

PRESENT STATUS OF EXPLOITATION OF FISH AND SHELLFISH RESOURCES : CATFISHES

N. GOPINATHA MENON, V. N. BANDE, C. MUTHIAH, S. G. RAJE, P. U. ZACHARIA AND K. BALACHANDRAN

Central Marine Fisheries Research Institute, Cochin - 682 031

ABSTRACT

The availability, abundance and yield of catfishes are very much influenced by the monsoon along the west coast of India. More than 55% of the annual total catfish production from the west coast (1984-'88) is realised during postmonsoon period and 35.6% in premonsoon and 9.2% in monsoon. The gearwise and seasonwise catfish production, abundance and species composition in different States and at selected fishing centres on the west coast are presented. Catfish resource has high abundance during monsoon at Veraval, Bombay, Calicut and Cochin. Although the yield is low during the monsoon period, it is proportionate to the effort put in at all the centres. All along the west coast, *Tachysurus dussumieri* (32.4%) is the most dominant species in the fishery of premonsoon period and *T. thalassinus* (42.4%) in that of monsoon. The percentage contribution of *T. tenuispinis* and *T. dussumieri* during postmonsoon is about 28.

The size frequency and spawning of the dominant species in various fishing centres during the three seasons are discussed. The spawning season of all the species is found to be during the end of monsoon or in the beginning of postmonsoon. An attempt is made to correlate the seasonal resource abundance with rainfall and the results show a positive correlation at Calicut and Cochin.

INTRODUCTION

The catfish production from the coastal waters of India is about 59,000 tonnes mostly realised from 0-50 m depth belt, whereas the estimated potential is 123,000 t. Acoustic surveys and fishing experiments of the Pelagic Fisheries Project along the west coast have revealed abundant catfish stocks on the western shelf during peak upwelling season of southwest monsoon (Rao *et al.*, 1977). Fishery Survey of India's surveys (Philip, 1986) in 11° - 15°N along the west coast have also indicated catfish concentration in depth belts of 20 - 50 m (25%) and 50-100 m (21%).

The fishing surveys conducted by FORV *Sagar Sampada* also located catfish concentration pockets during monsoon (June) in bathymetric belt 40-70 m off Kerala (James and Pillai, 1990). Southwest monsoon directly influences the coastal catfish resource abundance and their migration.

Although the potential available along the west coast (Rao *et al.*, 1977) gives scope for the future possibilities for its exploitation, indiscriminate fishing on brooder/spawning population of catfishes by more efficient purse seines from Karnataka waters (Silas *et al.*, 1980; Dhulkhed *et al.*,

1982; Muthiah and Syda Rao, 1985) has necessitated to search for ways and means for a rational management of the resource. Thus, the relevance of the present study centres round not only on the mere exploitation, but also conservation of affected species.

In this account, informations such as Statewise, centrewise, gearwise catfish production during premonsoon, monsoon and postmonsoon seasons, abundance of commercially important species and their biology are incorporated. An attempt is made to interpret the possible relation between rate of production of total catch and various species with the seasonal rainfall.

DATA BASE

Gearwise catfish catch and effort data for various States along the west coast were categorised into premonsoon, monsoon and postmonsoon. These data were taken from the NMLRDC of CMFRI. Centrewise, gearwise and specieswise seasonal catch, effort data and biology of important species were collected from major fishing centres at Veraval, Bombay, Mangalore, Calicut and Cochin for 1984-1988 period. Seasonal rainfall data were obtained from Indian Meteorological Department.

OBSERVATIONS

General fishery characteristics in different States

Along the west coast catfishes are generally caught by non-mechanised gears such as drift net, hooks and line, boat seine, dol net and mechanised gears like trawl net, purse seine and drift net or gill net. In addition to these, plank-built canoe and catamaran with IBM and OBM also operate gears such as drift net and hooks and line for catfish fishery. In general, catfishes are caught as a by-catch in trawlers; whereas they form a major component in drift net. Purse seiners exploit catfishes, whenever they form breeding shoals and move towards the shore or migrate parallel to the coast along surface drifts. On the other hand hooks and line (longline) fishing yields mostly catfishes and often accounts for the major share (28%) of the total line catch.

In Gujarat, catfishes were landed by trawl net (40.9% of the total catfish catch), gill net (46.1%) and dol net, hooks and line and other non-mechanised gears (13%). Average production during 1984-1988 was 4,656 t in premonsoon, 447 t in monsoon and 3,502 t in postmonsoon with seasonal percentage of 54.1, 5.2 and 40.7 respectively (Table 1). In trawl net, premonsoon (45.6%) and postmonsoon (39.5%) yielded the bulk of the catch; whereas in gill net, the corresponding percentages were 45.3 and 44.0. About 73.8% of the total catch of monsoon was realised by gill net. In this State, premonsoon production ranged from 3,586 t (1987) to 6,408 t (1986), monsoon yield varied from 293 t (1987) to 596 t (1984) and postmonsoon landings from 2,627 (1980) to 4,402 t (1986).

TABLE 1. *Seasonal catfish production (t) in Gujarat during 1984-1988 and the average gearwise contribution*

Year	Premonsoon	Monsoon	Postmonsoon	Total
1984	4349	596	3334	8279
1985	4198	353	4367	8918
1986	6408	518	4402	11328
1987	3586	293	2772	6650
1988	3439	476	2637	7852
Average	4656 (54.1%)	447 (5.2%)	3502 (40.7%)	8605
Trawl net	2123.2 (45.6%)	14.0 (3.1%)	1382.6 (39.5%)	
Drift net	2106.8 (45.3%)	330.4 (73.8%)	1539.4 (44.0%)	
Others	426.0 (9.1%)	102.6 (23.1%)	580.0 (16.5%)	

Catfishes were mainly caught in trawl net, gill net and hooks and line along Maharashtra. During 1984-1988 period, the all gear total catch ranged from 11,469 t (1986) to 17,922 t (1988) with a mean of 13,188 t. Almost 80% of the catfish catch was realised from Greater Bombay and Ratnagiri. Postmonsoon season yielded peak landings of 50.8% of the total. In this season the production fluctuated from 5,613 t (1984) to 7,474 t (1985) with an average of 6,701 t. Premonsoon was the next dominant season for catfish with a mean catch of 5,912 t forming 44.8% of the total landing. The premonsoon catch varied from 3,870 (1985) to 10,629 t (1988). Monsoon season was the least productive as there was limited operation by mechanised units. Catfish production during monsoon (mainly by gill nets and hooks and line) accounted for about 4.4% of the annual total catch. The catch in this season showed no wide fluctuation and it ranged from 456 t (1984) with a mean of 575 t (Table 2).

TABLE 2. *Seasonal catfish production (t) in Maharashtra during 1984-88*

Year	Premonsoon	Monsoon	Postmonsoon	Total
1984	5448	456	5613	11517
1985	3870	655	7474	11999
1986	3966	697	6809	11469
1987	5645	583	6805	13033
1988	10629	488	6805	17022
Average	5912 (44.8%)	575 (4.4%)	6701 (50.5%)	13188

Catfishes were exploited mainly by purse seine (63.7% of total yield), trawl net (25.3%) and drift net (5.3%) along Karnataka. The average landing during 1985-88 was estimated to be 5,421 t with seasonal values of 1,009 t (18.6%), 16.3 t (0.4%) and 4,395.5 t (81.0%) during premonsoon, monsoon and postmonsoon respectively. During the four years the all gear premonsoon catfish catch fluctuated from 302 t (1987) to 1,675 t (1988), in monsoon the landing varied from 7 t (1985) to 26 t (1988); whereas in postmonsoon the yield ranged from 1,108 t (1985) to 7,310 t (1986). Purse seine was the chief gear used to exploit catfishes from waters of Karnataka. More than 92% of annual catfish catch was landed during premonsoon (39.7%) and postmonsoon (59.8). Similarly, drift net caught 85.5% of the catfishes in postmonsoon and the remaining in premonsoon (Table 3).

TABLE 3. Seasonal catfish production (t) in Karnataka during 1985-88 and the average gearwise contribution

Year	Premonsoon	Monsoon	Postmonsoon	Total
1985	318	7	1108	1433
1986	1475	17	7310	3802
1987	302	15	2095	2412
1988	1671	26	7069	8766
Average	1009 (18.6%)	16.3 (0.4%)	4395.5(81.0%)	5421
Purse seine	265.5 (26.6%)	-	3184.5(72.4%)	
Trawl net	544.0 (53.9%)	7 (42.9%)	818.5(18.6%)	
Drift net	41.3 (4.1%)		248.8(5.7%)	
Others	155.2 (15.4%)	9.3 (57.1%)	143.7(2.3%)	

Along the Kerala Coast, the exploitation of catfishes was carried out by mechanised gears such as trawl net, drift net, hooks and line and purse seine and by a wide variety of non-mechanised gears such as boat seine, gill net, handline, cast net, etc. The mechanised sector landed 56.5% of the total yield. During 1984-88 period the annual average trawl net yield was 27% of the all gear total catch followed by drift net (18.3%), hooks and line (9.6%) and purse seine (1.6%). Peak landing was in postmonsoon (60.7%) and monsoon and premonsoon contributed 28.1% and 11.2% respectively in the annual total production. More than 70% of the total trawl net catch of catfishes was realised in monsoon; whereas both in drift net and purse seine, the major landings are during postmonsoon with corresponding percentages of 69.9 and 60.2. There was no monsoon fishery for purse seiners, while drift net landed catfishes in monsoon (16.7%) and premonsoon (13.4%). More than 99% of the hooks and line landings took place in postmonsoon (Table 4).

Seasonal gearwise effort, catch and catch rate at different centres

Veraval : Catfishes were caught in trawl net and gill net with an annual average (1984-86) catch of 512.7 t and 278.4 t respectively; forming 0.84% of total trawl catch and 6.4% of total gill net landings. During premonsoon the average catfish catch by trawl net was 246.8 t (0.7% of total trawl catch) for an effort input of 21,774 units. In postmonsoon the average yield was 265.9 t (24,865 units effort) forming 1.1% of total trawl production. In monsoon season there was no trawling in the Veraval area. Both premonsoon and postmonsoon showed

TABLE 4. Seasonal catfish production (t) in Kerala during 1984-88 and the average gearwise contribution

Year	Premonsoon	Monsoon	Postmonsoon	Total
1984	2632	3046	4917	10595
1985	882	1233	3087	5202
1986	320	983	7277	8580
1987	162	2070	2359	4591
1988	362	3609	6017	9988
Average	871.6 (11.2%)	2188.2 (28.1%)	4731.4 (60.7%)	7791
Trawl net	258.0 (29.6%)	1483.6 (67.8%)	360.6 (7.6%)	
Gill net	190.2 (21.8%)	263.4 (12.5%)	994.4 (21.0%)	
Purse seine	50.6 (5.8%)	-	76.4 (1.6%)	
Hooks & Line	1.4 (0.2%)	-	745.4 (15.8%)	
Others	371.4 (42.6%)	431.2 (19.7%)	2554.6 (54.0%)	

similar trend of catfish landings as well as rates of production (11.3 kg/unit in premonsoon and 10.7 kg/unit in postmonsoon).

