly good from October to January in 1968-69. Though the catches per haul of purse seine were remarkably good throughout 1969-70, they were below average in thangu vala during that season excepting from October-November and February. In 1970-71, though the catch per haul figures in purse seine were average throughout, the corresponding figures in *thangu vala* were just above average for about five months only with a sharp decline from March to May.

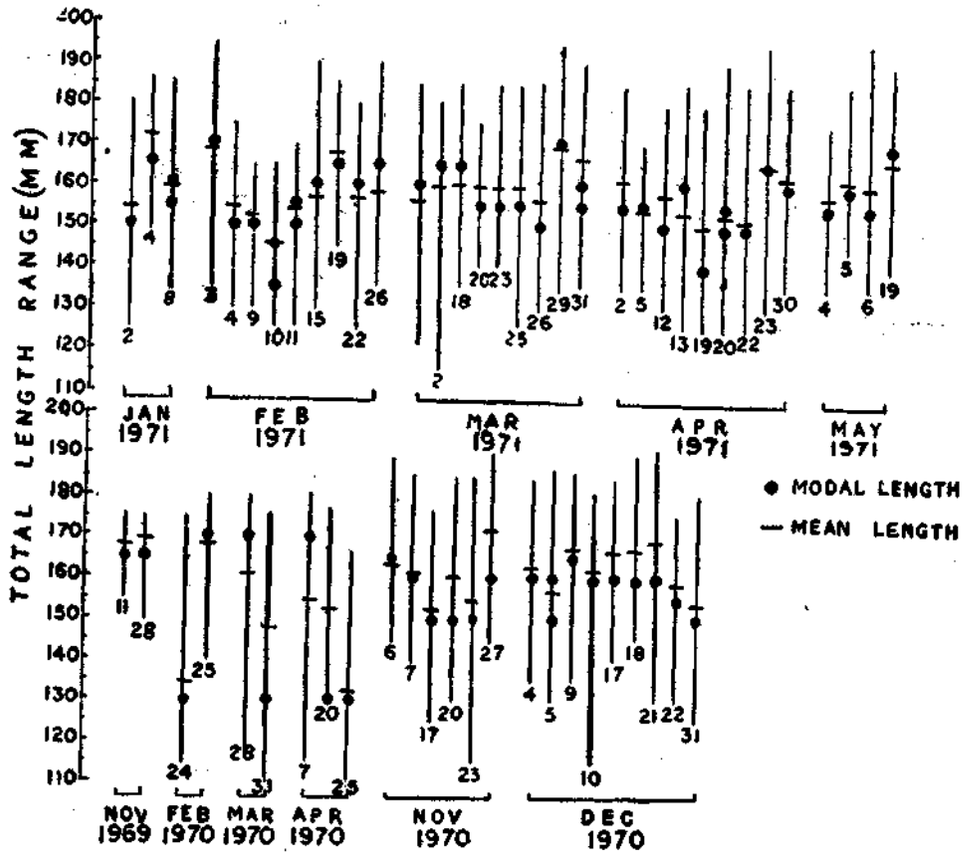

FIG. 1. Length distributions of oil sardine samples from daily total catches of purse seine (dates marked against length ranges) from November 1969 to May 1971, off Cochin.

Length Composition of The Oil Sardine Catches of Purse Seine

As the purse seine is able to catch almost the entire shoals encountered, it is reasonable to infer that the catches obtained in this net give a complete picture of the length composition of the individuals constituting the shoals. The modal and the mean length of the sardine samples (taken from daily total catches) examined on different fishing days show good similarity (except in March 1970). (Fig. 1).

In November 1969, with the appearance of older age group in the catches, the 165 mm modal length dominated. In February and April, with the increase of abundance of young age groups, the mode dropped to 130 mm (the 170 mm mode was relatively less important in February). In March, a higher year class (170 mm mode) was dominant, the 130 mm mode being less important. When the purse seining started again in November 1970, on account of adundant recruitment of older age group consisting mostly of " spent " sardine, the 160 mm modal length (mode being the same in the succeeding month) became prominent. Mode progressed slightly, then remained static in January and February of 1971, owing to a large-scale influx of older year-class of " spent-recovering " fish. From March to May, modal length slightly declined and stood static at 155 mm. The mean

Table 3. *Monthly length distribution of oil-sardine in Purse seine and thangu vala catches from November 1969 to May 1971 off Cochin*

