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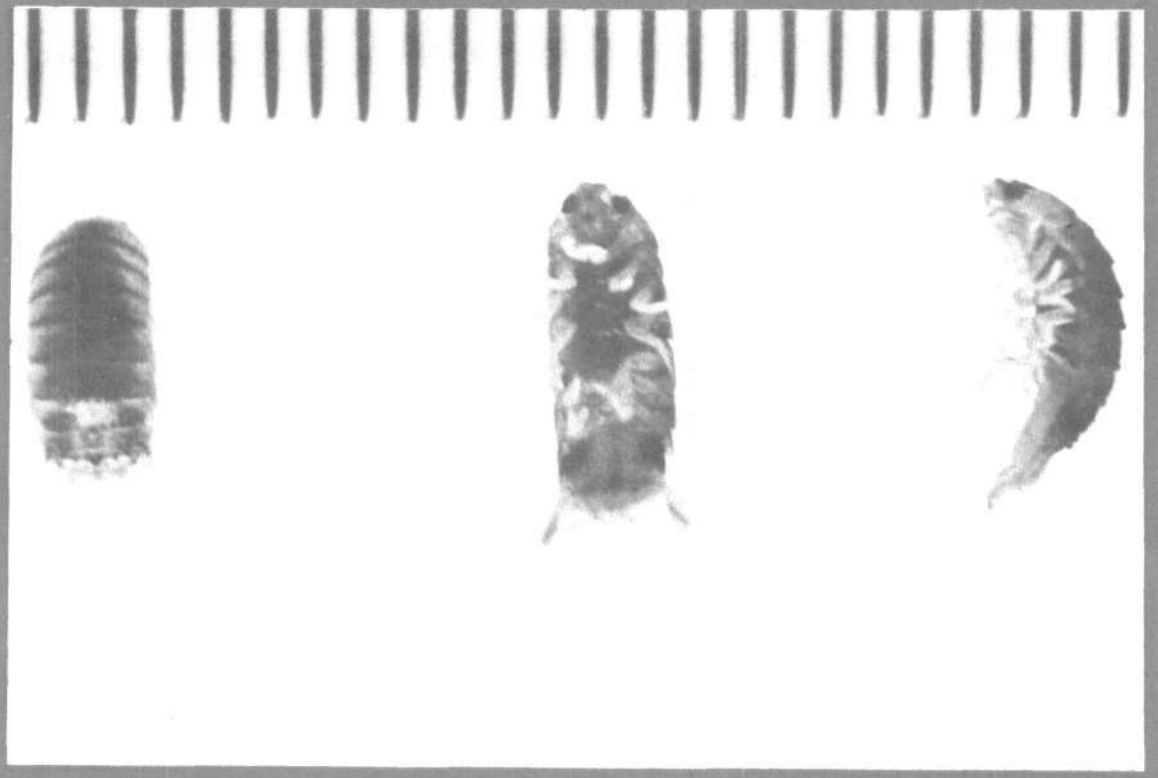

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OBSERVATIONS ON THE FISHERY OF CROAKERS (SCIAENIDAE) IN THE TRAWLING GROUNDS OFF RAMESWARAM ISLAND

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Introduction

Croakers (Family : Sciaenidae) form one of the important demersal finfish resources of India. They contributed to 5% of total annual marine fish production and to 10.9% of demersal landings of India in 1991 (Anon., *CMFRI Annual Report*, 1991-1992, pp., 4-5). From the region off Rameswaram island (8°55'-9°20'N & 79°-79°40'E), the mechanised trawlers land annually about 425t of croakers which form 3-6% of total trawl catch.

Five genera and 9 species of the family Sciaenidae commonly occur in the commercial catches in the island, of which 'Kathalai' (*Pennahia macrophthalmus*) in the Palk Bay and 'Pulli kathalai' (*Nibea maculata*) in the Gulf of Mannar are the dominant species. Information on sciaenid fishery from the region is scanty (Bensam, 1973, *Proc. Symp. Living Resources of the seas around India, Special Pub.*, CMFRI, pp.,. 461-469). The present study was taken up in 1988 and provides information on the sciaenid fishery including hydrographical parameters-related fluctuations during 1988-'92.