The gill net catch also showed similar magnitudes of production in premonsoon and postmonsoon with averages of 128.5 t and 109.8 t respectively. Whereas, the monsoon period yielded only 40.1 t. In the total fish production of gill nets, catfishes formed 7.7% in premonsoon, 6.7% in monsoon and 5.3% in postmonsoon (Table 5). Though the yield was low in monsoon season, the catch rate was the highest (10.97 kg/unit) compared to premonsoon (10.04 kg/unit) and postmonsoon (8.09 kg/unit).

Monthly average production (trawl and gill net) trend showed the lowest (8.4 t) in July and the highest (130.6 t) in April with corresponding catch rates of 8.6 and 12.3 kg/unit. The highest rate of yield of 27.4 kg/unit effort was recorded in June. Catfish resource had high abundance in this area during November-April and June. Although the production in monsoon season was only 5.1% of annual total, the abundance during this season was estimated to be 29.1% of the annual total. This is indicative of the future possibilities to increase fishing pressure during monsoon.

Bombay : Catfish was landed by trawlers at Bombay with an annual average production of 3,535.8 t and accounted for 4.5% of the total fish catch by trawlers. Seasonal effort, catch and catch rate of catfishes at Bombay by trawlers are given in

TABLE 5. Gearwise seasonal catfish catch, catch rate and total catch during 1984-86 at Veraval

Season	Year	Trawl net		Drift net		Total
		C (t)	C/E (kg)	C (t)	C/E (kg)	C (t)
Premonsoon	1984	300.7	14.1	52.1	3.8	352.8
	1985	152.1	7.8	138.6	10.8	290.7
	1986	287.5	11.8	194.8	16.4	482.3
	Average	246.8	11.3	128.5	10.0	375.3
Monsoon	1984			3.8	9.0	3.8
	1985	No data		31.7	7.2	31.7
	1986			84.9	13.8	84.1
	Average			40.1	11.0	40.1
Postmonsoon	1984	213.3	8.5	152.8	9.4	366.1
	1985	357.3	15.9	79.6	6.9	436.9
	1986	227.1	8.4	96.8	7.5	323.9
	Average	265.9	10.7	109.8	8.1	375.7

Table 6. During premonsoon season the catch ranged from 764.1 t (1985) to 1,660.6 t (1986) with catch rates of 51 kg and 96.7 kg/unit effort respectively. The mean catch of premonsoon period was 1,345.5 t at a production rate of 81.9 kg/unit effort, when the resource accounted for 5.5% of the total fish yield of trawlers. In monsoon season, the production varied from 280.2 t (1985) to 438.3 t (1986) with catch rate of 50.2 and 67.3 kg/unit effort respectively. The average monsoon production was only 342.1 t (CPUE of 52.8 kg) and catfishes formed 3.6% of the total fish landed by trawlers. Peak landings were recorded during postmonsoon season with a mean yield of 1,848.2 t at a catch rate of 75.1 kg/unit effort and this group accounted for 3.9% of the total landings of trawlers. During 1984-88 period the postmonsoon landings varied from 1,270.7 t (1984) to 2,574 t (1988) with corresponding catch rates of 53.6 and 92.7 kg/unit effort. At Bombay, both production and abundance showed high values during premonsoon and postmonsoon seasons. More than 90% of total yield was realised during these seasons by exploiting 75% of the resource abundance, exerting 86% of the total fishing pressure.

Mangalore : Catfishes were harvested by purse seine, trawl net and drift net at Mangalore. They occurred in large quantities, during seasons of shoal movements, as incidental catch by purse seiners in

TABLE 6. Seasonal trawl net catfish catch and catch rate at Bombay during 1984-88

Season	Year	Catch (t)	C/E (kg)
Premonsoon	1984	1537.6	106.6
	1985	764.1	51.0
	1986	1660.6	96.7
	1987	1522.2	82.7
	1988	1243.2	72.3
	Average	1345.5	81.9
Monsoon	1984	287.4	45.3
	1985	280.2	50.2
	1986	438.3	67.3
	1987	281.9	47.1
	1988	422.5	53.1
	Average	342.1	52.8
Postmonsoon	1984	1270.7	53.6
	1985	1407.8	63.9
	1986	1808.5	76.8
	1987	2179.9	83.8
	1988	2574.1	92.7
	Average	1848.2	75.1

the area from Kaup to Kasaragod. As the Government of Karnataka had suspended mechanised fishing during June-August, there was no monsoon fishery by trawl net, purse seine and drift net. Therefore, the effort, catch and catch rate of catfishes at Mangalore during premonsoon and postmonsoon seasons alone are given in Table 7. In premonsoon season the catfish landing by purse seine ranged from nil catch in 1984-85 to 1,158.9 t in 1986-87. Catfishes accounted for 12.0% of the total fish catch by purse seines in premonsoon. The entire catch for this season was realised in February (79%) and March (21%). The catch rates were 71.1 kg/unit effort in 1985-86 and 338.5 kg/unit effort in 1986-87 with a mean of 118 kg/unit effort. Peak catch rate of 642.9 kg was recorded in February, 1986. The trawler landings of catfishes fluctuated from 4.0 t in 1987-88 to 215.5 t in 1984-85 with an average of 88 t in the premonsoon. Catfishes formed only about 1% of the total trawl catch and the catch rate ranged from 0.14 kg(1987-88) to 9.2 kg/unit effort (1984-85) with a mean of 3.3 kg/unit effort. About 81% of the trawler catfish catches of this season were landed in February and March. In premonsoon drift net landings varied from 0.3 t (1987-88) to 7.3 t (1984-85) with catch rates of 0.21 kg and 10.2 kg/unit effort respectively. The mean rate of production was 3.3 kg/unit effort. Catfishes accounted for 7.1% of the all fish total drift net landings during this season. Again, February and March produced 95% of the season's total catfish catch by this gear.

The catfish catch of purse seine fluctuated from 87.6 t (1984-85) to 277.7 t (1987-88) with a mean of 781.0 t during the postmonsoon season. The catch rate varied from 9.6 kg in 1984-85 to 186.2 kg/unit effort in 1986-87 and the seasonal average was 81.4 kg/unit effort. In the total catfish production, the postmonsoon season landed 71.3% and the resource formed only 2.8% of the total fish catch by purse seine. The average catfish production of the season by trawl net was 83.8 t accounting for 48.9% of the annual total catfish landing. The postmonsoon production by this gear fluctuated from 7.8 t (1986-87) to 271.8 t (1984-85) with corresponding catch rates of 0.5 and 10.4 kg/unit effort and the average was 4.3 kg/unit effort. In the total fish catch of trawlers, catfishes formed only 1.4% during postmonsoon season. In this season the drift gill netters caught an average of 17.5 t of catfishes and the yield varied from 11.6 t (1984-85) to 20.9 t (1987-88). The catch rate was 2.9 kg in 1984-85 and 7.0 kg in 1985-86 with a seasonal mean of 4.9 kg/unit effort. This resource accounted for 6% of the total fish yield by the gear. In the annual total gill net production of catfishes, the postmonsoon contributed 87%. The all gear catch was the highest during postmonsoon (66.8%) followed by premonsoon (31.4%). Similarly the rate of yield was 66.8% in postmonsoon and 33.2% in premonsoon at Mangalore.

Calicut : At Calicut catfishes were harvested mainly by hooks and line (67.0%), drift net (22.7%)

TABLE 7. Seasonal, gearwise catfish catch, catch rate and all gear total catch at Mangalore during 1984-88

Season	Year	Purse seine		Trawl net		Gill net	
		C (t)	C/E (kg)	C (t)	C/E (kg)	C (t)	C/E (kg)
Premonsoon	1984-85	-	-	215.5	9.2	7.3	10.2
	1985-86	98.0	71.1	38.1	4.4	0.5	1.5
	1986-87	1158.9	338.5	93.0	0.3	2.4	3.3
	1987-88	-	-	4.0	0.1	0.3	0.2
	Average	314.2	102.2	87.7	3.3	2.6	3.25
Monsoon	1984-88	No fishing					
Postmonsoon	1984-85	87.6	9.6	271.8	10.4	11.6	2.9
	1985-86	1045.4	91.6	22.1	1.4	16.7	7.0
	1986-87	1713.5	186.2	7.8	0.5	20.7	6.0
	1987-88	277.7	32.2	22.5	1.6	20.9	4.8
	Average	781.1	81.4	83.8	4.3	17.5	5.0

and trawl net (19.3). However, occasional bulk landings were also recorded by *Pattenkolli vala* during seasons of catfish shoal movements in the coastal surface waters. Gearwise, seasonal average (1979-85) catfish catch, effort and catch rate at Calicut is given in Table 8. Average monthly gearwise catch and catch per effort of catfishes are shown in Fig. 1.

During postmonsoon trawlers landed an average catch of 35.2 t with a catch rate of 9.4 kg/unit effort by expending 58.5% of the total annual trawler efforts. In this season, hooks and lines produced 83.0 t at a catch rate of 134.6 kg/unit effort, with an effort input of 38.9% of the total. The average production by drift net in this season was only 14.2 t with a production rate of 12.6 kg/unit effort. This catch was realised by a fishing pressure of 30.2% of the total annual drift net efforts.

In monsoon the trawler operation was almost negligible (about 1% of the total annual effort) and proportionately the catfish catch was also poor. The average hooks and line landing of this season was 18.5 t, but the catch rate was 121.8 kg/unit effort. This low production of less than 6% of the total annual landings was mainly due to less effort inputs in this season (8.3% of total annual efforts). Similarly, the drift net yield was only 8.5 t with a catch rate of 34.0 kg/unit effort. The low production (7.9% of annual total) was again due to poor fishing pressure (6.6%) in monsoon.