Months		Purse seine			thangu vala		
		Total length range (mm)	Mean length (mm)	Modal length (mm)	Total length range (mm)	Mean length (mm)	Modal length (mm)
Nov.	1969	150—175	168.3	165	110—180	159.6	165
Dec.			N. A.	...	100—185	129 8	120
Jan.	1970		do	...	110—185	135.3	120
Feb.		115—180	146.5	130	110—180	139.0	130
Mar.		110—180	153.7	170	115—180	146.8	130
Apr.		110—180	144 9	130	120—170	136.0	130
May			N. A.	...	115—170	132.2	130
June			N. F.	...	110—175	142.8	145
July			N. F.	...	130—180	150.1	145
Aug.			N. F.	...	45—195	115.1	100
Sept.			N. F.		75—185	116.2	140
Oct.			N. A.	..	120—195	155.4	150
Nov.		115—190	160.7	160	115—195	158.5	160
Dec.		115—195	162.1	160	115—195	160.7	165
Jan.	1971	125—185	161.2	165	115—195	161.0	165
Feb.		125—195	157.6	165	120—190	158.5	165
Mar.		115—195	160.8	155	120—190	159.2	150
Apr.		125—195	156 4	155	120—190	155.3	155
May		135—195	161.1	155	125—195	160.2	155

N. A.—Material not available.
N. F.—No fishing.

length values of the sardine catches of purse seine and thangu vala showed a fairly good similarity from November 1970 to May 1971.

The modal lengths of the oil sardine caught in the purse seine during the period of this study showed a fair degree of similarity with those of the fish landed by thangu vala excepting in March and December 1970 and March 1971, the slight differences observed in certain months being possibly due to commingling of slightly different age-groups in the fishing grounds (Table 3).

Sex Composition

A total of 3,754 oil sardine was examined for studying the sex composition during the period of this investigation. There were small variations in the percentages between the two sexes in the individual samples. The average proportion $\bar{p}$ of females for the entire period of study was found to be 0.5013, i. e. about half. To test if this average proportion was being maintained during the different months of the period, Chi-square test was made using the formula

$$\chi^2 = \frac{1}{\bar{p}\bar{q}} \left\{ \sum ap - n\bar{p} \right\}$$

where $\bar{p}$ is proportion of females to the total for all the months, $\bar{q}$ is $(1-\bar{p})$, a is the individual number of females in each month and n, is the total number of females examined during this investigation. The χ^2 value was found to be 12.66 which is non-significant, showing that there is no significant difference in the sex ratios between months (Table 4).

Discussion

A comparison of the sardine catches made by the purse seine and thangu vala in the inshore waters off Cochin indicated slight differences during the three seasons covered. In addition to differences in the number of hauls made, in hours spent in searching for shoals, in the availability of shoals in the fishing grounds etc., in the case of purse seine, factors such as (1) total area of webbing of the net, (2) total area covered during each operation of the net, (3) horse power and size of the mechanized vessel used and (4) the efficient manoeuvrability in shooting and hauling up of the net are also to be taken into consideration while comparing it with the indigenous gear. In the case of *thangu vala* since several hauls were made and several units operated on different fishing days, and all the hauls made by each unit were pooled together in the respective units before the catches were landed on each fishing day. Hence, a comparison of catch per haul of purse seine with the catch per unit of *thangu vala* would obviously have its own limitations.

Hornell and Nayudu (1923) recorded dominance of females up to the size at first maturity, the sexual segregation getting reduced among the ripe fish, and suggested that there was greater mortality among females after spawning.

TABLE 4. *Monthly sex ratio of oil-sardine in purse seine catches during 1969–'71 off Cochin*

	Nov 1969	Feb 1970	Mar ,,	Apr ,,	Nov ,,	Dec ,,	Jan 1971	Feb ,,	Mar ,,	Apr ,,	May ,,	Total Examined
Females	38	77	103	82	189	250	93	244	305	373	128	1882
Males	38	100	100	82	206	219	80	243	262	390	152	1872
Total	76	177	203	164	395	469	173	487	567	763	280	3754
Ratio of Females	0·5000	0·4350	0·5074	0·5000	0·4785	0·5330	0·5376	0·5010	0·5379	0·4889	0·4571	0·5013

Chidambaram (1950) reported equal proportions of sexes upto the length of 200 mm, but beyond that size, the females were found to outnumber the males. Nair (1960) found no disparity in sex ratio. Antony Raja (1969, p. 54) stated, "although the individual samples showed dominance of either sex or their equal distribution, there were no seasonal differences in the ratio of males to females, nor dominance of either sex among juvenile stock. But the females were distinctly more in the overall population of recovering spawners." A statistical examination of the available sex composition data in the present study clearly established that there was no significant predominance of either sex in the oil sardine catches made by the purse seine, during the seasons 1969–71 off Cochin.

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