



MARINE FISHERIES INFORMATION SERVICE



No. 38
MAY 1982

Technical and Extension Series
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
COCHIN, INDIA

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the Fishery Data Centre and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

Abbreviation - *Mar. Fish. Infor. Serv. T & E Ser., No. 38: 1982*

CONTENTS

- 1. The present status of small-scale traditional fishery at Vizhinjam**
- 2. Mechanisation of indigenous crafts with outboard motors in Tamil Nadu—An impact study**
- 3. News—India and overseas**

Cover photo: Fish landing centre at Vizhinjam

THE PRESENT STATUS OF SMALL-SCALE TRADITIONAL FISHERY AT VIZHINJAM*

Introduction

Vizhinjam, situated at Long. $76^{\circ}59'15''$ E, Lat. $8^{\circ}22'30''$, and 16 km south of Trivandrum, is an important fish landing centre among the twenty-seven fish landing villages in the fishery zone extending from Kollangode in the south to Valiaveli in the north, spanning a distance of about 50 km on the south-west coast of India. Owing to its location which affords facilities for putting the boats out to the sea even in the monsoon season, as well as due to good marketing outlets at nearby places such as Balaramapuram, Trivandrum and adjacent towns, fishing activity takes place in the Vizhinjam area all through the year. With the completion of the Vizhinjam Fishing Harbour which is underway, the fisheries importance of this area is bound to increase further. Vizhinjam is thus at the threshold of modernization and expansion of its fishing activities, particularly with reference to exploitation of the deep-sea fishery resources. An account of the present status of the traditional fishery of the Vizhinjam area is therefore timely.

Annual production

Data collected over a period of 12 years, from 1968 to 1979, have been analysed for this study. Table 1 gives the gearwise annual effort (E) (that is the number in each type of gear employed in fishing), catch (C) in tonnes, and catch per unit effort (C/E) in kg (which is the catch per net or the catch per set of three or four numbers of hook and line operated from a single catamaran, per fishing trip lasting for 4 to 24 hours), the annual average catch and the efficiency factor of each gear in relation to the catch per unit effort (C/E) of boat seine which, being the most important gear, is taken as the standard gear. The table also furnishes the annual total catch landed by all gears, the standard effort, SE, (which is obtained by multiplying the effort of each type of gear by its relative efficiency with reference to boat seine and totalling them) as well as the annual catch per standard effort (C/SE) during the period from 1968 to 1979.

The data shows that the annual marine fish landings at Vizhinjam ranged from 1,497 tonnes in the year 1975 to 8,506 tonnes in the year 1978 with the annual average at 4,525 tonnes. The average monthly landings varied between 147 tonnes in February and 750 tonnes in July with the overall monthly average at 377 tonnes. Fish landings higher than this monthly average were obtained during June to October, when nearly 60% of the annual catch was landed. The monthly trends of total fish landings, standard effort and catch per standard effort are given in Fig. 1. It may be seen from the figure that the effort was fairly high from April to November, and the catch per standard effort, barring for January, was higher than its annual average of 62.6 kg during July, September and October. The highest C/SE of 171 kg seen in Fig. 1. for January was due to an unusually high catch of 548 tonnes of *Loligo* spp. recorded in boat seine at a catch rate of 310 kg and 161 kg per net in two consecutive observation days (6th and 10th January 1972). If the average catch for the month of January for the other years (excluding 1972) is substituted for this month, the average C/SE for January would work out to 13.5 kg only. From the foregoing trends it may be stated that June to October represents the main fishery season with best returns in October in the Vizhinjam area.

The chief craft employed for fishing at Vizhinjam is the catamaran, the next important one being the dugout canoe. In recent years, however, a few mechanized boats have started operating in the area using the traditional drift net. At present eleven types of gears are employed in this area to exploit its fishery resources. Of these, the boat seine (*Thattumadi*) contributes to the bulk (47.9%) of the total fish landings followed by hook and line (locally known as *Choonda*) 22.7% and dritt net (locally known as *Pattiyala*) 16.6%. The other gears and their contributions are: *Chalavala* (gill net)–4.3%, *Katchal* (scoop net using bait)–

*Prepared by G. Luther, P. N. Radhakrishnan Nair, G. Gopakumar and K. Prabhakaran Nair. Basic data of this account was collected and maintained by S/Shri P. S. Sadasiva Sarma, T. A. Omana, J. J. Joel, S. G. Vincent, (Late) K. Rajasekharan Nair, A. K. Velayudhan, Mathew Joseph and K. T. Thomas.

↪ **Table 1.** Gear-wise annual effort, catch (tonnes) and catch per unit effort (kg), annual average catch (tonnes) and the efficiency factor in relation to boat seine along with yearly total catch (tonnes), standard effort and catch per standard effort (kg) for the period 1968-1979.

Sl. No.	Gears	Effort Catch & C/E	YEARS											Annual average (tonnes)	Relative efficiency	
			1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978			1979
1.	Boat seine	E	28,734	27,199	40,425	37,320	30,929	39,728	46,319	33,595	21,774	9,710	51,324	47,794	34,571	1.00
		C	1,309.0	1,050.9	1,771.9	2,056.1	1,926.9	2,781.1	2,707.2	748.6	1,792.9	780.7	5,180.6	3,883.6	2,165.8	
		C/E	45.6	38.6	43.8	55.1	62.3	70.0	58.5	22.3	82.3	80.4	100.9	81.3	62.6	
2.	Hook & Line	E	21,911	30,784	55,179	66,640	64,985	47,946	59,629	49,022	72,271	44,310	69,508	51,115	52,775	0.31
		C	493.5	737.4	1,599.8	1,637.9	1,475.4	791.2	1,007.4	432.7	1,066.5	793.7	1,461.1	840.6	1,028.1	
		C/E	22.5	24.0	29.0	24.6	22.7	16.5	16.9	8.8	14.8	17.9	21.0	16.4	19.5	
3.	Drift net	E	8,922	10,350	16,605	15,249	25,663	22,370	12,943	12,081	21,883	18,130	21,183	14,259	16,636	0.72
		C	254.1	338.3	854.1	962.3	1,034.9	1,437.8	549.0	147.7	1,181.0	837.4	836.2	580.8	751.1	
		C/E	28.5	32.7	51.4	63.1	40.3	64.3	42.4	12.2	54.0	46.2	39.5	40.7	45.2	
4.	Chala vala	E	4,655	3,570	10,993	4,576	7,176	11,484	14,738	11,822	10,666	5,717	22,985	15,093	10,290	0.31
		C	86.6	91.9	163.3	207.3	180.8	188.7	379.6	119.4	164.8	105.8	410.2	226.2	196.2	
		C/E	18.6	25.7	14.9	45.3	25.2	19.0	25.8	10.1	15.5	18.5	17.9	15.0	19.1	
5.	Katchal	E	6,506	2,657	1,318	Not operated	6,894	Not operated	Not operated		4,456	5,043	Not operated	4,479	0.83	
		C	153.2	61.6	25.0		782.5				197.3	172.1		232.0		
		C/E	23.5	23.2	19.0		113.5				44.3	34.1		51.8		
6.	Shore seine	E	6,286	3,449	2,011	1,302	622	746	1,475	979	1,154	658	2,448	2,416	1,962	0.90
		C	180.7	226.3	93.1	150.8	64.1	78.7	126.4	36.3	58.3	28.5	148.6	131.3	110.3	
		C/E	28.8	65.6	46.3	115.9	103.0	105.5	85.7	37.1	50.5	43.3	60.7	54.4	56.2	
7.	Netholi vala	E	2,459	3,392	2,900	2,691	5,259	2,511	1,014	Not operated	911	206	983	378	2,064	0.54
		C	32.5	52.4	40.1	57.0	290.2	153.3	29.0		24.8	3.1	75.1	15.0	70.2	
		C/E	13.2	15.5	13.8	21.2	55.2	61.0	28.6		27.3	15.1	76.4	39.6	34.0	
8.	Konchu vala	E	Not operated							1,643	2,303	1,292	18,072	12,930	7,248	0.21
		C								10.9	14.3	21.3	302.1	132.9	96.3	
		C/E								6.6	6.2	16.5	16.7	10.3	13.3	
9.	Nandu vala	E	Not operated			959	167	3,603	867	Not operated			1,031	2,043	1,445	0.55
		C				26.6	2.8	169.6	20.9				40.9	39.9	50.1	
		C/E				27.8	16.6	47.1	24.1				39.7	19.6	34.7	
10.	Kolachi vala	E	Not operated			111	2,189	1,841	Not operated	150	667	423	1,298	517	900	0.58
		C				1.3	83.0	94.5	operated	1.5	10.6	6.6	51.1	12.4	32.6	
		C/E				11.9	37.9	51.3		9.8	15.8	15.7	39.4	24.0	36.3	
11.	Achil	E	Not operated				861	2,820	969	Not operated			2,241	Not operated	1,723	0.16
		C					5.9	20.6	21.4				23.2		17.8	
		C/E					6.9	7.3	22.1				10.3		10.3	
Annual total catch (C) (tonnes)			2,509.6	2,558.8	4,547.4	5,098.8	5,846.5	5,745.5	4,840.9	1,497.1	4,511.2	2,772.3	8,505.9	5,862.6	4,524.7	
Standard Effort (SE)			55,055	66,308	1,03,797	92,582	93,832	82,074	82,806	67,084	54,844	34,472	84,281	72,112	72,254	
C/SE in kg			45.6	38.6	43.8	55.1	62.3	70.0	58.5	22.3	82.3	80.4	100.9	81.3	62.6	

Note: E = Effort; C = Total catch in tonnes; C/E = Catch per unit effort in kg; C/SE = Catch per standard effort in kg.