During postmonsoon season, the average trawl production was 13.1 t, accounting for 27.1% of the annual catch. The catch rate was 5.1 kg/unit effort realised by a fishing pressure of 40.6% of the annual total effort. This season yielded the highest catch in hooks and line (215.0 t) forming 67.9% of

TABLE 8. Seasonal, gearwise catfish catch (t) and all gear total landing (t) and catch per effort (kg) at Calicut during 1979-85

Season	Year	Trawl net	Drift net	Hooks & line	All gear combined	Total
Premonsoon	1979	92.1	39.6	94.1	225.8	35.6
	1980	100.9	7.6	130.2	246.7	35.1
	1981	5.3	9.4	102.5	117.2	28.8
	1982	2.6	9.5	42.3	54.4	11.1
	1983	43.8	14.4	63.7	121.9	22.5
	1984	-	5.7	73.5	79.2	48.0
	1985	-	13.1	66.7	79.8	35.0
	Average		34.9	14.2	83.0	130.3
Monsoon	1979	9.9	29.9	27.8	37.7	62.2
	1980		14.4	15.7	30.1	99.9
	1981		5.7	18.5	14.2	21.9
	1982		7.4	46.4	53.8	56.5
	1983		2.1	1.6	3.7	8.4
	1984		8.8	11.0	19.8	60.3
	1985		11.1	18.4	29.5	94.8
	Average			8.5	18	26.1
Postmonsoon	1979	25.9	119.0	218.4	363.3	80.1
	1980	72.0	195.4	324.8	592.8	72.4
	1981	6.0	96.2	238.7	340.9	67.6
	1982	1.7	45.9	123.8	171.4	51.2
	1983	3.3	31.3	260.2	296.8	79.6
	1984	-	39.2	176.5	215.7	73.8
	1985		80.9	120.6	201.5	56.5
	Average		15.5	86.8	209.0	316.8

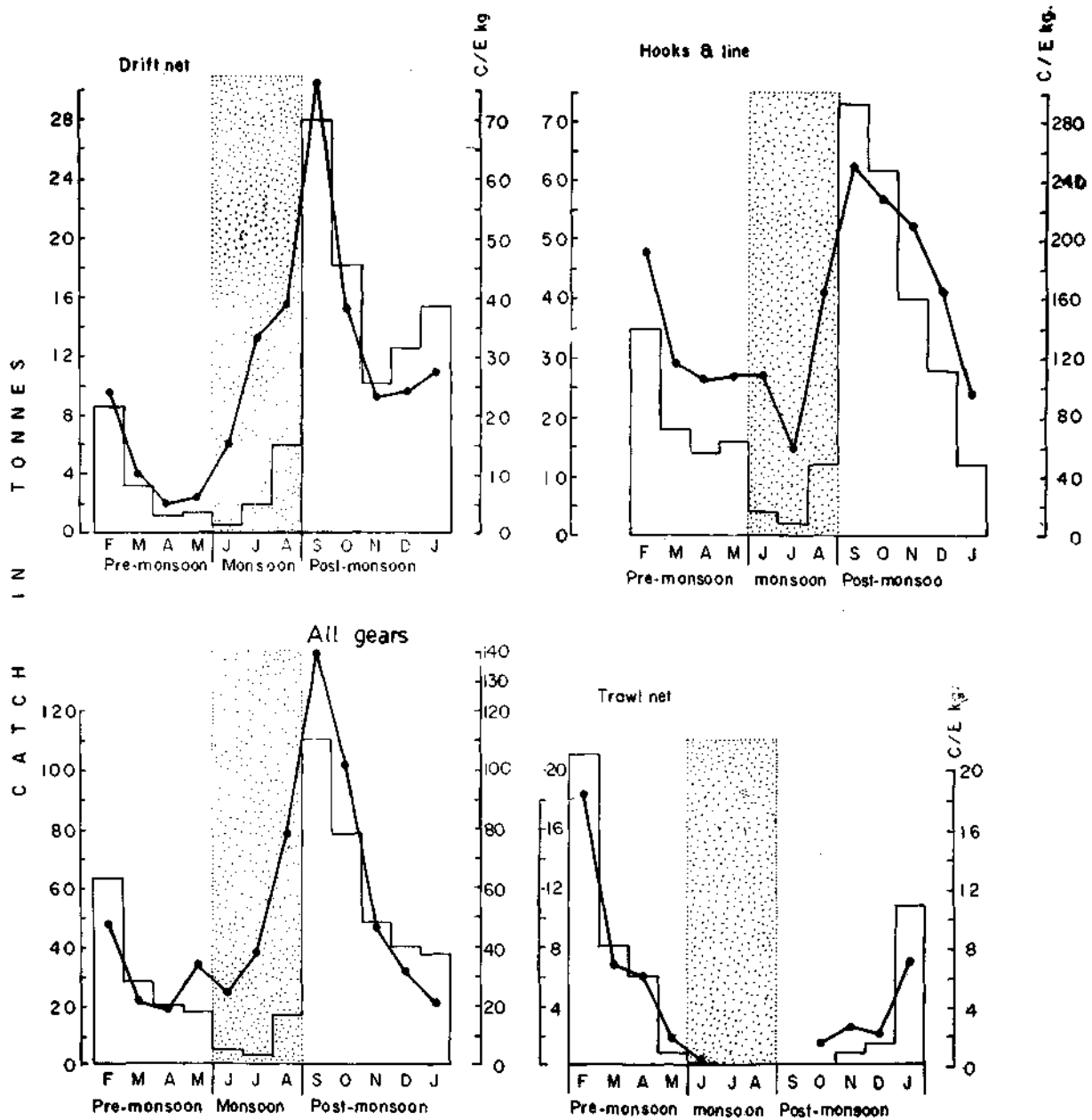


Fig. 1. Total and gearwise seasonal average catch and catch rate of catfishes at Calicut.

the annual production. The production rate was also highest, 204.2 kg/unit effort, in postmonsoon. The drift net landed 84.7 t at a catch rate of 35.7 kg/unit efforts and the production accounted for about 79% of the annual yield by the gear. All-gear total landings of catfishes showed peak yield in post-monsoon (67%) followed by premonsoon (27.5%) and the production rate was 52.6 kg and 29.0 kg/unit effort respectively. Although monsoon catch was only 5.5% of the annual total, the rate of

production (46.9 kg/unit effort) was 36.5% of the total.

Cochin : Catfish resource was exploited by trawl net (59.9%), drift net (40.0%) and purse seines (0.1%) at Cochin with an annual average production of 816.5 t. Gearwise, seasonal average (1984-88) catch and catch rates are given in Table 9.

In premonsoon season the trawlers landed, on an average 47.5 t, accounting for 9.7% of the

annual production by the gear. The catch rate showed an average value of 2.6 kg/unit effort. The average drift net landing in this season was 2.8 t forming only 0.9% of the annual production and the production rate was only 0.65 kg/unit effort; whereas the purse seine produced only 0.4 t (94% of the total annual yield by the gear).

seine also landed negligible quantities of catfishes during postmonsoon.

All gear combined production trends showed peak landing in monsoon (585.8 t) forming 71.7% of the total annual catch and the catch rate also attained the highest value (30.5 kg/unit effort) in

TABLE 9. *Seasonal, gearwise catfish catch (t) and catch rate (kg) of catfishes at Cochin during 1984-88*

Season	Year	Trawl net		Drift net		Purse seine		Total catch
Premonsoon	1984	237.5	12.4	8.2	2.0	-	-	245.6
	1985			5.6	1.0			6.6
	1986			0.2	0.04			0.2
	1987					2.0		2.0
	Average	47.5	2.6	2.8	0.7	0.4		50.7
Monsoon	1984	299.0	21.9	181.1	25.8			480.1
	1985	301.4	59.5	195.7	27.8			497.2
	1986	307.8	20.7	263.7	38.5			571.5
	1987	538.2	29.8	106.9	15.3			695.1
	1988	728.8	80.1	6.5	0.9			735.3
	Average	435.0	35.8	150.8	21.2			585.8
Postmonsoon	1984			152.5	17.1	0.1		152.6
	1985			142.4	20.9			142.4
	1986			355.0	13.2			355.0
	1987			43.5	9.3			70.1
	1988							
	Average			173.3	24.2			150.0

During monsoon the production by drift net varied from 6.5 t (1988) to 263.7 t (1986) with a mean of 150.8 t, forming 46.1% of the annual total. The catch rate also correspondingly ranged from 0.9 kg (1988) to 38.5 kg (1986) with an average of 21.3 kg/unit effort. More than 50% of the all gear annual total catfish catch was realised by trawl net during monsoon (435.0 t), accounting for about 89% of the annual yield by the gear. The yield ranged from 279.0 t (1984) to 728.8 t (1988) with a progressive increasing trend at a mean catch rate of 35.8 kg/unit effort. The purse seine operation was banned during monsoon at Cochin.

Higher yields were realised during postmonsoon by drift nets. The seasonal production fluctuated from 43.5 t (1987) to 355.0 t (1986) with an average of 173.3 t at a catch rate of 24.2 kg/unit effort. In this season the trawlers landed 6.7 t at a catch rate of 0.6 kg/unit effort. Similarly the purse

this season. The postmonsoon was the next dominant season for catfishes with a production of 180.0 t (22.1%) at a CPUE of 10.1 kg/unit effort; whereas the premonsoon caught only 50.7 t (6.2%) with a rate of only 2.2 kg/unit effort. The average monthly CPUE at Cochin showed better abundance during June (53.6 kg/unit) to October (20.9 kg/unit effort). Catfish yield (71.7%) and abundance (71.3%) were the highest in monsoon and achieved by expending only 32.3% of the annual total effort input.

Gearwise, seasonal species composition at different centres

About 8 species of catfishes occurred in the commercial fisheries of the west coast all through the seasons. The estimated, all gear combined seasonal species composition in the west coast, based on data from representative centres, revealed

that in premonsoon, *Tachysurus dussumieri* was the most dominant species (32.4%), followed by *T. tenuispinis* (20.5%), *Osteogeneios militaris* (17.2%), *T. thalassinus* (14.8%), *T. serratus* (9.6%), *T. caelatus* (3.2%), *T. jella* (1.3%) and *T. sona* (1.2%), whereas in monsoon season, *T. thalassinus* formed the bulk of landings (42.4%) closely followed by *T. tenuispinis* (39.2%) and *T. dussumieri* (19.8%). The less abundant species caught in this season were *T. caelatus* (3.7%), *T. serratus* (1.6%), *O. militaris* (1.5%), *T. sona* (0.5%) and *T. jella* (0.3%). During postmonsoon, *T. tenuispinis* and *T. dussumieri* accounted for 28.3% and 28.2% respectively in the total catfish catch of the season, the other species were *T. thalassinus* (18.8%), *O. militaris* (9.5%), *T. caelatus* (4.6%), *T. serratus* (4.3%), *T. sona* (3.9%) and *T. jella* (2.4%).

Only 4 species such as *T. dussumieri*, *T. tenuispinis*, *T. thalassinus* and *T. serratus* were recorded from the coast of Kerala, Karnataka and Goa; whereas in Maharashtra and Gujarat 4 more species like *O. militaris*, *T. caelatus*, *T. sona* and *T. jella* contributed substantially to the catfish production.

In Gujarat, *T. dussumieri* was the most abundant species throughout the seasons. The next important species were *T. thalassinus* and *O. militaris* (pre and postmonsoon). *T. tenuispinis* (throughout the season) and *T. caelatus* (monsoon). The catfish landings of Maharashtra showed high catches of *T. dussumieri* throughout the seasons, followed by *O. militaris*, *T. thalassinus* and *T. tenuispinis*. *T. caelatus* was more abundant during monsoon and *T. sona* in postmonsoon. In Karnataka, *T. dussumieri* was accounted for peak production during premonsoon; whereas *T. tenuispinis* was the chief item in postmonsoon. *T. serratus* was common in premonsoon season, while *T. thalassinus* in postmonsoon. Along Kerala during the premonsoon period *T. tenuispinis* formed 48.5% of the total yield of the season, followed very closely by *T. dussumieri* (42.9%). On the contrary, in monsoon season *T. thalassinus* (48.5%) was the most common species followed by *T. tenuispinis* (44.3%). Almost a similar condition was found in postmonsoon, with major catch by *T. tenuispinis* (37.6%) and *T. thalassinus* (36.0%). *T. serratus* appeared in fair quantities during postmonsoon.

Veraval : In premonsoon season, the trawlers landed *T. dussumieri*, *T. thalassinus*, *O. militaris*,

T. tenuispinis and *T. caelatus* in the decreasing order of production; whereas the postmonsoon contributed *T. tenuispinis*, *T. thalassinus*, *T. dussumieri* and *O. militaris* in 30.3, 25.7, 17.0 and 15.1% respectively in the total yield of the season. Gill net catch gave a different picture, in that *T. dussumieri* was the most dominant component during all seasons, with a percentage range of 53.6 - 74.6. The other important species was *T. tenuispinis*, but with better yield in premonsoon and monsoon seasons. *T. caelatus* formed about 1/3rd of the total production by gill net in monsoon.

Bombay : Eight species of catfishes appeared in trawl net catches of Bombay. On an annual average *T. dussumieri* (27%) was the major constituent followed by *T. thalassinus*, *O. militaris* and *T. tenuispinis* accounting for 18.5%, 18.4% and 10.8% respectively in the total landing. Species such as *T. sona*, *T. jella* and *T. serratus* are less abundant in Bombay area, together constituted less than 20% of the annual total. Although all the species appeared in all seasons, the relative dominance varied from season to season. In premonsoon, the catch comprised mostly of *O. militaris* (28.6%), *T. dussumieri* (23.8%), *T. thalassinus* (18.3%) and *T. tenuispinis* (11.9%). During monsoon and postmonsoon seasons *T. dussumieri* was most abundant, followed by *T. thalassinus*. Species such as *T. tenuispinis* and *T. caelatus* were common; whereas *O. militaris* appeared in good quantities during postmonsoon.

Mangalore : All the 4 species viz. *T. dussumieri*, *T. thalassinus*, *T. tenuispinis* and *T. serratus* were caught from the coastal waters of Mangalore by purse seine, trawl net and drift net. All gears operate only during premonsoon and postmonsoon seasons. During premonsoon *T. serratus* was the dominant catch (82.7%) in purse seine, followed by *T. dussumieri* (17.3%); whereas in postmonsoon, *T. tenuispinis* (58.2%) was the chief item followed by *T. dussumieri* (30.1%) and the remainder by *T. thalassinus* and *T. serratus*. The trawl net catch showed a different condition, in that *T. tenuispinis* (84.8%) and *T. thalassinus* (15.4%) were the major species in premonsoon and a very similar trend of species composition was recorded in postmonsoon. The drift net landed *T. dussumieri* and *T. serratus* at 66.7 and 29.6% respectively in total yield during premonsoon. During postmonsoon *T. serratus* formed about 39% of the total catch and the other 3 species occurred in almost uniform percentages.

Calicut : Of the 4 species landed at Calicut, *T. tenuispinis* was the most dominant (52.6%) in all gear total catch followed by *T. dussumieri* (27.8%), *T. thalassinus* (12.9%) and *T. serratus* (6.7%). In premonsoon *T. dussumieri* formed 60.7% and *T. tenuispinis*, *T. serratus* and *T. thalassinus* accounted for 35.4%, 3.5% and 0.4% respectively. The abundant species of monsoon were *T. dussumieri* (40.8%) and *T. tenuispinis* (35.6%); whereas *T. serratus* and *T. thalassinus* formed 19% and 4.6% respectively. In postmonsoon *T. tenuispinis* ranked first (60.4%) in total yield of the season, while *T. thalassinus*, *T. dussumieri* and *T. serratus* accounted for 18.2%, 14.5% and 6.9% respectively. In hooks and line landings *T. dussumieri* (56.5%) and *T. tenuispinis* (35.2%) were the dominant species during premonsoon; *T. dussumieri* (37.7%), *T. tenuispinis* (29.3%) and *T. serratus* (20.8%) in monsoon and *T. tenuispinis* (59.9%) and *T. thalassinus* (24.4%) in postmonsoon.

Cochin : Catfishes were exploited by trawl net, drift net and purse seine at Cochin and the former two gears operate throughout the season, while the latter only during pre and postmonsoon seasons. The composition of catch by drift net in premonsoon indicated an average production of 57.0% by *T. serratus*, 36.4% by *T. dussumieri* and 6.6% by *T. thalassinus* in the seasonal total catfish catch. In monsoon, *T. tenuispinis* and *T. serratus* formed 37.3 and 36.8% respectively and *T. dussumieri* (14.0%) and *T. thalassinus* (11.9%) were the less abundant species in drift net. The catch composed of *T. thalassinus* (59.8%), *T. serratus* (23.4%), *T. dussumieri* (12.0%) and *T. tenuispinis* (4.8%) during postmonsoon. In trawl net, *T. tenuispinis* was the most abundant component (77.4%) followed by *T. thalassinus* (14.9%) and *T. dussumieri* (7.8%) during premonsoon; whereas the entire catch, consisted of *T. thalassinus* (57.9%) and *T. tenuispinis* (42.1%) in monsoon and *T. thalassinus* (100%) in postmonsoon. The purse seine landing was very negligible and composed of *T. dussumieri* in premonsoon period. All-gear seasonal percentage composition of different species of catfishes at Cochin are shown in Fig. 2.

Size composition in different seasons

Veraval : The length frequency distribution (1984-86) of *T. thalassinus*, *T. tenuispinis* and *T. caelatus* during premonsoon, monsoon and postmonsoon seasons are given in Fig. 3-5, separately for trawl net and gill net.

The size of *T. thalassinus* in trawl catch ranged from 160-540 mm during monsoon and 180-680 mm in postmonsoon with mean sizes of 403 mm and 373 mm respectively. In gill net the length varied from 340-520 mm (premonsoon) and 240-580 mm (postmonsoon) with mean sizes of 443 and 433 mm in pre and postmonsoon respectively (Fig. 3).

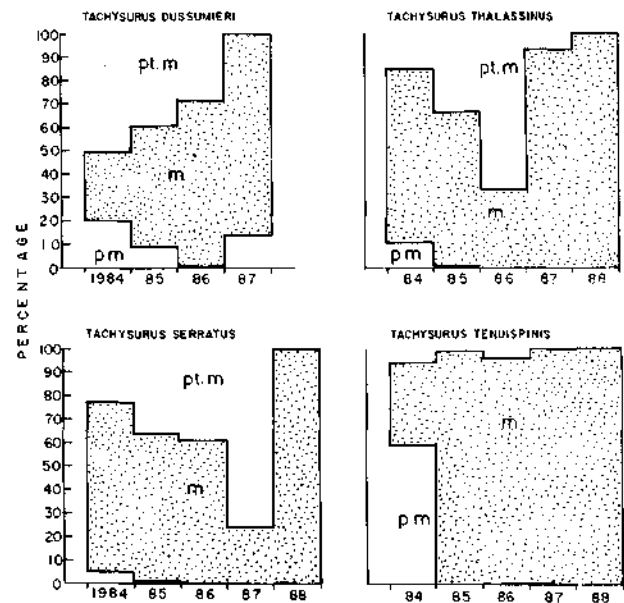


Fig. 2. Seasonal percentage composition of different species of catfishes during 1984-'88 at Cochin.

The length range of *T. tenuispinis* in trawl catch was 160-580 mm with a mean size of 354 mm in premonsoon and 140-580 mm with a mean size of 357 mm in postmonsoon. The premonsoon, monsoon and postmonsoon size ranges in gill net landings were 200-500 mm, 160-560 mm and 180-560 mm with mean sizes of 406, 448 and 366 mm respectively (Fig. 4).

In trawl catch, the size of *T. caelatus* fluctuated from 100-400 mm in premonsoon and 220-480 mm in postmonsoon with corresponding mean sizes of 271, 350 mm. In gill net, the length ranges were 320-480 (mean size of 308 mm) in premonsoon, 260-420 mm (335 mm) in monsoon and 320-380 mm (354 mm) in postmonsoon (Fig. 5).

Bombay : The length frequency distribution of *O. militaris* and *T. thalassinus* in trawl catches for the year 1987 and 1988 are given separately for premonsoon, monsoon and postmonsoon seasons in Fig. 6 and 7.

The length of *O. militaris* ranged from 160-420 mm in premonsoon with mean size of 265 mm (1987) and 310 mm (1988); in monsoon the mean sizes were 198 mm (1987) and 281 mm (1988). Larger size classes (160-540 mm) appeared in postmonsoon season with mean sizes of 265 mm (1987) and 295 mm (1988). The data indicated that recruitment took place in monsoon months at Bombay.

purse seine, drift net and trawl net are shown in Fig. 8 and 9.

The size of *T. dussumieri* caught by purse seine ranged from 500-980 mm during premonsoon with mode at 720 mm and from 440-880 mm with modes at 640, 680 mm in drift net. During postmonsoon season the size varied from 340-1000 mm with modes at 640, 680 mm in drift net landings.

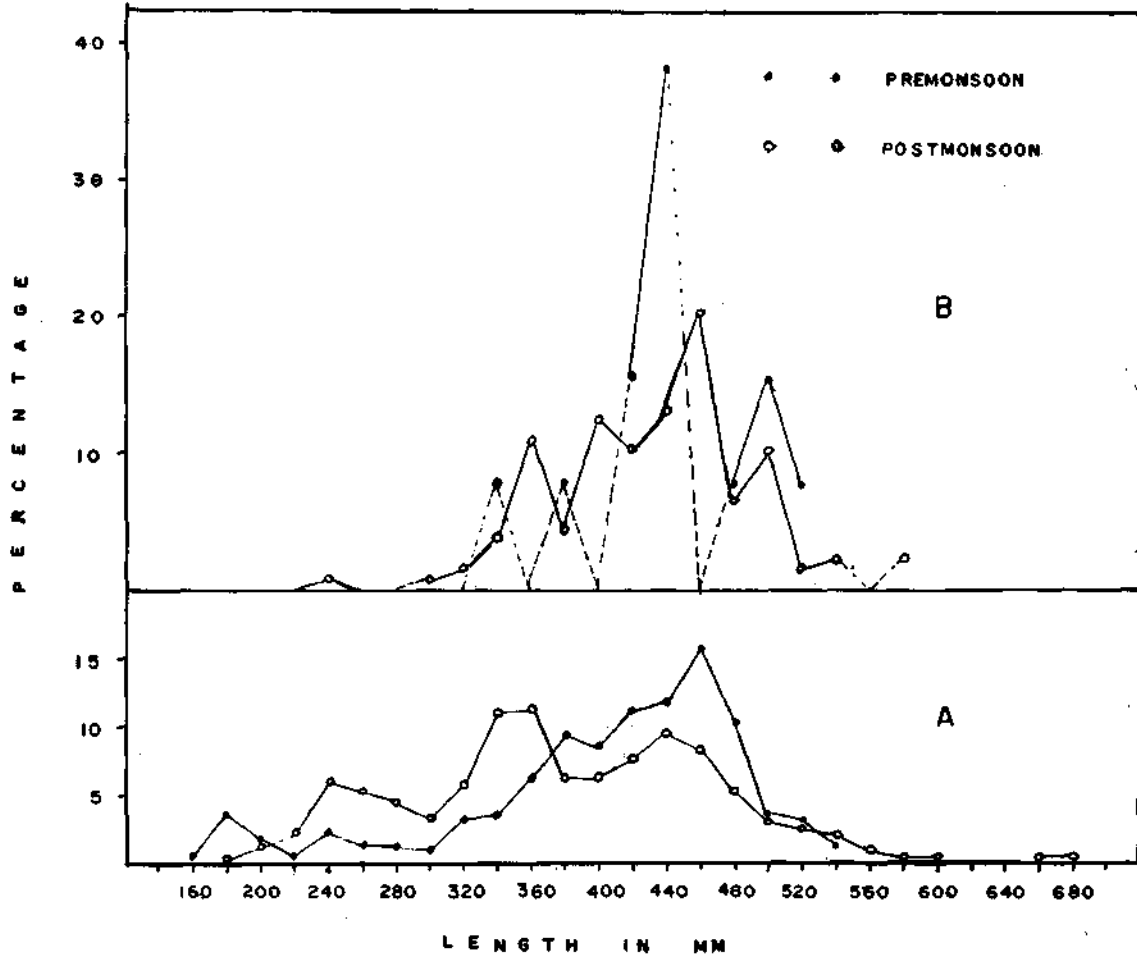


Fig. 3. Seasonal length frequency distribution of *T. thalassinus* (A - Trawl net, B - Gill net) at Veraval during 1984-88.