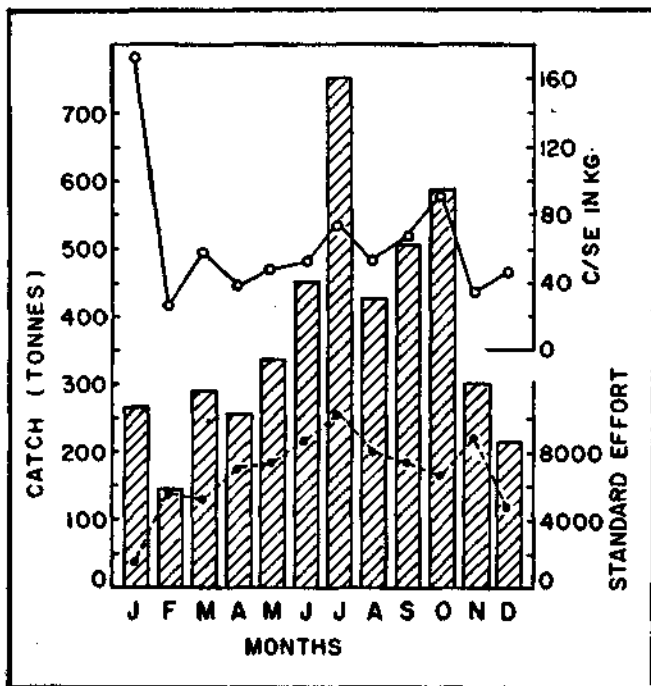


Fig. 1. The average monthly trends of total fish landings, standard effort and catch per standard effort (C/SE) at Vizhinjam during 1968-1979.

2.6%, Shore seine locally known as *Kamba vala*)-2.4%, *Netholi vala* (gill net)-1.4%, *Konchu vala* (gill net)-0.9%, *Nandu vala* (Bottom-set gill net)-0.6%, *Kolachi vala* (a variation of boat seine with strips of palmyrah leaves stuck along the float line and the warp and operated both in the surface water as well as from the shore)-0.5%, and *Achil* (a hand line with smaller hooks closely set at the end of the line together with artificial bait, a variation of the hook and line)-0.1%. Details of the common nets employed at Vizhinjam, together with the mode of their operations are given by Nayar (*Indian J. Fish.*, 1958, 5 (1): 32-55) and Bennet (*J. Bombay Nat. Hist. Soc.*, 1967, 64 (2): 377-380).

Gearwise production

The yearly total catch of the important groups of fish forming about 1% or more in each gear, together with their annual average percentage composition in the landings by that gear and the rank are presented in Tables 2-12. Monthly trends of operation of different gears (E) together with their catch (C) and the catch per unit effort (C/E) are given in Figs. 2 and 3. In the following account the trends of fisheries by different gears are given.

Boat seine: Boat seine was operated in all the years from 1968 to 1979. The number of units em-
ployed ranged from 9,710 in 1977 to 51,324 in 1978 with the average at 34,571 units per year. This wide range in the number of boat seines operated was mainly due to the variation in the migration of fishermen with their craft and gear into Vizhinjam area during periods of good fishery, particularly during June-August. Further, going for more than one trip of fishing in the same day, usually two or three trips, when the fishery was good and the fishing ground was near, also contributed to this variation in the number of units operated. Occasionally a catamaran merely lands the catches, like the carrier boat of purse seine, while operation of boat seine is being continued by two other catamarans. The total catch ranged from 748.6 tonnes in 1975 to 5,180.6 tonnes in 1978. The annual average catch was 2,165.8 tonnes. The range of annual C/E was between 22.3 kg in 1975 to 100.9 kg in 1978, with the average (over the whole period) at 62.6 kg.

Though boat seine was operated almost throughout the year, about 82% of its annual effort was expended during June-September when 81% of the catch by this gear was landed, with the monthly C/E ranging between 50.8 kg and 74.1 kg (Fig. 2A). It may be mentioned here that the seasonal trend of the fishery at Vizhinjam generally coincides with the trend of the fishery by boat seine.

Trichiurus was the most dominant group of fish caught in boat seine accounting for 45.8% of the average annual catch followed by *Stolephorus* (8.6%), carangids (8.5%) and leiognathids (7.3%). Other important groups met with were squids, sardines, cat fish, *Dussumieria*, sciaenids, perches, *Acetes*, goat fishes, *Lactarius* and mackerel in that order (Table 2).

Hook and line: Hook and line was operated in all the years from 1968 to 1979. The annual effort ranged between 21,911 units in 1968 and 72,271 units in 1976 with the average at 52,775 units. Thus, the hook and line is the most commonly used gear as it requires minimum capital expenditure. The total catch ranged from 432.7 tonnes in 1975 to 1,637.9 tonnes in 1971 with the average at 1,028.1 tonnes. The annual C/E varied from 8.8 kg in 1975 to 29 kg in 1970 with the annual average at 19.5 kg. The relative efficiency of this gear was 0.31.

Fishing by this gear is carried out throughout the year, but it is more intense during January-May and September-December, when 49% and 34% respectively of the annual effort is expended, landing 48% and 37% respectively of its annual catch with the monthly

Table 2. Catch composition of important groups of fish (tonnes) during the year 1968-1979 in Boat seine

Groups	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average	%	Rank
Trichiurids	471.7	74.9	364.1	741.9	458.1	1,028.8	726.8	429.2	723.2	331.7	3,298.7	3,250.9	991.7	45.8	1
<i>Stolephorus</i>	137.0	53.5	296.1	178.5	129.8	468.0	304.5	82.2	119.2	89.2	335.4	34.2	185.6	8.6	2
Leiognathids	84.0	69.0	127.7	99.3	204.2	317.3	699.0	23.4	72.1	14.7	159.7	34.5	158.8	7.3	3
<i>Decapterus</i>	34.7	165.0	57.4	100.9	16.7	44.4	146.4	14.3	41.3	28.9	324.8	197.5	97.7	4.5	4
Squids	55.3	11.5	16.7	3.9	678.7	20.4	22.4	28.0	45.3	5.7	116.9	138.2	95.2	4.4	5
Other carangids	48.0	32.2	78.0	178.9	70.9	179.2	246.9	14.8	89.6	37.2	43.2	31.1	87.5	4.0	6
Cat fish	92.6	36.2	14.1	274.6	14.4	39.6	5.3	21.5	169.6	5.7	73.7	38.4	65.5	3.0	7
<i>Dussumieria</i>	65.4	36.0	196.6	29.7	2.5	28.7	143.1	8.8	18.0	2.3	165.7	0.4	58.1	2.7	8
Sciaenids	42.7	69.9	73.4	53.0	14.8	4.4	42.7	20.3	40.6	10.2	238.8	28.4	53.3	2.4	9
Lesser sardines	19.1	17.0	63.0	66.9	25.4	147.6	32.6	14.4	116.3	25.8	8.2	74.9	50.9	2.4	10
Perch-like fishes	47.6	159.4	55.3	14.8	50.1	90.4	96.9	15.8	17.8	0.5	27.0	18.4	49.5	2.3	11
<i>Acetes</i>	—	—	130.8	1.1	41.3	206.3	37.1	28.6	0.2	8.4	115.3	5.7	47.9	2.2	12
Goat fish	87.2	195.5	69.8	57.2	43.7	3.7	1.2	0.3	0.9	—	13.1	—	39.4	1.8	13
Mackerel	10.6	29.3	30.2	91.4	24.5	15.4	25.4	9.0	31.9	28.5	56.2	0.9	29.4	1.3	14
Oil sardine	—	—	—	14.4	5.3	17.7	0.5	9.4	179.2	115.7	3.4	—	28.8	1.3	15
<i>Lactarius</i>	43.9	26.5	62.4	24.3	54.5	31.0	13.0	4.5	33.4	2.6	45.4	0.1	28.4	1.4	16
Miscellaneous	69.2	75.0	136.3	125.3	92.0	138.2	163.4	24.1	94.3	73.5	155.1	30.1	98.0	4.5	—
Total	1,309.0	1,050.9	1,771.9	2,056.1	1,926.9	2,781.1	2,707.2	748.6	1,792.9	780.6	5,180.6	3,883.6	2,165.7		

Table 3. Catch composition of important groups of fish (tonnes) during the year 1968-1979 in Hook and line

Groups	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average	%	Rank
Other carangids	55.0	102.4	288.5	146.7	165.6	121.6	156.8	44.5	111.5	49.6	178.8	88.4	125.8	12.2	1
<i>Nemipterus</i>	74.4	67.4	112.2	217.2	64.3	73.4	108.1	36.9	133.6	50.2	141.4	48.6	94.0	9.1	2
Cuttle fish	126.1	0.3	35.0	166.0	208.7	24.9	11.1	95.2	115.4	95.1	129.2	99.2	92.2	8.9	3
<i>Magalaspis</i>	6.6	178.9	206.4	185.5	198.4	79.5	55.5	4.5	2.0	36.1	38.6	31.8	85.3	8.3	4
Cat fish	46.2	93.5	149.1	256.4	91.0	77.0	177.8	17.2	58.6	9.9	31.0	13.9	85.1	8.3	5
<i>Euthynnus</i>	39.5	67.7	235.4	92.9	75.5	69.9	108.8	35.7	86.8	21.7	16.4	77.5	77.3	7.5	6
Balistids	—	0.4	3.9	25.3	169.2	52.4	2.4	10.6	94.1	33.7	118.2	5.4	68.0	6.6	7
<i>Decapterus</i>	—	7.3	57.7	106.1	40.3	22.0	107.2	21.5	61.4	3.2	75.5	103.8	50.5	4.9	8
Lethrinids	5.9	26.4	52.2	57.4	87.7	30.9	19.0	15.2	7.4	13.7	181.3	23.0	43.3	4.2	9
Sharks	33.9	45.5	107.9	60.8	30.3	63.8	3.7	9.8	27.0	9.3	35.6	12.1	36.6	3.6	10
<i>Saurida</i>	25.2	21.1	28.4	54.8	28.1	13.2	48.2	15.6	72.7	20.8	62.0	15.5	33.8	3.3	11
Other perch-like fishes	10.1	25.5	16.8	77.6	18.0	34.2	14.0	3.6	26.0	4.3	119.6	30.5	31.7	3.1	12
Lutianids	20.3	23.2	47.8	35.1	98.1	2.0	27.2	12.8	24.0	13.4	69.7	19.4	32.8	3.2	13
<i>Coryphaena</i>	13.6	15.3	10.4	21.1	100.4	30.2	32.1	19.7	66.6	22.3	17.6	7.7	29.8	2.9	14
Trichiurids	—	—	—	—	6.9	—	79.0	1.6	16.8	2.7	2.5	176.1	23.8	2.3	15
Other tunas	12.2	—	16.6	17.2	3.8	8.9	10.0	6.5	26.7	1.4	53.3	5.4	13.5	1.3	16
Miscellaneous	24.5	62.5	231.5	117.8	89.0	87.3	46.5	81.8	135.9	106.3	190.4	82.3	104.6	10.2	—
Total	493.5	737.4	1,599.8	1,637.9	1,475.4	791.2	1,007.4	432.7	1,066.5	793.7	1,461.1	840.6	1,028.1		

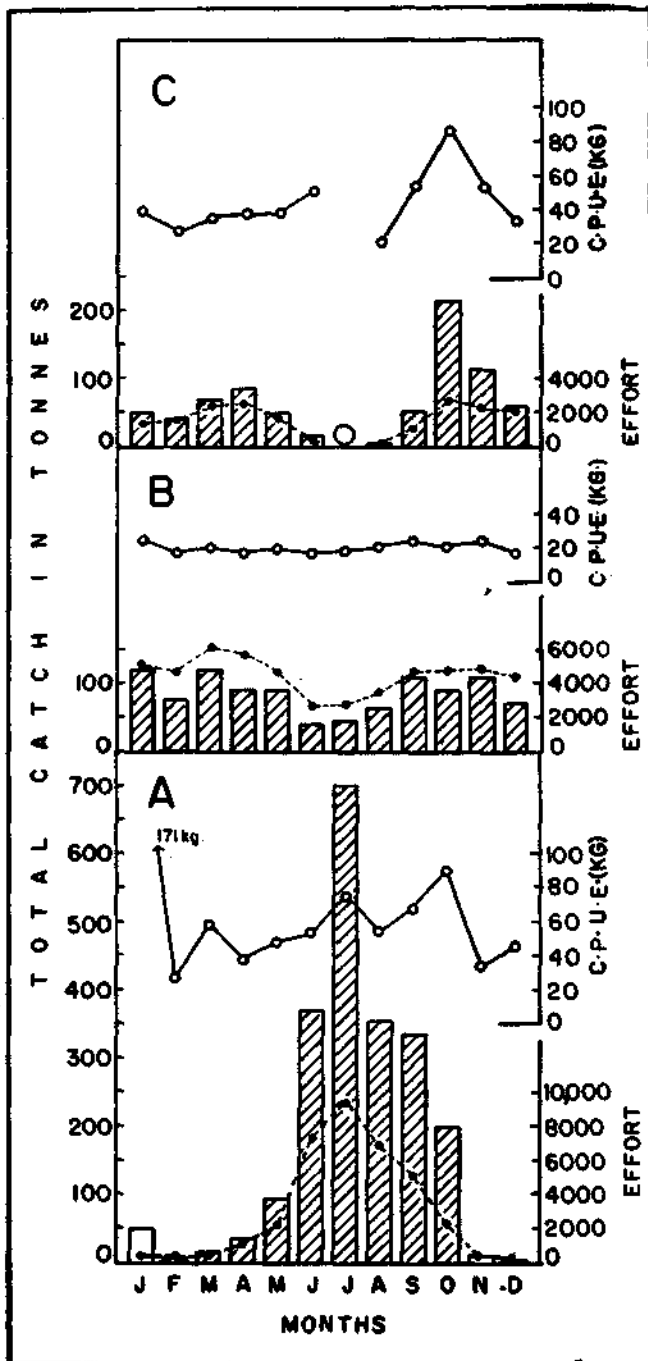


Fig. 2. The gearwise average monthly trends of catch, effort and catch per unit effort (C.P.U.E.) at Vizhinjam during 1968-1979. Open circle on the base line indicates that the gear was not operated during that month. A. Boat seine, B. Hook and line, C. Drift net.

C/E ranges of 15.2 kg-23.3 kg and 16.4 kg-23.9 kg respectively during the two seasons (Fig. 2B).

Among the catches of this gear, carangids accounting for about 25% form the dominant group followed by nemipterids (9.1%), cuttle fish (8.9%), tunas (8.8%),

cat fish (8.3%), others being lethrinids, sharks, *Saurida*, lutianids, perches, *Coryphaena* and *Trichurus* (Table 3).

Drift net: The drift net was operated in all the years during 1968-1979. The total number of units operated each year varied from 8,922 in 1968 to 25,663 in 1972 with the average at 16,636. Minimum values for catch (147.7 tonnes) and C/E (12.2 kg) were noticed in 1975 and the maximum in 1973 the respective values being 1,437.8 tonnes and 64.3 kg. The annual average catch and C/E were 751.1 tonnes and 45.2 kg respectively. The relative efficiency factor of this gear was 0.72.

Fishing by drift net also is carried out throughout the year except during July and in some years August, and it is intense during February-May and October-December periods when 44% and 40% respectively of the annual effort is expended accounting for 32% and 52% respectively of the annual catch, with the monthly C/E ranges of 26.1-35.5, kg and 31.1-85.1 kg respectively during the two seasons, October being the best season for the drift net fishery (Fig. 2C).

Tunas (*Euthynnus*, *Auxis*, *Sarda* and others) accounting for 39.3% form the dominant catch in this gear, followed by carangids (18.8%) seer fish (13.5%) and elasmobranchs (6%); others being mackerel, cat fish, lethrinids *Sphyraena* and *Chirocentrus* (Table 4).

'Chala vala': Chala vala also was operated in all the years. The number of units operated ranged between 4,576 in 1971 and 22,985 in 1978, with the average at 10,290. The total catch varied between 86.6 tonnes in 1968 to 410.2 tonnes in 1978, with the average at 196.2 tonnes. The annual C/E ranged from 10.1 kg in 1975 to 45.3 kg in 1971 with the average at 19.1 kg. The relative efficiency of this gear was 0.31.

Fishing by Chala vala is carried out throughout the year except for July and August, and it is intense during March-May and November-December when 57% and 21% respectively of the annual effort was expended, accounting for 50% and 26% respectively of the annual catch with the monthly C/E ranges of 12.0 kg-20.1 kg and 20.5 kg-24.8 kg respectively during the two seasons (Fig. 3A).

Sardines dominated by *Sardinella gibbosa* form the dominant catch accounting for 80.5%, followed by *Dussumieria* (5.5%) and leiognathids (5.2%); others being carangids and *Sphyraena* (Table 5).

'Katchal': During the period 1968-1979, Katchal was operated only for six years at times of abundance

Table 4. Catch composition of important groups of fish (tonnes) during the years 1968-1979 in drift net.

Groups	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average	%	Rank
<i>Euthynnus</i>	64.6	89.8	212.6	194.9	190.2	221.5	117.2	21.6	193.7	198.8	91.1	101.6	141.5	18.8	1
<i>Auxis</i>	40.5	9.7	207.4	159.0	213.2	227.6	43.5	18.4	191.2	178.1	230.4	54.2	131.1	17.5	2
Seer fish	32.6	27.3	21.2	125.7	123.9	247.4	83.6	22.8	235.1	113.3	96.1	88.7	101.5	13.5	3
<i>Caranx</i> sp.	29.0	41.3	55.5	59.3	137.4	150.7	98.4	11.5	98.9	69.3	100.4	56.9	75.7	10.1	4
<i>Megalaspis</i>	14.6	41.8	63.4	92.0	137.7	286.3	20.5	1.2	21.3	9.1	5.2	3.4	58.1	7.7	5
Sharks	17.4	14.7	20.5	26.1	35.7	28.2	4.1	7.4	74.3	74.2	74.8	30.5	34.0	4.5	6
Mackerel	6.0	36.7	41.4	55.2	24.7	28.7	16.5	15.4	24.4	27.5	27.1	22.9	27.2	3.6	7
Cat fish	3.0	2.3	37.7	—	53.7	24.9	21.0	5.8	33.8	7.2	32.3	10.3	19.3	2.6	8
Lethrinids	5.9	3.8	15.5	13.0	32.7	42.5	16.5	3.5	22.3	44.1	5.3	11.4	18.0	2.4	9
<i>Sphyaena</i>	—	2.4	9.5	18.1	15.4	14.6	37.7	0.9	22.1	33.2	33.4	17.6	17.1	2.3	10
<i>Chirocentrus</i>	9.1	13.7	15.8	118.0	1.7	3.6	16.2	1.1	3.0	0.4	13.5	7.0	16.9	2.2	11
<i>Istiophorus</i>	—	2.6	31.6	4.0	2.8	36.7	9.1	4.5	60.2	14.0	4.4	4.1	14.5	1.9	12
<i>Tylosurus</i>	—	6.6	14.7	0.9	0.4	13.2	1.9	6.1	89.6	10.7	2.7	6.1	12.7	1.7	13
Rays	10.4	4.5	17.8	4.1	5.1	3.5	11.1	6.0	1.8	14.5	29.0	29.8	11.5	1.5	14
<i>Sarda</i>	—	—	—	—	—	—	1.3	—	23.1	3.2	12.1	94.3	11.2	1.5	15
Other tunas	—	—	1.7	0.6	15.7	36.5	5.9	0.8	63.4	2.8	3.5	2.7	11.1	1.5	16
Lutianids	13.2	15.2	4.8	5.5	5.3	45.8	5.6	2.6	3.4	9.6	8.2	12.0	10.9	1.5	17
Other carangids	4.5	11.3	18.1	12.4	10.5	1.8	6.9	1.4	7.7	6.8	4.6	4.3	7.5	1.0	18
Other perch-like fishes	—	11.0	19.1	6.5	9.6	9.0	14.4	3.6	1.2	2.1	3.3	1.5	6.8	0.9	19
Miscellaneous	3.3	3.6	45.8	67.0	19.2	15.3	17.6	13.1	10.5	18.5	58.9	21.5	24.5	3.3	—
Total	254.1	338.3	854.1	962.3	1,034.9	1,437.8	549.0	147.7	1,181.0	837.4	836.2	580.8	751.1		

Table 5. Catch composition of important groups of fish (tonnes) during the years 1968-1979 in Chala vala.