In premonsoon, the size range of *T. thalassinus* was 100-520 mm (mean size of 214 mm in 1987 and 297 mm in 1988), during monsoon the mean sizes were 214 mm (1987) and 229 mm (1988); whereas in postmonsoon larger sizes, 160-600 mm occurred in trawl with mean sizes of 292 mm (1987) and 300 mm (1988), when most of the spawning population aggregate the shallow grounds.

Mangalore : The seasonal length frequency distribution of *T. dussumieri* and *T. tenuispinis* landed by

In premonsoon season, the length of *T. tenuispinis* in trawl net ranged from 40-400 mm with the bulk of the landings in the length group 40 - 180 mm; whereas the sizes caught during postmonsoon included fishes of 40-520 mm. Juveniles (40-200 mm) were abundant in November-February with a modal length of 60 mm. Fishes of the size 200-520 mm with a mode at 440 mm occurred in the purse seine landing of the premonsoon.

Calicut : In premonsoon and postmonsoon, adult *T. dussumieri* of age classes 5 and above dominated the landing both in drift net and hooks and line. Bulk of *T. thalassinus* landed in postmonsoon belong to age classes 3 and above. Hooks and line and drift net fishery for *T. serratus* comprised of size classes 700-1100 mm in monsoon and postmonsoon. *T. tenuispinis* was fully vulnerable to hooks and line and drift net by ages 3 and 4 in postmonsoon seasons.

Cochin : There was no appreciable variation in the

820 mm in drift net during monsoon and postmonsoon. The length of *T. serratus* in drift net varied from 500-1140 mm during both monsoon and postmonsoon with major size classes of 700-900 mm in the fishery. Premonsoon and monsoon landed *T. tenuispinis* of sizes 180-420 mm. Large sizes of 220-500 mm appeared in the drift net during monsoon and postmonsoon months.

SPAWNING

All along the west coast the spawning

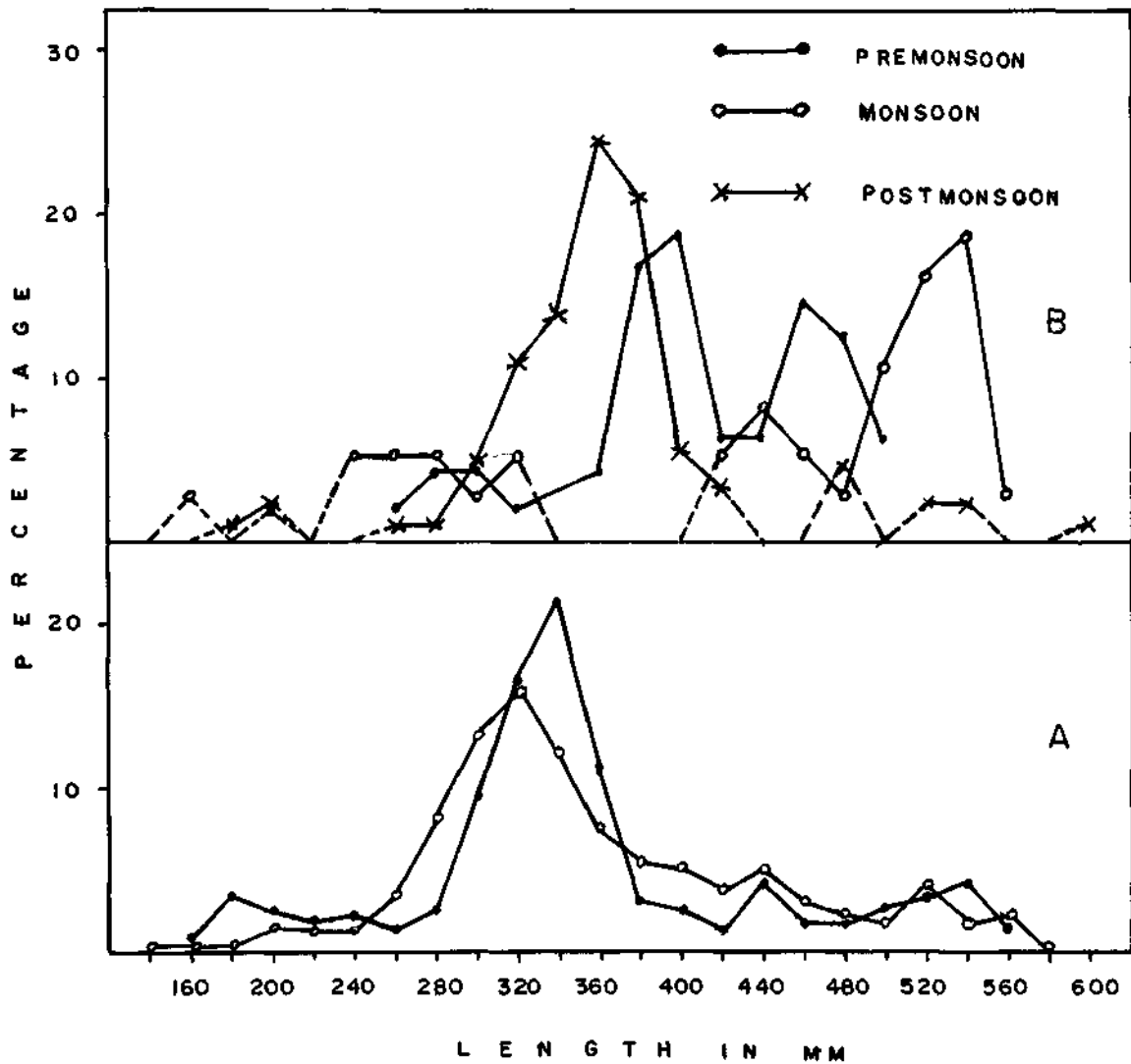


Fig. 4. Seasonal length frequency distribution of *T. tenuispinis* (A - Trawl net, B - Gill net) at veraval during 1984-88.

length range of *T. dussumieri* caught during different seasons. Fishes of age 5 and above dominated the drift net catch of monsoon and postmonsoon. The size range of *T. thalassinus* was from 180-440 mm in trawl net during monsoon and from 300-

seasons of catfishes were either premonsoon or postmonsoon. Generally the mature population moves towards the coastal waters during monsoon and spawning takes place by the end of monsoon, or in the beginning of postmonsoon (Anon., 1987).

The spawning season of *T. thalassinus* is post-monsoon all along the west coast. Ripe females and gestating males appeared in the catches during September-November months at all centres and in fairly high percentages at Mangalore, Calicut and Cochin.

T. tenuispinis spawn during premonsoon months of February-May along Veraval waters as evidenced by the appearance of ripe females of stages V and VI during March and April months with F:M ratio of 1.7:1. But this species spawns during postmonsoon months of September-

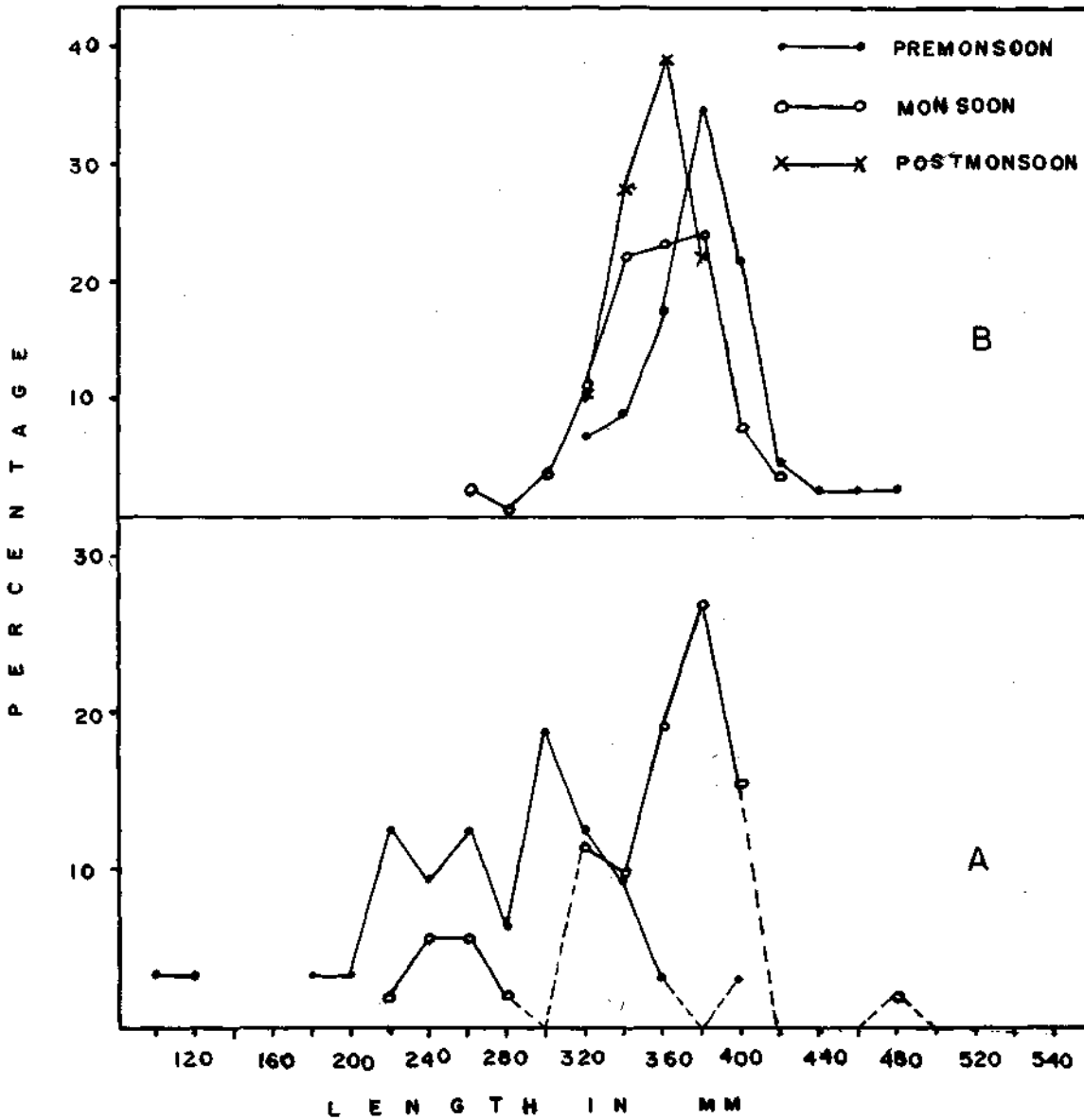


Fig. 5. Seasonal length frequency distribution of *T. caelatus* (A - Trawl net, B - Gill net) at Veraval during 1984-88.