Groups	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average	%	Rank
Lesser sardines	80.9	85.3	131.5	174.2	161.3	210.5	252.9	94.5	130.7	90.4	287.1	151.4	154.2	78.6	1
<i>Dussumieria</i>	5.1	6.6	21.9	9.8	3.3	—	45.3	7.0	5.1	0.8	16.5	7.2	10.7	5.5	2
<i>Leiognathus</i>	—	—	0.7	—	6.2	7.8	44.1	1.6	5.8	0.2	33.9	22.9	10.3	5.2	3
Oil sardine	0.6	—	—	1.0	—	—	3.7	5.0	16.3	12.3	6.0	—	3.7	1.9	4
Carangids	—	—	0.8	8.6	—	0.4	1.1	2.6	1.9	—	14.3	10.1	3.3	1.7	5
<i>Sphyaena</i>	—	—	—	1.4	—	—	5.9	—	—	—	9.5	9.4	2.2	1.1	6
Miscellaneous	—	—	8.4	12.3	10.0	—	26.6	8.7	5.0	2.1	43.0	25.2	11.8	6.0	—
Total	86.6	91.9	163.3	207.3	180.8	218.7	379.6	119.4	164.8	105.8	410.3	226.2	196.2		

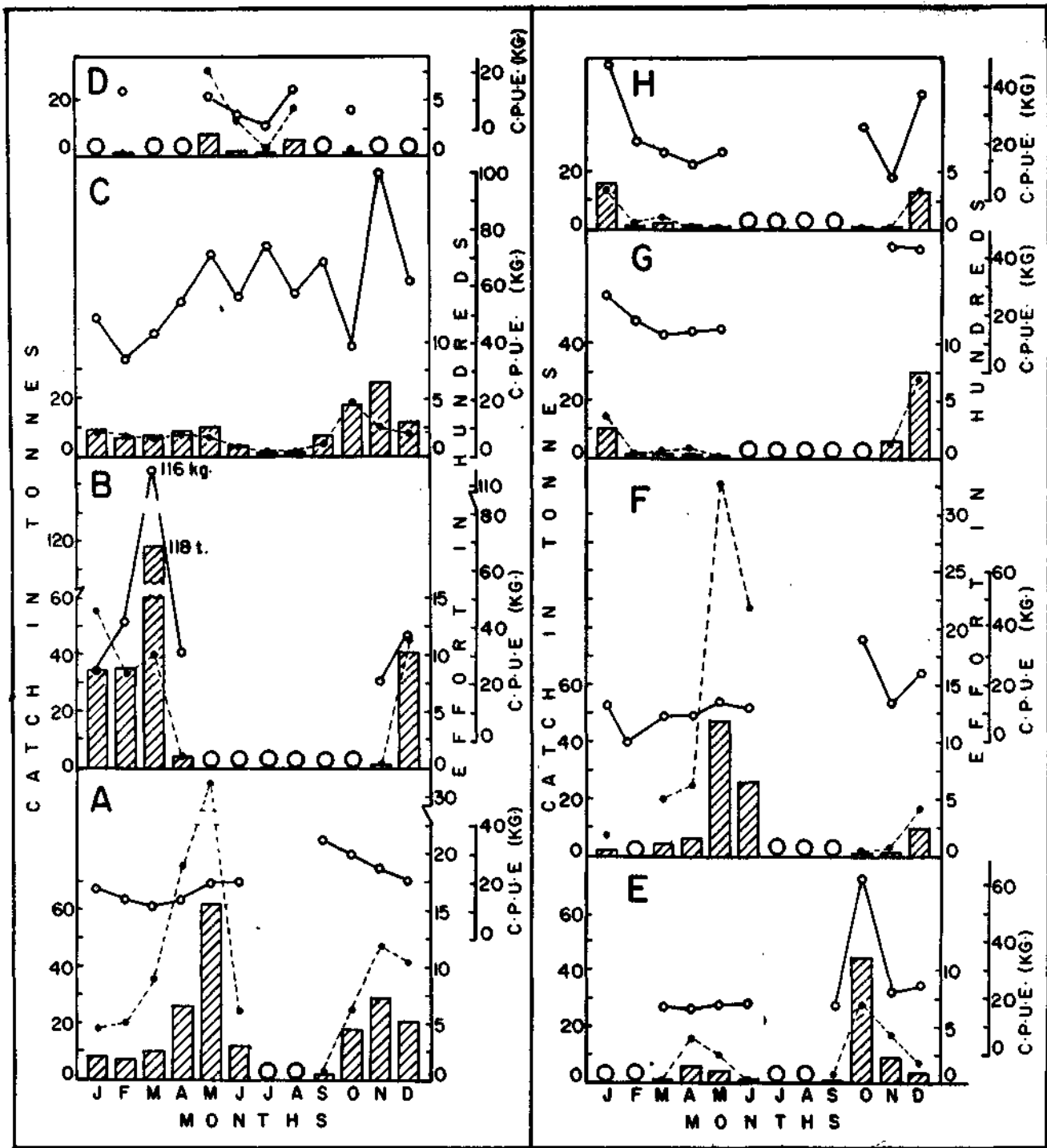


Fig. 3. The gearwise average monthly trends of catch, effort and catch per unit effort (C.P.U.E.) at Vizhinjam during 1968-1979. Open circle on the base line indicates that the gear was not operated during that month.

A. Chala vala, B. Katchal, C. Shore seine, D. Achil, E. Netholi vala, F. Konchu vala, G. Nandu vala, H. Kolachi vala.

of balistids during 1968-70, 1972, 1976 and 1977. The annual effort varied from 1,318 in 1970 to 6,894 in 1972 with the average for six years at 4,479 units. The

year 1970 registered the minimum catch (25 tonnes) as well as C/E (19 kg), and 1972 registered the maximum catch (782.5 tonnes) as well as in C/E (113.5 kg).

Table 6. Catch composition of important groups of fish (tonnes) during the years 1968-1979 in Katchal

Groups	1968	1969	1970	1972*	1976	1977	Average	%	Rank
Balistids	153.2	61.6	25.0	470.0	197.1	172.1	179.8	77.5	1
Squids	—	—	—	312.5	—	—	52.1	22.5	2
Miscellaneous	—	—	—	—	0.2	—	0.1		
Total	153.2	61.6	25.0	782.5	197.3	172.1	232.0		

* Note: The gear was not operated during 1971, 1973-'75 and 1978-1979.

Table 7. Catch composition of important groups of fish (tonnes) during the years 1968-1979 in shore seine.

Groups	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average	%	Rank
Leiognathids	30.9	57.9	17.9	8.9	3.6	7.6	20.1	5.1	7.8	3.4	20.2	19.6	16.9	15.3	1
Caranx	25.6	34.1	22.8	16.7	7.0	4.5	23.7	10.8	6.5	2.4	8.9	11.9	14.6	13.2	2
Stolephorus	15.8	23.4	7.1	13.8	5.9	18.7	24.1	2.3	18.2	6.0	22.1	6.3	13.6	12.4	3
Lesser sardines	34.2	11.6	1.4	38.2	2.9	7.0	6.6	1.8	4.1	1.4	5.7	20.8	11.3	10.3	4
Decapterus	1.4	21.7	0.6	33.7	4.9	—	8.0	2.0	1.1	0.6	7.3	2.0	7.0	6.3	5
Dussumieria	15.9	8.9	4.6	8.3	0.2	—	8.0	0.5	3.1	0.3	4.3	0.6	4.6	4.1	6
Mackerel	4.8	10.0	6.8	7.4	3.8	2.8	2.2	2.2	2.6	1.1	6.5	0.7	4.2	3.8	7
Sphyraena	—	7.0	0.2	2.8	0.1	13.6	0.1	—	0.4	3.4	17.2	2.4	3.9	3.6	8
Squids	21.4	10.0	0.8	—	1.0	—	—	1.5	0.5	0.9	8.9	0.9	3.8	3.5	9
Sciaenids	2.4	10.2	1.1	0.2	0.1	—	0.7	—	1.3	—	14.7	9.2	3.3	3.0	10
Cat fish	—	—	—	0.3	—	—	—	—	—	—	—	34.4	2.9	2.6	11
Juvenile fishes	—	6.9	—	2.2	1.7	2.9	7.1	0.8	2.7	1.7	0.9	0.2	2.3	2.1	12
Puffer fish	—	—	—	—	—	15.7	11.0	—	—	—	—	—	2.2	2.0	13
Euthynnus	4.5	4.4	2.6	0.2	11.4	—	0.8	0.6	0.2	—	0.1	—	2.1	1.9	14
Perch-like fishes	2.7	1.4	0.8	6.8	1.2	—	2.1	0.7	0.5	0.2	3.6	4.1	2.0	1.8	15
Megalaspis	9.6	2.8	1.2	1.5	0.1	1.2	2.8	—	0.2	0.8	3.2	0.2	2.0	1.8	16
Miscellaneous	11.5	16.0	25.2	9.8	20.2	4.7	9.1	8.0	9.1	6.3	25.0	18.0	13.6	12.3	—
Total	180.7	226.3	93.1	150.8	64.1	78.7	126.4	36.3	58.3	28.5	148.6	131.3	110.3		

The average annual catch and C/E were at 232 tonnes and 51.8 kg respectively. The relative efficiency of the gear was 0.83.

'Katchal' is operated during January-April and November-December with intense operations during January-March and December (December to March) when 72% and 25% of the annual effort is expended, landing 80% and 18% respectively of the annual catch with the monthly C/E ranges of 25.0-0 116.3 kg and 36.3 kg respectively during the two seasons, March being the best season for this fishery (Fig. 3B).

Balistids or file fish accounting for about 78% form the dominant catch in Katchal followed by squids (22%). Only rarely stray catches of other fishes are obtained by this gear (Table 6).

Shore seine: Shore seine was operated in all the years and the annual effort ranged between 622 units

in 1972 and 6,286 in 1968, with the average at 1,962 units per year. The total catch ranged from 28.5 tonnes in 1977 to 226.3 tonnes in 1969 with the average at 110.3 tonnes. The C/E ranged between 28.8 kg in 1968 and 115.9 kg in 1971 with the average at 56.2 kg. The relative efficiency of shore seine was 0.90.

The shore seine is operated almost throughout the year, and the operations are intense during January-April and October-December when 36% and 47% of the annual effort is expended landing 29% and 51% of the annual catch with the monthly C/E ranges of 34.1 kg-54.9 kg and 38.5 kg-100.0 kg respectively during the two seasons (Fig. 3C).

Carangids accounting for 21.3% form the dominant catch followed by *Leiognathids* (15.3%), *Stolephorus* (12.4%), sardines (10.3%), others being *Dussumieria*, mackerel, *Sphyraena*, squids, Sciaenids, cat fish, Tetraodontids, perches and early juveniles of fishes, squids and prawns (Table 7).

Table 8. Catch composition of important groups of fish (in tonnes) during the years 1968–1979 in *Netholi vala*

Groups	1968	1969	1970	1971	1972	1973	1974	1976*	1977	1968	1979	Average	%	Rank
<i>Stolephorus</i>	32.5	52.4	38.1	56.9	29.0	153.3	29.0	24.8	3.1	75.1	15.0	70.1	99.7	1
Sardines	—	—	2.0	—	—	—	—	—	—	—	—	0.2	—	2
Total	32.5	52.4	40.1	56.9	29.0	153.3	29.0	24.8	3.1	75.1	15.0	70.3		

* Note: *Netholi vala* was not operated during 1975.

Table 9. Catch composition of important groups of fish (tonnes) during the years 1975–1979 in *Konchu vala*

Groups	1975*	1976	1977	1978	1979	Average	%	Rank
Prawns	6.0	14.3	8.2	116.3	16.5	32.2	33.5	1
Mackerel	—	—	2.0	15.7	37.5	11.0	11.5	2
Sciaenids	—	—	0.8	36.4	17.7	11.0	11.4	3
<i>Caranx</i> sp.	0.2	—	1.9	35.0	15.5	10.5	10.9	4
<i>Lactarius</i>	4.7	—	0.9	37.0	5.0	9.5	9.9	5
Leiognathids	—	—	1.9	9.7	5.8	3.5	3.6	6
<i>Therapon</i>	—	—	—	8.2	4.1	2.5	2.6	7
Flat fish	—	—	—	1.5	8.7	2.0	2.1	8
Cat fish	—	—	—	6.9	1.5	1.7	1.7	9
Rays	—	—	—	6.0	1.8	1.6	1.6	10
<i>Chirocentrus</i>	—	—	—	4.2	3.2	1.5	1.5	11
Miscellaneous	—	—	5.6	25.2	15.6	9.3	9.6	
Total	10.9	14.3	21.3	302.1	132.9	96.3		

* Note: *Konchu vala* operation was started from 1975

Netholi vala: Except for the year 1975, *Netholi vala* was operated in all the years from 1968 to 1979. At an average of 2,064 units per year, the yearly effort varied between 206 units in 1977 and 5,259 units in 1972. The average annual catch was 70.2 tonnes with a very wide range of 3.1 tonnes in 1977 and 290.2 tonnes in 1972. The C/E ranged from 13.2 kg in 1968 to 76.4 kg in 1978, with the annual average at 34.0 kg. The relative efficiency of this gear was 0.5.

Netholi vala has two seasons of operation, one during March–June and the other during September–October, with intense operations during April–May and October–December, when 32% and 63% of the annual effort is expended accounting for 15% and 82% respectively of the annual catch with the monthly C/E ranges of 15.7 kg–18.1 kg and 22.3 kg–62.0 kg respectively during the two seasons, October being the best season for the *Netholi vala* fishery (Fig. 3 E).

As the local name of the gear implies, *Stolephorus* constitutes almost the entire catch of this gear. Occa-

sionally, however, juveniles of sardines and of other fishes are also caught in this net (Table 8).

Konchu vala: The *Konchu vala* was operated from 1975 onwards. On an average 7,248 units were operated per year. The effort ranged from 1,292 units in 1977 to 18,072 in 1978. The annual catch varied between 10.9 tonnes in 1975 and 302.1 tonnes in 1978 with the average at 96.3 tonnes. The minimum C/E of 6.4 kg and maximum of 16.7 kg were observed in 1976 and 1978 respectively with the average at 13.3 kg. The relative efficiency of this gear was 0.21.

The 'Konchu vala' was operated during March–June and October–January but the operations were intense during April–June period, when 84% of the annual effort is expended, accounting for 81% of the annual catch with the monthly C/E range of 9.3 kg–14.3 kg, highest yield being obtained in May (Fig. 3 F).

Prawns form the dominant catch (33.6%) followed by mackerel (11.5%), Sciaenids (11.4%), carangids

(10.9%), *Lactarius* (9.9%) and others: leiognathids, theraponids, flat fishes, cat fish and rays (Table 9).

Nandu vala: During the period 1968–69 this gear was in operation only for six years: from 1971 to 1974, 1978 and 1979. The annual effort ranged from 167 units in 1972 to 3,603 units in 1973, with the average at 1,445 units. The average annual catch was 50 tonnes with the annual variation of 2.8 tonnes in 1972 and 169.6 tonnes in 1973. The annual C/E ranged between 16.6 kg in 1972 and 47.1 kg in 1973 with the average at 34.6 kg. The relative efficiency of the gear was 0.55.

'Nandu vala' is operated during January–May and November–December (November–May), with intense operations during January and November–December (November–January) when 85% of the annual effort is expended, landing 94% of the annual catch with the monthly C/E ranging from 27.3 kg to 44.3 kg (Fig. 3G).

Crabs mainly *Portunus* spp. accounting for 59.4% form the dominant catch in this gear, followed by mackerel (7.5%), skates and rays (7.5%), nemipterids (7.1%); others being carangids, balistids, *Thenus orientalis* and *Sphyraena* (Table 10).

Kolachi vala: The gear was operated from 1971 onwards except during 1974. The annual effort ranged between 111 units in 1971 and 2,189 units in 1972 with the annual average of 900 units. The annual catch also showed wide variation, being 1.3 tonnes in 1971 and 94.5 tonnes in 1973, with the average at 32.6 tonnes.

The annual C/E ranged between 9.8 kg in 1975 and 51.3 kg in 1973 with the average at 36.3 kg. The relative efficiency of this gear was 0.58.

'Kolachi vala' is operated during January–March and December (December–March) with intense operations during January and December (December–January) when 76% of the annual effort is expended, landing 88% of the annual catch with the monthly C/E ranging between 36.5 kg. and 47.7 kg (Fig. 3H).

The net as its local name implies, is designed mainly to catch half-beaks. Thus *Hemirhamphus* spp. accounts for the bulk (89.7%) of the catch by this net, followed by flying fish (Exocoetidae) 9.4%, and a few other stray catches (Table 11).

Achil: This gear was operated only during 1972 to 1974 and 1977, when the effort varied between 861 units in 1972 and 2,820 units in 1973, with the annual average at 1,723 units. The fish catch ranged from 5.9 tonnes in 1972 to 23.2 tonnes in 1977, with the annual average at 17.8 tonnes. The annual C/E ranged from 6.9 kg in 1972 to 22.1 kg in 1974, with the average at 10.3 kg. The relative efficiency of Achil was 0.16.

Achil appears to have no specific season of operation. However, over the four years when it was employed, its active operation was noticed during May–June and August when about 87% of the annual effort was expended landing 93% of the annual catch with the C/E ranging between 5.4 kg and 14.3 kg (Fig. 3D).

Table 10. Catch composition of important groups of fish (tonnes) during the years 1971–1979 in *Nandu vala* (Bottom set gill net).

Groups	1971*	1972	1973	1974	1978*	1979	Average	%	Rank
Crabs	3.9	0.2	—	—	3.0	1.5	29.7	59.4	1
Mackerel	—	—	—	—	7.6	15.0	3.8	7.5	2
<i>Nemipterus</i>	0.3	—	—	20.9	—	—	3.5	7.1	3
Rays	5.7	1.6	—	—	6.3	4.0	2.9	5.9	4
Carangids	—	—	—	—	6.3	7.4	2.3	4.5	5
Balistids	12.4	—	—	—	—	—	2.1	4.1	6
<i>Thenus orientalis</i>	—	0.9	169.6	—	4.5	2.5	1.3	2.6	7
Skates	—	—	—	—	3.4	1.3	0.8	1.6	8
<i>Sphyraena</i>	—	—	—	—	2.6	1.3	0.6	1.3	9
Miscellaneous	4.3	0.1	—	—	7.2	6.9	3.1	6.0	
Total	26.6	2.8	169.6	20.9	40.9	39.9	50.1		

*Note: *Nandu vala* (Bottom set gill net) operation was started from 1971. The net, however, was not operated from 1975 to 1977.

Table 11. Catch composition of important groups of fish (tonnes) during the year 1971–1979 in Kolachi vala

Groups	1971*	1972	1973	1975	1976	1977	1978	1979	Average	%	Rank
<i>Hemirhamphus</i>	1.3	58.5	94.3	1.5	10.5	6.6	50.1	11.3	29.3	89.7	1
<i>Cypsilurus</i>	—	24.4	—	—	—	—	—	—	3.0	9.4	2
Miscellaneous	—	—	0.2	—	0.1	—	1.0	1.1	0.3	0.9	
Total	1.3	82.9	94.5	1.5	10.6	6.6	51.1	12.4	32.6		

* Note: Kolachi vala operation was started from 1971. This gear, however, was not operated during 1974.

Table 12. Catch composition of important groups of fish (tonnes) during the years 1972–1977 in Achil.

Groups	1972*	1973	1974	1977	Average	%	Rank
<i>Dussumieria</i>	2.8	11.2	1.5	2.2	4.4	24.9	1
Lesser sardines	3.1	9.4	1.5	—	3.5	19.8	2
<i>Caranx</i>	—	—	6.2	3.2	2.5	13.2	3
<i>Decapterus</i>	—	—	3.2	4.7	2.0	11.1	4
Trichiurids	—	—	7.0	—	1.7	9.8	5
Mackerel	—	—	0.9	3.7	1.2	6.5	6
<i>Nemipterus</i>	—	—	1.1	2.9	1.0	5.5	7
<i>Sarda orientalis</i>	—	—	—	3.3	0.8	4.6	8
<i>Saurida</i>	—	—	—	2.1	0.5	3.0	9
Miscellaneous	—	—	—	1.0	0.2	1.5	
Total	5.9	20.6	21.4	23.1	17.8		

* Note: Achil operations were started from 1972. The gear, however, was not operated during 1975–76 and 1978–79.

Small sized fish are generally hooked by this gear. Thus *Dussumieria* spp. and *Sardinella* spp. accounting for 25% and 20% respectively form the dominant catch of Achil, followed by carangids (24.3%), *Trichiurus* (9.8%), mackerel (6.5%), *Nemipterus* (5.5%); others being tunas, *Saurida* and a few other stray catches (Table 12).

Species composition

From the foregoing account, it could be noticed that a large variety of fishes support the fishery at Vizhinjam, and the landings of each gear have a characteristic species composition of fishes. In fact, some of the gear are designed to catch particular groups of fish (Table 13). The seasonal trends in the catches of important groups of fish are given in the following account (Fig. 4).