Gestating male shoals of *T. dussumieri* appeared in shallow grounds during postmonsoon and premonsoon months of December-February at Mangalore. Spawners were also encountered in the catches of Calicut and Cochin during December-February.

November all along the southwest coast of India as evidenced by the occurrence of gestating male shoals in coastal waters off Mangalore and Calicut and ripe females off Cochin.

The spawning season of *T. serratus* is post-monsoon months of September-December at

Mangalore, Calicut and Cochin. Shoals of gestating males are generally caught from Mangalore by purse seine during postmonsoon season. The

soon season of January-April. Ripe females occurred in the catches during this season with a F:M ratio of 2:1.

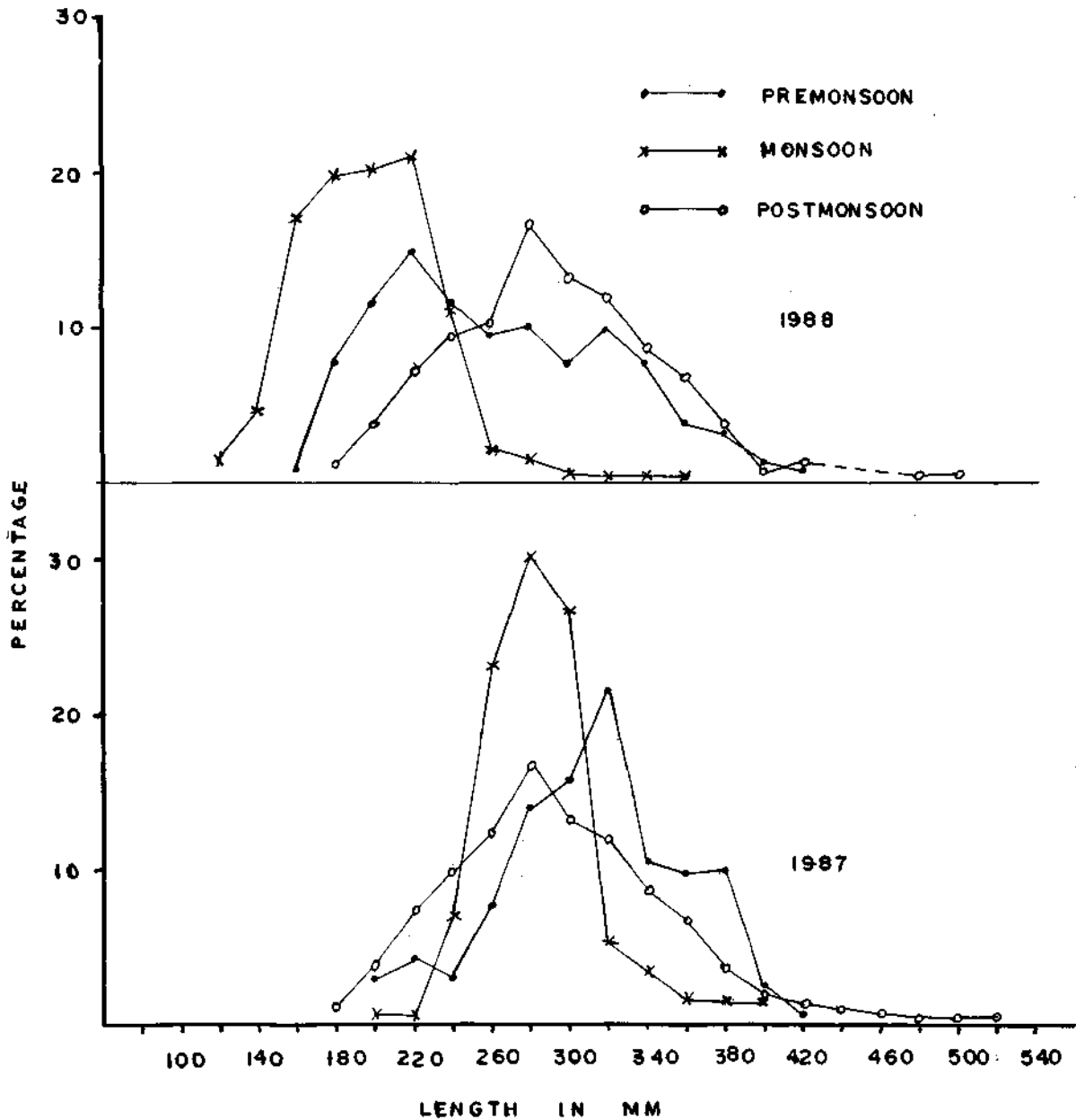


Fig. 6. Seasonal length frequency distribution of *O. miltaris* at Bombay during 1987-88.

landings of this species by drift net and hooks and line at Cochin and Calicut recorded high percentage of ripe females during September-December months.

T. caelatus is a regular species of catfish landed at Veraval, which spawns in the premon-

SEASONAL ABUNDANCE AND RAINFALL

An attempt was made to correlate the seasonal resource abundance with rainfall at Calicut and Cochin. At Calicut the catch rate was generally low during premonsoon and it varied

from 11.1 kg with a rainfall of 205 mm (1982) to 48.0 kg with 484 mm rainfall (1984). Whereas monsoon season recorded catch rates from 8.4 (1983) to 99.1 kg (1980) with corresponding rainfall of 1793 mm and 2745 mm. Similarly in postmonsoon the abundance fluctuated from 51.2 kg (1982) to 80.1 kg (1979) when rainfall was 456 mm and 460

The catfish production as well as CPUE showed a positive correlation with seasonal rainfall at Cochin also. The seasonal mean rainfall (1984-1988) was 422 mm (15.6%) in premonsoon, 1576 mm (58.1%) in monsoon and 714 mm (26.3%) in postmonsoon, the corresponding production was 50.7 t (6.2%), 585.8 t (71.7%) and 180.0 t (22.1%). The

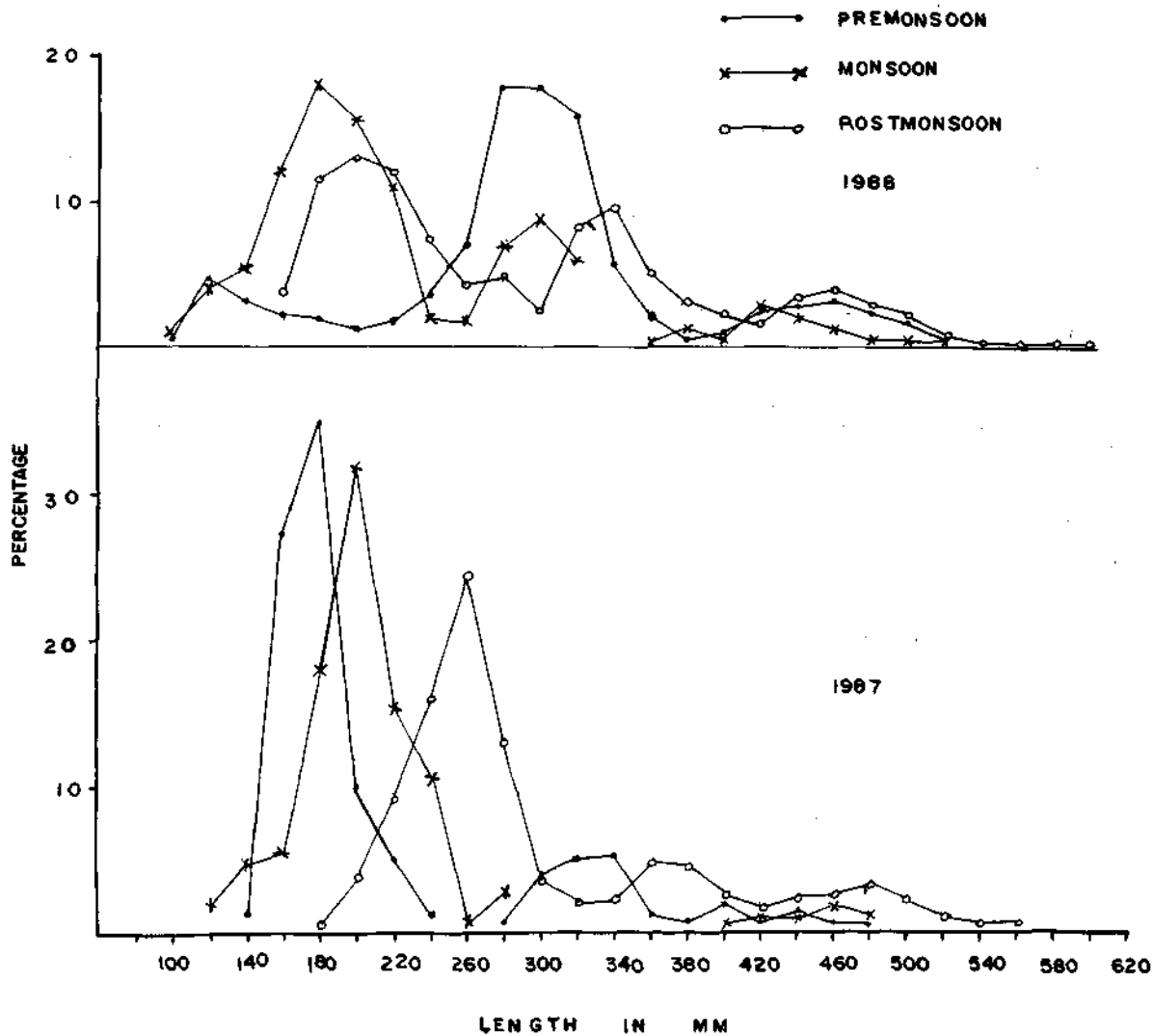


Fig. 7. Seasonal length frequency distribution of *T. thalassinus* of Bombay during 1987-88.

mm respectively (Fig. 10). The intensity of rainfall indicated a strong positive correlation with the abundance (catch rate) of catfish. But the seasonal production trend showed poor landings during monsoon, although the resource is abundant in the fishing grounds. This is mainly due to low fishing pressure (5% of the total) during monsoon at Calicut.

catch rate also showed a similar trend with 2.2 kg (5.1%), 30.5 kg (71.3%) and 10.1 kg (23.6%) during premonsoon, monsoon and postmonsoon seasons respectively (Fig. 11). The monthly catfish production and CPUE data of all the 4 species when superimposed over rainfall for a period of 5 years from 1984 to 1988 also showed positive correlation (Fig. 12).