The ribbon-fish (Family Trichiuridae) fishery comprising mainly of *Trichiurus lepturus* rank foremost among the different fisheries occurring off Vizhinjam. The average annual landings of ribbon-fish was 1,021

tonnes, forming about 22.6% of the total fish landings. Most of the catch (97%) is landed by boat seine at an annual catch rate of 29.5 kg per net and during June–October (99%) with peak landings in July (Fig. 4A).

Carangids are the next important group with the average annual landings at 601 tonnes accounting for about 13.3% of the total fish landings. *Decapterus dayi* and *Megalaspis cordyla* with the average annual landings at 159 tonnes and 152 tonnes, accounting for 26% and 25% respectively of the carangid catches are the two important single species fisheries of the carangids. The rest of the catches comprises mainly species of *Carangoides*, *Caranx*, *Selar* and *Chorinemus* (*Scomberoides*) followed by stray catches of the species of *Alectis*, *Alepes*, *Atropus*, *Atule*, *Elagatis*, *Gnathanodon*, *Selaroides*, *Trachinotus*, *Uraspis* and *Ulua*. Carangids are landed almost throughout the year with good catches during July (12%) and September–November (43%). The fishery season for *Decapterus dayi* is May–November with peak landings during July and September. *Megalaspis cordyla* on the other hand has two distinct fishery seasons, a major one during October–November

Table 13. Percentage contribution by different gears to the landings of important groups of fish based on average annual landings during the period 1968-1979.

Sl. No.	Groups	Hook and line	Boat seine	Drift net	Shore seine	Bottom set gill net	Kachal	Netboli vala	Konchu vala	Achil	Kolachi vala	Chala vala	Annual average catch (In tonnes)
1.	Sharks	51.7	0.1	48.0	—	0.1	—	—	0.1	—	—	—	70.8
2.	Rays	37.5	18.1	34.8	3.2	4.5	—	—	1.9	—	—	—	32.9
3.	Oil sardine	—	87.2	0.3	1.2	—	—	—	—	—	—	11.3	33.0
4.	Lesser sardine	0.2	23.2	0.2	5.2	0.1	—	0.1	0.2	0.5	—	70.3	219.4
5.	Dussumieria	4.7	73.6	—	5.8	—	—	—	0.5	1.9	—	13.5	78.9
6.	Stolephorus	—	70.3	—	5.2	—	—	24.3	—	—	—	0.2	264.0
7.	Saurida	85.1	7.3	2.5	0.2	0.2	—	—	0.6	0.5	—	3.6	39.7
8.	Cat fish	49.0	37.7	11.1	1.7	0.1	—	—	0.4	—	—	—	173.8
9.	Tylosurus	52.3	2.4	44.6	0.5	—	—	—	—	—	0.2	—	28.6
10.	Sphyraena	15.3	34.5	35.9	8.2	0.7	—	—	0.8	—	—	4.6	47.6
11.	Lactarius	1.1	80.7	1.8	1.1	—	—	—	11.3	—	—	4.0	35.2
12.	Megalaspis	56.0	4.4	38.1	1.3	0.1	—	—	0.1	—	—	—	152.3
13.	Decapterus	31.9	61.6	0.9	4.4	—	—	—	0.1	0.4	—	0.7	158.5
14.	Other carangids	38.2	27.8	26.1	5.0	0.3	—	—	1.5	0.3	—	0.8	290.3
15.	Coryphaena	94.0	—	5.8	0.1	0.1	—	—	—	—	—	—	31.6
16.	Lutianids	69.6	6.7	23.2	0.1	0.4	—	—	—	—	—	—	47.0
17.	Nemipterus	82.4	13.9	1.5	0.1	1.6	—	—	0.1	0.3	—	0.1	114.1
18.	Leiognathids	—	84.7	—	9.0	—	—	—	0.8	—	—	5.5	187.5
19.	Sciaenids	5.6	80.3	1.5	5.0	—	—	—	6.9	—	—	0.7	66.4
20.	Lethrinids	70.0	0.3	29.1	0.3	0.2	—	—	0.1	—	—	—	61.9
21.	Upeneus	15.3	77.0	0.9	3.0	—	—	—	0.7	—	—	3.1	51.2
22.	Trichiurids	2.3	97.1	0.3	0.1	—	—	—	—	0.1	—	0.1	1,021.3
23.	Mackerel	9.6	39.2	36.2	5.6	2.5	—	—	6.1	0.5	—	0.2	75.1
24.	Auxis	9.1	—	90.7	0.1	0.1	—	—	—	—	—	—	144.5
25.	Euthynnus	35.0	0.1	64.0	0.9	—	—	—	—	—	—	—	221.0
26.	Seer fish	6.3	1.8	90.9	1.0	—	—	—	—	—	—	—	111.6
27.	Istiophorus	54.9	—	45.1	—	—	—	—	—	—	—	—	32.2
28.	Balistids	42.4	0.7	0.1	—	0.7	56.1	—	—	—	—	—	160.3
29.	Acetes	—	98.6	—	1.4	—	—	—	—	—	—	—	48.6
30.	Squids	8.7	69.5	—	2.8	—	19.0	—	—	—	—	—	137.0
31.	Cuttle fish	95.4	3.6	0.3	0.7	—	—	—	—	—	—	—	96.6
32.	Miscellaneous	19.6	32.7	22.6	4.2	5.6	—	—	5.8	0.1	7.4	1.9	291.8
Average Total catch (In tonnes)		1,028.1	2,165.8	751.1	110.3	25.0	116.0	64.4	40.2	5.9	21.7	196.2	4,524.7
%		22.7	47.9	16.6	2.4	0.6	2.6	1.4	0.9	0.1	0.5	4.3	

landing about 50% of the annual catch and a minor one during March–May accounting for about 25% of the annual catch. In some years, good catches are also obtained in December (Fig. 4B and C). One or the other species of the 'Other carangids' are caught almost throughout the year in good quantities with peak landings during September–October, accounting for 30% of their annual landings (Fig. 4D). Bulk of the catches of *Decapterus dayi* is landed by boat seine (62%) and hook and line (32%), whereas those of *Megalaspis cordyla* is landed by hook and line (56%) and drift net (38%). The 'other carangids' are mainly caught by hook and line (38%), boat seine (28%) and drift net (26%).

The tunas *Euthynnus affinis* and *Auxis thazard*, with their relative contributions at about 60% and 40% respectively together contribute annually to about 365 tonnes accounting for about 8.1% of the total fish landings, and rank third, next to ribbon-fish and carangids. Two principal gear namely drift net (64%) and hook and line (35%) contribute to the bulk of *Euthynnus* landings, while *Auxis thazard* is mainly caught in drift net (90%), the hook and line accounting for about 9% of the catch. Both these genera are landed almost throughout the year with two periods of peak landings, the major one during March–May and the minor one during October–November (Fig. 4 E and F). Stray catches of *Sarda orientalis*, *Thynnus albacares*, *Kishinouella tonggol*, *Katsuwonus pelamis* and *Auxis rochei* are met with in the tuna landings.

Anchovies rank fourth in the fisheries of the area with the average annual landings at 272 tonnes, accounting for about 6% of the total fish landings. Bulk of the catch (97%) is formed by *Stolephorus* and the rest by *Thryssa*. The fishery for the former has two principal seasons namely, June–July and September–October accounting for about 29% and 48% respectively of their annual catch (Fig. 4G). Boat seine lands bulk (70%) followed by gill net (Netholi vala)-24%, shore seine-5% and the rest by other gear. Three species namely *Stolephorus devisi* (47%), *S. bataviensis* (31%) and *S. buccaneeri* (14%) comprise the bulk of *Stolephorus* catch, and the rest by *S. indicus*, *S. andhraensis*, *S. commersonii*, *S. macrops* and *S. heterolobus*. *Thryssa* is landed mainly by boat seine and Chala vala. *T. setirostris* and *T. mystax* together account for 90% of the *Thryssa* catch.

Sardines (genus *Sardinella*) accounting for about 5.6% of the total fish landings are the next important group. About 252 tonnes of this fish are landed annually. Of this, oil sardines (*S. longiceps*) accounts for only

about 13% of the catch, whereas the lesser sardines account for the bulk (87%) of the catch. About half the lesser sardine catch is constituted by *S. gibbosa*, followed by *S. sirm* (24%), *S. dayi* (13%), *S. fimbriata* (6%) and the rest by a few other species. Fishery season for oil sardine lasts from May to October with good landings in June and August. The fishery for lesser sardines, on the other hand, lasts for almost throughout the year with two periods of good catches namely April–May and October–November accounting for 30% and 22% respectively of their annual landings (Fig. 4H).

Squids and cuttle fish with their relative composition at 58% and 42% respectively and the combined average annual catch at 234 tonnes rank sixth in the fisheries of the area accounting for 5.1% of the total fish landings. Bulk (70%) of the squid catch is landed by boat seine followed by Katchal (19%) and hook and line (9%), while most of the cuttle fish (95%) is caught by hook and line. Good fishery accounting for about 85% of the annual catch occurs during January, March and September for squids, and during January–February and September–November for cuttle fish as well (Fig. 4 I). *Loligo duvauceli* is the most important species of squids caught in the area with stray catches of *Doryteuthis singhalensis*; the most important species of cuttle fish is *Sepia pharaonis* with stray catches of *S. aculeata*, *S. elliptica*, *Sepioteuthis lessoniana* and *Sepiella inermis*.

Silver bellies (Family Leiognathidae) comprising the genera *Leiognathus*, *Secutor* and *Gazza* and contributing about 187 tonnes annually account for about 4% of the total fish landings. *Leiognathus bindus* and *Secutor insidiator* are the two important species of silver bellies of the area. The other species met with are *Leiognathus daura*, *L. dussumieri*, *L. brevirostris*, *L. equulus*, *L. lineolatus*, *L. splendens*, *L. leuciscus*, *Secutor reconius* and *Gazza minutus*. Bulk (85%) of the leiognathid catch is landed by boat seine, followed by shore seine (9%), Chala vala (5%) and the rest by other gear. Though the fish is landed almost throughout the year, nearly 90% of the catches are landed during April–October with peak landings in June (Fig. 4K).