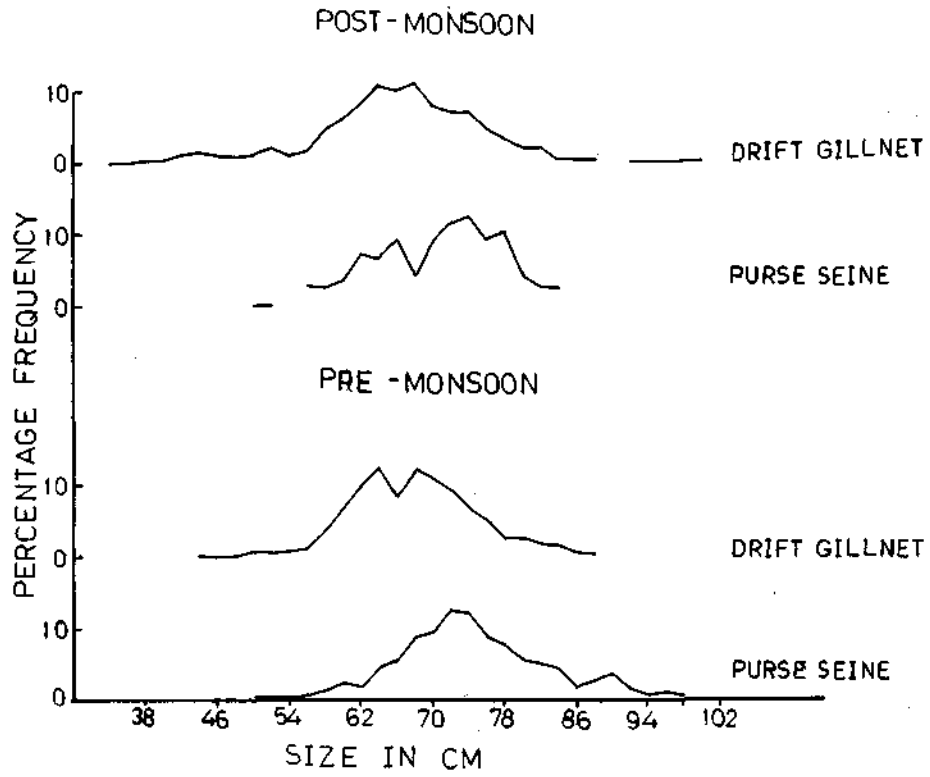


Fig. 8. Seasonal length frequency distribution of *T. dussumieri* in purse seine and drift gill net at Mangalore.

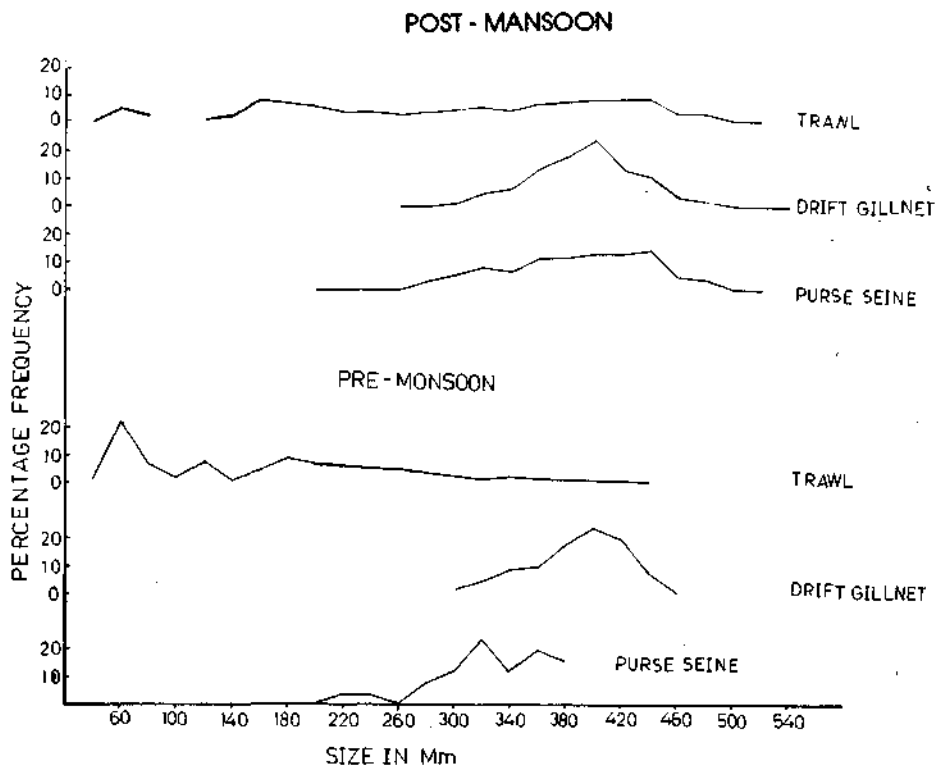


Fig. 9. Seasonal length frequency distribution of *T. tenuispinis* in trawl net, purse seine and drift gill net at Mangalore.

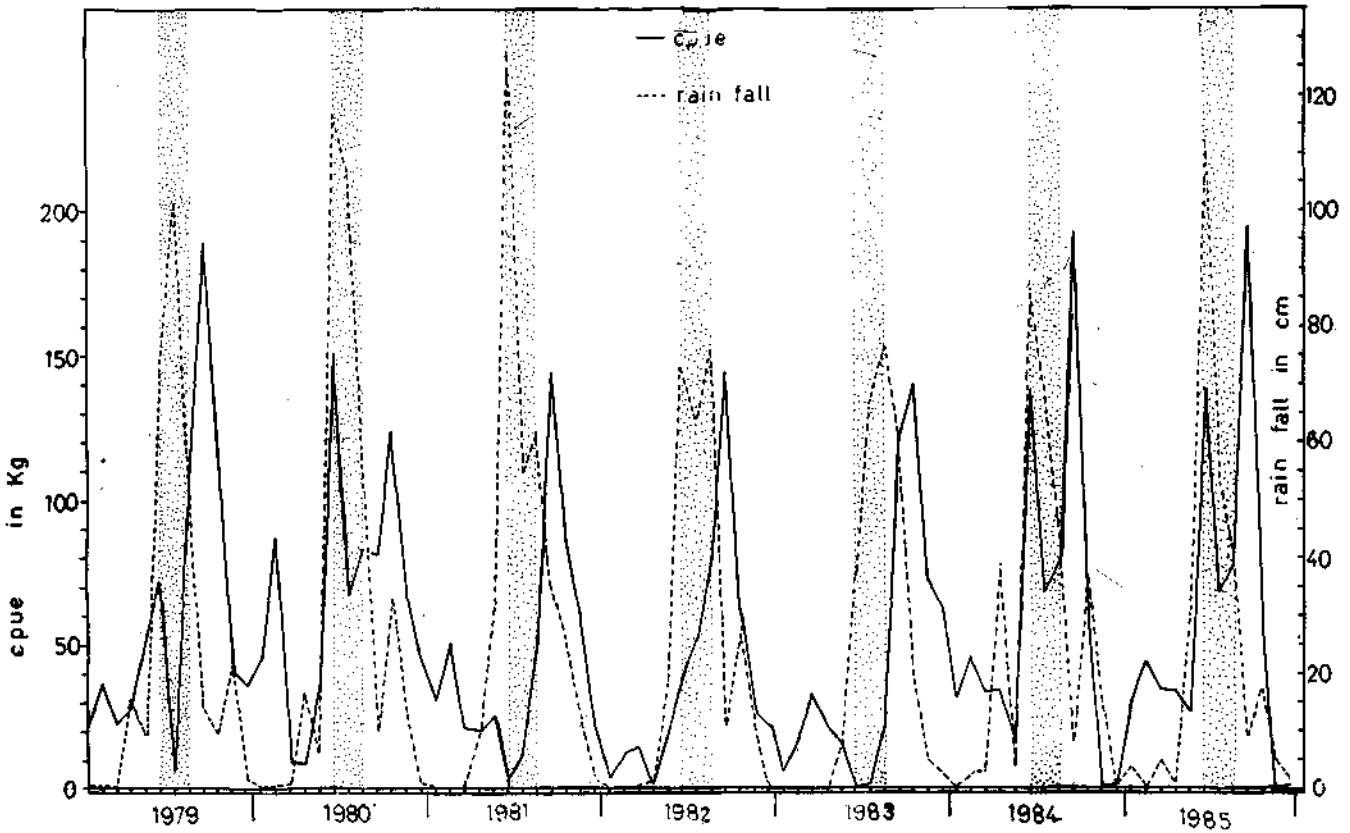


Fig. 10. Monthly catch per unit effort and rainfall at Calicut during 1979-85.

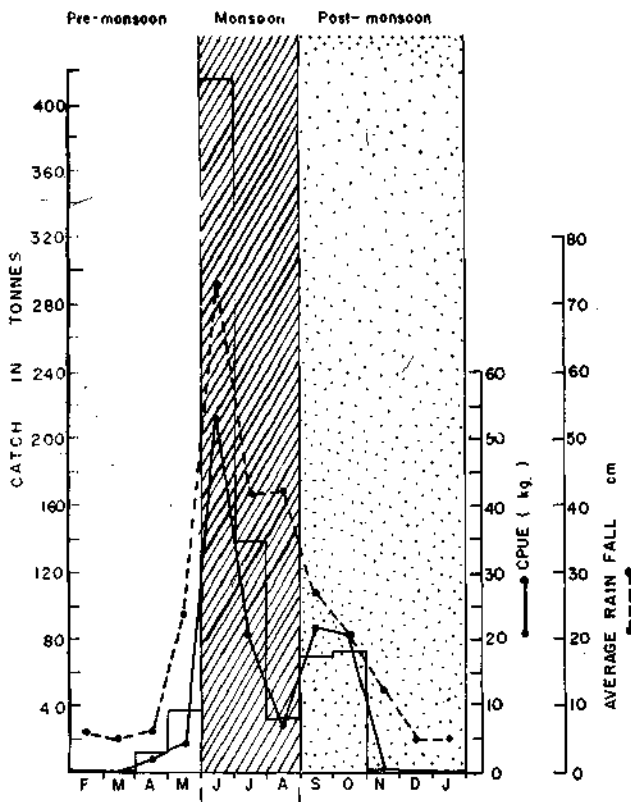


Fig. 11. Average seasonal catch, catch rate and rainfall at Cochin during 1984-88.

DISCUSSION

More than 55% of the total annual catfish production of west coast is realised during premonsoon. The premonsoon season landed 35.6% of total catfish catch; whereas the monsoon contribution was only 9.2%. The low production in monsoon was attributed to poor fishing pressure during that season, especially along waters of Gujarat, Maharashtra and Karnataka owing to local/regional, legal/social restrictions of fishing operations in this season. A summary of the seasonal percentages of effort, yield and yield per effort; rainfall, major gears and the species composition are presented in Table 10.