Cat fish catches amount to about 174 tonnes annually and account for 3.8% of the total fish landings. Hook and lines land about half the annual catch followed by boat seine (38%), drift net (11%), and other gear. Though the fish is landed almost throughout the year, bulk of the annual catch is landed during July (18%) and September–November (50%) (Fig. 4L). Important

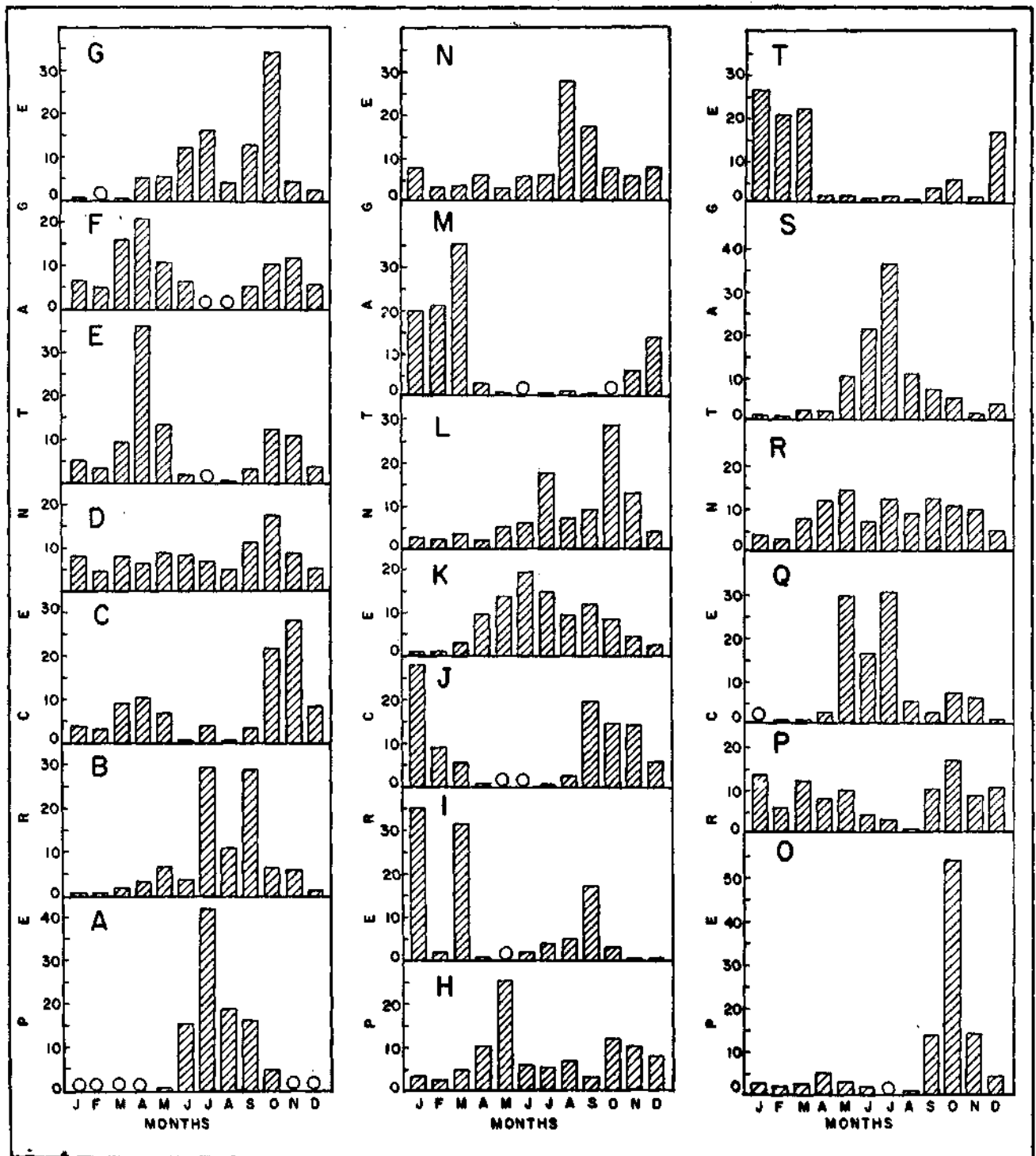


Fig. 4. The seasonal trends in the catches of important groups of fishes at Vizhinjam during 1968-1979. Open circle on the base line indicates nil or negligible amount of catch during the corresponding month.

A. *Trichurus*, B. *Decapterus*, C. *Megalaspis*, D. Other carangids, E. *Euthynnus*, F. *Auxis*, G. *Stolephorus*, H. Lesser sardines, I. Squids, J. Cuttle fish, K. Leiognathids, L. Cat fish, M. Balistids, N. Nemipterids, O. Seerfish, P. Sharks, Q. *Dussumieria*, R. Mackerel, S. Sciaenids, T. Lethrinids.

species of cat fish caught are *Netuma thalassinus* and *Trachysurus dussumieri*.

File fish (Family Balistidae) contributing to 160 tonnes annually account for 3.5% of the total fish lan-



Fish landing activities and catches at Vizhinjam

dings. Bulk of this fish is caught by Katchal (56%) and hook and line (42%). Main fishery season which accounts for nearly 90% of the annual catch lasts from December to March, peak landings being obtained during March (Fig. 4M). *Odonus niger* is the dominant species of file fish of the area, with occasional good landings of *Sufflamen capistratus*. Other important species met with are *Pseudobalistes fuscus* and *Abalistes stellaris*.

The threadfin bream (Family Nemipteridae) contribute to about 114 tonnes accounting for 2.5% of the annual landings. *Nemipterus bleekeri*, *N. mesoprion*, *N. delagoae* and *N. japonicus* are the important species of the area. Bulk (82%) of the nemipterid catch is obtained by hook and line, followed by boat seine (14%), and other gear. The fish is landed throughout the year, main fishery season accounting for 45% of the annual catch occurs during August–September (Fig. 4N).

Seer fish (Family Scomberomoridae) landings amount to 112 tonnes and account for about 2.5% of the total annual fish landings. *Scomberomorus commersoni* forms the dominant species in the catches, followed by *S. lineolatus* and *S. guttatus*. Most of the catch of seer fish (about 90%) is landed by drift net, followed by hook and line (6%), and other gear. Main fishery season lasts from September to November when about 82% of the annual catch is landed (Fig. 4O).

Sharks and rays with their relative contribution at about 70% and 30% respectively contribute together to 104 tonnes annually accounting for about 2.3% of the total fish landings. Most of the shark catches (99.5%) are landed almost equally by hook and line and drift net (35%) and boat seine (18%). Though sharks and rays are landed throughout the year, September–March period accounts for about 70% of the annual catch (Fig. 4P). Important species caught are *Loxodon macrorhinus*, *Scoliodon laticaudus* and *Carcharhinus limbatus* among sharks, *Gymnura poecilura*, *G. macrura*, *Himantura bleekeri*, *Amphotistius kuhli*, *Pastinachus sephen* and *Rhinoptera javanica* among the rays. Occasionally the skates, *Rhynchobatus djiddensis* and *Rhinobatus grannulatus* are also caught in the area.

Rainbow sardines (Family Dussumieridae) catches amount to about 79 tonnes and account for about 1.7% of the annual total fish landings. About 75% of the catch is landed by boat seine, followed by shore seine (5.8%), hook and line (4.7%) and other gear. Best fishing season lasts from May to July accounting for

about 75% of its annual catch (Fig. 4Q). *Dussumieria hasselti* and *D. acuta* occur in the catches.

Mackerel (*Rastrelliger kanagurta*) catches amount to about 75 tonnes annually and account for about 1.7% of the total fish landings. Boat seine and drift net are the two equally important gear for this fishery, together contributing to 75% of the annual catch, followed by hook and line (9.6%), Konchu vala (6.1%), shore seine (5.6%), Nandu vala (2.5%), and the rest by Achil and Chala vala. Good fishery occurs during April–May and July–November, when 25% and 52% respectively of the annual catch is landed (Fig. 4R).

Jew fish (Family Sciaenidae) with an annual catch of about 66 tonnes and pig-face bream (Family Lethrinidae) with an average annual catch of about 62 tonnes are the two other important groups of fish of this area accounting for 1.5% and 1.4% of the total fish landings. Most of the sciaenid catch (80%) is obtained by boat seine, whereas the lethrinids are mainly caught by hook and line (70%) and drift net (29%). Good fishery season occurs during May–August accounting for about 78% of the annual landings for sciaenids, and during December–March accounting for about 84% of the annual landings for lethrinids (Fig. 4S). Important sciaenids caught are *Sciaena dussumieri*, *Johnius maculatus* and *J. osseus* and those of lethrinids are *Lethrinus ornatus*, *L. mahsenoides*, *L. reticulatus* and *Lethrinella miniata*.

Seven more groups of fish and *Acetes* each accounting for about 1% of the total fish landings could be considered of some fishery importance in the Vizhinjam area. They are *Upeneus*, *Lactarius* and *Acetes* which are caught mainly in boat seine; *Sphyræna* caught mainly in boat seine and drift net; *Lutianids*, *Istiophorus gladius*, *Coryphaena* and *Tylosurus* which are caught mainly by hook and line and drift net; and *Saurida* caught mainly by hook and line. Though prawns and half-beaks do not constitute a sizable catch in the Vizhinjam area, they are caught in good quantities in certain months.

General remarks

Out of the eleven types of gear employed at present in the traditional fishing at Vizhinjam; three gears namely boat seine, hook and line and drift net are the principal gears used, accounting for the major share of about 87% of the total fish landings. These three and the other gears together comb the waters off Vizhinjam for harvesting the fishery resources generally upto a distance of about 8–10 km, and upto a depth of

about 40–50 metres. Surface and mid-water pelagic fishes therefore form the mainstay of the traditional fisheries at present. Very little is known about the demersal fishery resources of the inshore fishing grounds as also of the fishery resources of the offshore waters. Hence, fisheries developmental activities in the area

could be initiated by introducing the modern versions of the three principal traditional fishing gear of the area. Thus mid-water trawling, long lining and drift gill netting together with bottom trawling seem to offer good prospects for increased exploitation of the fishery resources of this area.