At Veraval, the catfish production as well as resource abundance were maximum (47.5% and 42.1% respectively) in postmonsoon realised by expending 66.7% of the total effort inputs. Although considerable relation in the yields of premonsoon (47.4%) and monsoon (5.1%) was observed, the CPUE showed almost same intensity in both the seasons. The poor yield of monsoon was clearly due to low fishing pressure (by drift gill

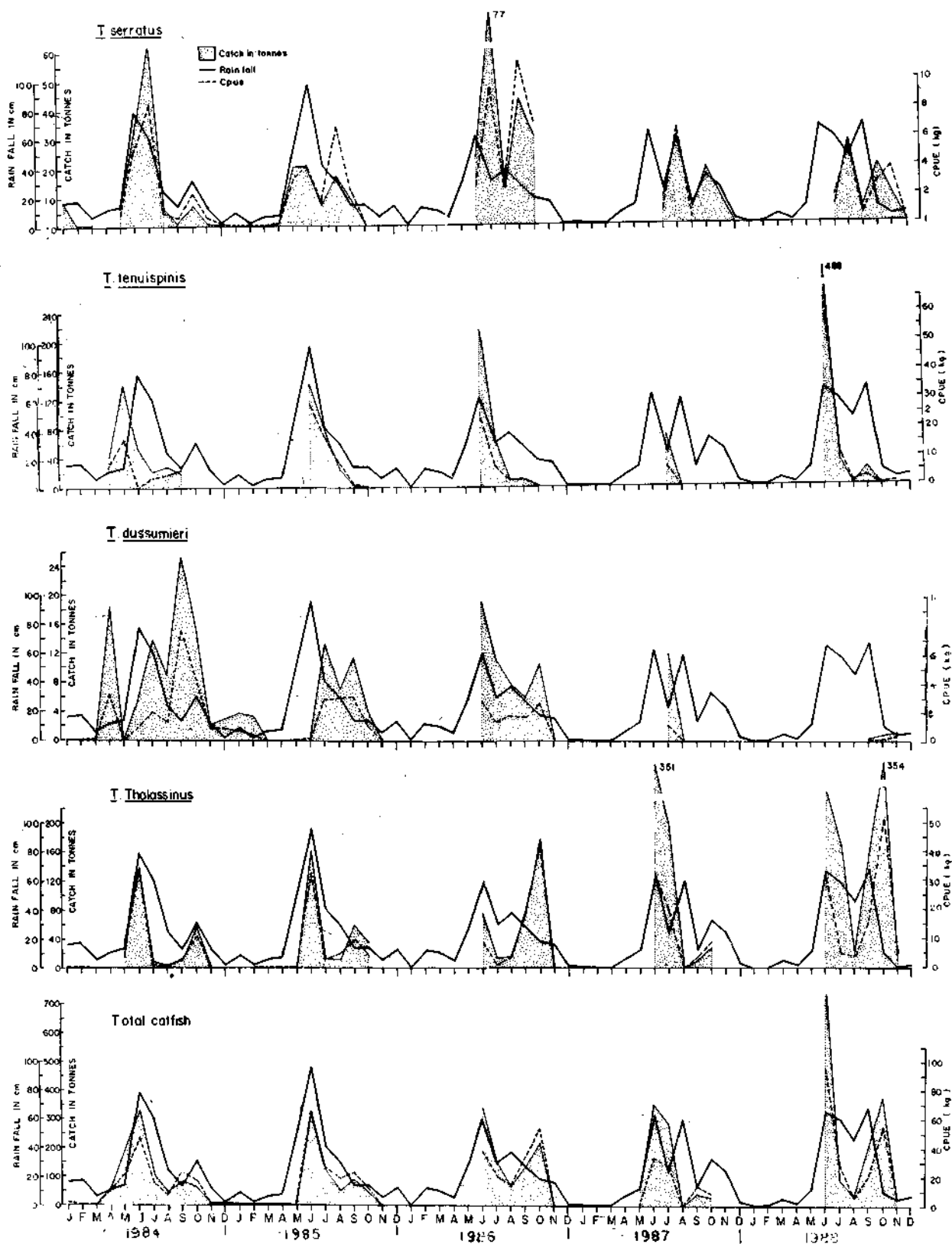


Fig. 12. Total catfish and specieswise catch, catch rate and rainfall at Cochin during 1984-88.

net). The data indicated that fishing effort of monsoon might be intensified to achieve increased harvest during monsoon. Throughout the seasons *T. dussumieri* was the most abundant species irrespective of the method of operation.

Catfish yield (52.3%) of Bombay by trawlers was almost proportional to the effort input (51.8%)

during postmonsoon; similarly in premonsoon also the production and effort inputs were of same magnitude (34.6% and 38.1% respectively). The low production (9.6%) and abundance (25.2%) in monsoon showed the poor availability of catfishes in the fishing grounds off Bombay during the season. Invariably *T. dussumieri* was the dominant species in the trawl catches of Bombay.

TABLE 10. Centrewise seasonal average (1984-86), effort (E), catfish yield (Yt) and yield rate (Y/E) and percentage with rainfall, gears and major species (Percentages in parenthesis)

Season	E	%	Y(t)	%	Y/E	(%)	Rainfall (%)	Gear	Composition of major species
Veraval									
Premonsoon	36569	30.0	375.3	47.4	10.9	28.8		TR, DN	Td (49.3) Tt (14.3), Ttp (12.8) Om (10.2) Tc (2.8)
Monsoon	3655	3.3	40.1	5.1	11.0	29.1		DN	Td (53.8) Tc (30.4), Ttp (10.3), Om (1.2), Tt (0.9)
Postmonsoon	76660	66.7	375.7	47.5	15.9	42.1		TR, DN	Td (32.9), Ttp (23.9), Tt (20.8), Om (11.7) Tc (3.4)
Bombay									
Premonsoon	16437	34.6	1345.5	36.1	81.9	39.0		TR	Om (28.6), Td (23.8), Tt (18.3), Ttp (11.9), Tc (4.8) <i>T. sona</i> (2.5), Ts (2.5)
Monsoon	6477	13.6	342.0	9.6	52.8	25.2		TR	Td (22.1), Tt (21.6), Ttp (18.8), Om (9.5) Tc (12.9) <i>T. sona</i> (3.3)
Postmonsoon	24613	51.8	1848.2	52.3	75.1	35.1		TR	Td (29.2), Tc (18.2), Om (15.1), Ttp (9.4), Tc (7.8), <i>T. sona</i> (7.1), Ts (2.3)
Mangalore									
Premonsoon	30106	47.9	404.5	31.4	13.4	33.2	4.4	PS, DN, TR	Td (52.9), Ts (25.5), Ttp (18.3) Tt (3.3)
Monsoon	-	-	-	-	-	-	80.1	-	-
Postmonsoon	32707	52.1	882.3	68.6	27.0	66.8	15.5	PS, DN, TR	Ttp (60.0), Td (7.1), Tt (7.8), Ts (5.1)
Calicut									
Premonsoon	1500	40.6	130.3	27.5	29.0	22.6	9.0	H&L, DN, TR	Td (60.7), Ts (3.5), Ttp (35.4), Tt (0.4)
Monsoon	558	5.0	226.1	5.5	46.9	36.5	71.9	H&L, DN	Td (40.8), Ttp (35.6), Ts (19.0) Tt (4.6)
Postmonsoon	6023	54.4	316.8	67.0	52.6	40.9	19.1	H&L, DN, TR	Ttp (60.4), Tt (18.2), Td (14.5), Ts (6.9)
Cochin									
Premonsoon	20492	37.9	50.6	6.2	2.2	5.1	15.6	TR, DN, PS	Ttp (72.5), Tt (14.3), Td (10.1), Ts (3.1)
Monsoon	19198	32.2	583.8	71.7	30.5	71.3	58.1	TR, DN	Tt (46.1), Ttp (40.8), Ts (9.5), Td (3.6)
Postmonsoon	17810	29.9	180.0	22.1	10.1	23.6	26.3	TR, DN, PS	Tt (61.3), Ts (22.5), Td (11.6), Ttp (4.6)

Td - *Tachysurus dussumieri*, Tt - *Tachysurus thalassinus*, Ttp - *Tachysurus tenuispinis*, Tc - *Tachysurus caelatus*, Ts - *Tachysurus serratus*, Om - *Osteogeneiosus militaris*, Tr - Trawl net, DN - Drift net and PS - Purse seine.

About 68.6% of the total yield was realised in postmonsoon season at Mangalore by exerting 52.1% of total fishing pressure. The resource abundance accounted for 66.8% in this season and about 60% of which consisted of *T. tenuispinis*. Detailed analysis of data showed that a vast majority of the catch of *T. tenuispinis* belonged to spawning or brooding populations. Almost the entire catch of the species was caught by purse seine during September - October when shoals of ripe females and male congregate the inshore waters for breeding. Similar mass harvest of *T. dussumieri* took place in December-March period, when spawners accumulated the shallow breeding grounds off Mangalore - Malpe, as recorded during the premonsoon seasons of 1982, 1984-1987. James *et al.* (1989) estimated that about 64% of the annual average purse seine catfish catch was composed of gestating males of *T. tenuispinis* and *T. dussumieri*, with an annual average landing of 1905 t and 502 t, mostly in postmonsoon and premonsoon seasons respectively. Further it is reported that the egg/embryo/larval annual average fishing mortality was around 8.2 million (13.4 t) for *T. tenuispinis* in postmonsoon season and 1.6 million (6 t) for *T. dussumieri* in premonsoon from Karnataka waters. Such wanton destruction of eggs/embryos/larvae is not only economically wasteful, but also biologically harmful to future recruitment.

As the species were highly migratory, the impact of the egg/larval fish mortality at any one point is felt at all fishing centre along the course of their migration, as evidenced by their low rate of recruitment (James *et al.*, 1989). In addition to egg/embryo mortality by fishing, the nearshore trawling in premonsoon also damaged whatever new recruitment of *T. tenuispinis* by removing the juveniles and subadults from the feeding grounds. As the bulk of catches are found in 50-80 m depth

belt during monsoon season in this region (Rao *et al.*, 1977; Philip, 1986; James and Pillai, 1990), it is suggested that monsoon fishing may be intensified along the grounds off Kerala and Karnataka to achieve better harvests.

The high abundance of catfishes during monsoon and postmonsoon season along Calicut (36.5%) and Cochin (71.3%) areas, estimated from the present data (Table 10) agreed well with earlier findings based on acoustic surveys by PFP (Rao *et al.*, 1977), resources survey by FSI (Philip, 1986) and fishery survey by FORV *Sagar Sampada* (James and Pillai, 1990). James *et al.* (1989) already showed a southward migration of catfishes during SW monsoon along waters off Kerala and Karnataka and the present data corroborated the earlier findings. The higher production of breeding/spawning fish in adult exploited population from shallow grounds of Kerala and Karnataka, gives a timely warning that exploitation of such stocks may bring about negative impacts on future recruitment. Therefore, in order to avoid any such negative effects on recruitment (1) catches must be organised to include exploitation at depths greater than 50 m by bottom and mid water trawling and purse seining, (2) exploitation by hooks and line should be encouraged and intensified in breeding grounds, as this gear spares juveniles and brooders/spawner (Menon *et al.*, 1989) population of catfishes and (3) fishing pressure may be intensified during south-west monsoon especially in deeper waters at depths of 50-100 m.

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