MECHANISATION OF INDIGENOUS CRAFTS WITH OUTBOARD MOTORS IN TAMIL NADU - AN IMPACT STUDY*

Mechanisation of fishing in India during the last few decades has resulted in the enhancement of catches and thereby better income for the fishermen. As a part of this general process of mechanisation, indigenous crafts are being motorised with outboard engines in different maritime states of India including Tamil Nadu, leading to promising results. In this context, a study relating to the extent of mechanisation of catamarans in the districts of Kanyakumari and Thirunelveli of Tamil Nadu and their economy was carried out and a brief account is given below.

About 80 out of 1,848 catamarans in the region from Neerodi to Enayam Puthenthurai in Kanyakumari district and 10 out of 935 catamarans in Uvari and Periyathalai villages in Thirunelveli district are fitted with outboard motors (Table 1). All these units are fitted with Yamaha engines (model 8 B.K., 7 H.P.) costing about Rs. 10,300 during August-December period of 1981. The catamarans have 4 to 5 logs

measuring about 25 feet length and cost about Rs. 5,000 per catamaran.

The number of catamarans fitted with outboard motors is very much less in Thirunelveli district and maximum in Vallavilai and Marthandanthurai of Kanyakumari district. The catamarans with outboard motors in relation to total catamarans available in the villages are 8 per cent in Vallavilai, 12 per cent in Marthandanthurai and less than 3.5 per cent in other fishing centres.

In Thirunelveli district there does not seem to be much impact due to the motorisation of the catamarans. The motorised catamarans in Uvari and Periyathalai villages in this district operated for about a period of four months from October '81 to January '82. There is not much difference in the total catches of motorised and non-motorised catamarans in this area. It is reported by the fishermen here that when the wind is

Table 1. *Details of number of catamarans fitted with outboard engines in Kanyakumari-Thirunelveli coast*

Districts	Fishing centre/village	Total catamarans	No. of catamarans fitted with outboard motors
Kanyakumari	Neerodi	175	6
-do-	Vallavilai	385	30
-do-	Marthandanthurai	202	25
-do-	Thoothoor and		
	Eraviputhenthurai	489	7
-do-	Enayam Puthenthurai	597	12
Thirunelveli	Uvari	505	7
-do-	Periyathalai	430	3

*Prepared by R. Sathiadhas.

favourable the non-mechanised catamarans are also able to move by using sails as fast as the catamarans fitted with outboard motors. Hence the fishermen of this area keep outboard motors in their units as reserve and utilise the same whenever the wind is unfavourable. The gears used by the fishermen of this area are drift nets and hooks and lines. The composition of catch is *Scomberomorus* sp, *Chirocentrus*, *Lactarius*, *Sciaena* and *Arius*.

In Kanyakumari region, the gear used in motorised units is hooks and lines with the aid of artificial baits. Three to five persons go for fishing in each unit. Normally they leave the shore between 3 and 4 a.m. and return to the shore between 6 and 8 p.m. The fishing season for these mechanised catamarans extend from November to March. They mainly go to fish for cuttle fishes, *Sepia* spp, which realise very good price due to export market. Along with *Sepia* spp. they also get good quantities of tunas, serranids, lutjanids, perches and balistids. The non-motorised catamarans of this area operate throughout the year using hooks and lines with scoop nets. The man power employed for this operation is 2 in each unit. They leave the

shore between 5 and 6 a.m. and return between 2 and 4 p.m. the duration of actual fishing being only 3 to 5 hours. The species wise average catch per trip both for motorised and non-motorised catamarans with price per kg to the landing centre is given in Table 2.

The gross returns by the motorised catamarans range from Rs. 100 to 2,000 per trip, averaging to Rs. 500. Each crew is given an allowance of Rs. 5 per trip in addition to his share. The income after deducting the fuel expenditure and allowance to the crew members is shared 50 per cent each among the owner of the unit and the crew members. The share received by the crew members is equally divided among themselves. The number of actual fishing days ranged from 20 to 25 days per month during this period and the average share received by each crew member works out to Rs. 37 per trip.

The fuel requirement per trip for the mechanised units is about 20 to 30 litres of kerosene and 1.5 to 3 litres of petrol. The fishermen used to take with them additional kerosene in barrels. During November 81-March '82 procurement of kerosene for their units became a great problem. There was no special allotments of kerosene for these units and the fishermen had to rely mostly on private traders who charged about Rs. 3 per litre which is 50 per cent higher than the official price. Repairing and maintenance charges of the outboard motors amount to about Rs. 250 per month. The average operational expenditure which includes fuel, repairing and maintenance of the engine and allowance to the crew members would be Rs. 130 per trip.

The gross fishing income of a non-motorised catamaran operating with hooks and lines average about Rs. 90 per trip in Kanyakumari region. This income is divided into 3 equal shares—two shares to the crew and one to the owner of the unit.

Due to motorisation employment opportunity is doubled since the motorised catamaran requires 3 to 5 persons instead of only 2 for the non-motorised units. The increased mobility and the easy accessibility of the fishing ground for the motorised catamarans resulted in higher gross returns of almost 6 times as compared to the returns of catamarans without outboard engine. The wage earners of the motorised units earn about 30 per cent higher than those of the non-motorised units.

There is no marketing problem for the disposal of the fish. More than 80% of the catches that are landed in the late hours are utilised for drying and

Table 2. Average catch per catamaran trip and price rate at the landing centres in Kanyakumari region (November 1981-March 1982)

Sl. No.	Name of fish/ species	Average catch per trip per catamaran unit (kg)		Price rate at the landing centre Rs/kg
		Motorised	Non-motorised	
1.	<i>Sepia</i> sp	15	1	17.00
2.	<i>Pristipomoides</i> types	18	—	4.00
3.	<i>Epinephelus</i> <i>tauvina</i>	7	—	4.00
4.	<i>Cephalopholis</i> <i>sonnerati</i>	5	1	4.00
5.	<i>Odonus niger</i>	12	5	1.50
6.	<i>Sufflamen</i> <i>capistratus</i>	3	2	1.50
7.	Lutjanids	5	—	4.00
8.	<i>Coryphaena</i>	5	1	4.00
9.	Tuna	5	—	5.00
10.	<i>Caranx</i> sp.	3	1	5.00
11.	<i>Scomberomorus</i> sp	—	4	8.00
12.	<i>Rachycentron</i> sp.	—	1	5.00
13.	<i>Tylosurus</i> spp.	—	1	4.00
14.	<i>Lethrinus</i> spp.	3	1	4.00
15.	Misc.	10	3	2.00

curing, the rest preserved in ice and disposed off in the morning. It is learnt that no subsidy or institutional loan is issued to the fishermen for the purchase of outboard motors. Most of the fishermen report that they have recovered more than 70 per cent of the capital investment during the short span of operation for five months.

The fishermen in Kanyakumari district operated these units in the respective centres only from November '81 to March '82 and after-wards all the units have migrated to Sakthikulangara area of Kerala coast for fishing. Their migration to the Kerala coast is mainly due to the roughness of sea and decline in the catch of *Sepia* spp. which fetches high prices. They report that their mechanised catamarans will return to the respective centres during November 1982 when the cuttle fish fishery starts.

Due to lack of facilities for the repairing and servicing of the outboard motors in this area, the fishermen have to go all the way to Vizhinjam even for minor repair works. It is desirable to have more stations started where spare parts and servicing facilities are readily available especially keeping in view of the expected increase in the number of motorised catamarans. As already mentioned, fishermen have been experiencing difficulties in procuring kerosene oil at reasonable price and it is suggested that the State Government may take necessary steps for continuous supply of kerosene oil to the fishermen operating motorised catamarans.

The help rendered in the collection of data by S/Shri I.P. Ebenezer and N. Retnaswamy, Technical Assistants, Kanyakumari Field Centre of C.M.F.R.I. is acknowledged.



NEWS — INDIA AND OVERSEAS

Bureau of fish genetics in India

A bureau of fish genetics resources is being set up in India by the Central Marine Fisheries Research Institute (CMFRI). The bureau will collect and classify information on the more important organisms found in Indian waters, particularly those which may be useful in aquaculture. It will also lay down conditions for the preservation of fish genetic material to ensure maximum efficiency at fish farms. Another function of the bureau will be to serve as a contact liaison agency for the exchange of such material with international agencies.

The bureau will operate from three centres. One in the fresh water aquacultural research and training centre of the Central Inland Fisheries Research Institute (CIFRI) at Dhauli, Orissa which would devote attention mainly to fresh water fish. Another unit will be located at CIFRI's Research Centre at Kakdeep in West Bengal and connected with brackish water species. The third Centre will be at Cochin to study marine species.

Success in crab rearing

The mud crab *Scylla serrata*, the largest and most expensive variety of crab in South East Asia has been successfully reared by Professor Hon-Cheng Chen at the National Taiwan University Laboratory. He succeeded in hatching the eggs of the gravid females and rearing the larvae to the juvenile stages. Under his supervision the Taiwan Fish Culture Station produced large numbers of young crabs.

As a result of the studies several small commercial

crab hatcheries have sprouted, some of which producing 1,00,000 megalops a month. Berried female crabs are taken from the sea and put in shallow concrete ponds to hatch the eggs which in turn develop into zoea. Fed on rotifers, these become megalops in 15 to 18 days and then in turn fed on brine shrimp grow to early juveniles within 7 days. At this stage they are sold to crab farmers.

Fish Farming International 8 (4): December 1981

Mussels for arthritis

Research in New Zealand has shown encouraging results to prove that mussels might relieve thousands of arthritis patients. An extract from their native green mussel *Perna canaliculus* is found to be 60 per cent successful in relieving rheumatoid arthritis symptoms. It is also effective in 50 per cent of the cases of osteoarthritis. The medicinal extract of the mussel is known as Seatone.

Among 16 species of mussel found in New Zealand only two species of mussels are cultured by using the raft as well as longline methods in addition to the wild stocks available in these waters. The cultured green mussels are increasingly used for the medicinal purpose.

In Indian waters also there are two species of mussels which are commercially important, the green and the brown. The latter *Perna indica* has a limited distribution in the southern most part of the peninsular India and the former *Perna viridis* is distributed in other areas. It is possible that any one of these species might prove to have the medicinal values as the green mussel of New Zealand.

Fish Farming International 9 (1): March 1982

Compiled and prepared by M. J. George & G. Subbaraju.

Published by Dr. M. J. George, Senior Scientist on behalf of the Director, Central Marine Fisheries Research Institute, Cochin-682 018 and printed at PAICO, Cochin-31