Data base

Trawling grounds off Rameswaram Island lie both in the Palk Bay and Gulf of Mannar. Mechanised trawling industry which came into vogue during early '70s, has expanded considerably, especially due to the remunerative export demand for shrimps. Three types of trawlers operate from the island employing synthetic net with a cod end mesh size of 20 mm. The types of trawlers are as below :

(i) 'IB' boat - 30' (9.2 m) in length with Ruston engine having 40 HP

(ii) 'STB' boat - 32' (9.8 m) in length with Leyland engine having 63-88 HP

(iii) Boat measuring 36' (11 m) in length with Leyland engine having 102 HP.

In the present study, the effort (number of units) was standardised taking 'STB' as the standard unit, since about 80% of the fleet are represented by them. All the demersal groups were considered as one group since the trawl fishing is a multispecies one (Gulland, 1969, *FAO Man. Fish. Sci.*, **4** : 154 pp). The catch rate mentioned in this paper refers to the catch per standardised unit.

The trawling grounds off Rameswaram landing centre in the Palk Bay (79°20'-79°40'E & 9°05'-9°-20'E) are located at a distance of 4-13 km from the land. The sea bottom is sandy, muddy or rocky. Depth of operation ranges from 8 to 19 m. The trawlers operating off Rameswaram centre do night fishing throughout the year. Some units engage in day fishing during January to about August. During February to April, trawling is done by two-boats with high opening trawl nets (Jayasankar and Bose, 1992, *Mar. Fish. Infor. Serv., T & E Ser.*, No. 118 : 17-18) during day time. The trawling grounds off Pamban landing centre in the Gulf of Mannar (79°-79°25'E & 8°55'-9°10'N) are situated at a distance ranging from 20 to 26 km off the coast. Sea bottom is muddy or sandy. Depth of operation ranges from 20 to 42 m. All the trawlers operating off Pamban engage in day fishing during May-September. During October - April while 50% of the fleet do night fishing the rest engage in fishing which involves two nights and one day.

Data on catch and effort were collected for 18-20 days/month from Rameswaram landing centre (hereafter referred to as Palk Bay) and for 10-12 days/month from the Pamban landing centre (hereafter referred to as Gulf of Mannar). The day's catch was raised to the month's following the method of Sekharan (*Indian J. Fish.*, **9** A (2) : 679-700).

Water samples were collected weekly from the Gulf of Mannar (10-20/m depth) and Palk Bay (5-8 m depth). Due to their incomplete nature, the hydrographical data of Palk Bay have not been incorporated, but only those of Gulf of

Mannar have been presented in this account. Data on rainfall in the Rameswaram Island was collected from the meteorological station at Pamban.

Trends in the fisheries

In the Palk Bay, trawl landings of croakers registered the peak in 1989 and the catch declined progressively to the lowest in 1992 (Table 1). This represented a decline by 34% in the catch from 1988 to 1992, though the effort increased by 47% during the same period. A similar trend was witnessed in the Gulf of Mannar (Table 2). From the highest catch of 229.92 t in 1989, sciaenid landings decreased to touch the trough in 1992. While the catch declined by 41%, there was an increase by 54% in the effort during 1988-1992.

Catches of croakers were relatively higher during September to January with peaks of production in October, December and January in the Palk Bay. In the Gulf of Mannar, sciaenid landings were higher during June-August and October-December with peaks of production in October and December. March-May was the lean season for sciaenid fishery in the island.

The average annual catch rate of croakers in the Palk Bay varied from 2.96 (1992) to 7.41 kg (1989) with a mean of 5.46 kg, showing decrease of 55% from 1988 to 1992 (Table 1). The monthly average catch rates ranged from 3.76 kg in March to 6.64 kg in February. The major crests of production during different years were: December in 1988 and 1989, February in 1990, January in 1991 and June in 1992. The production value of the principal crest varied from 5.44 (1992) to 12.5 kg (1990) showing increase upto 1990 and a downward trend thereafter (Fig. 1).

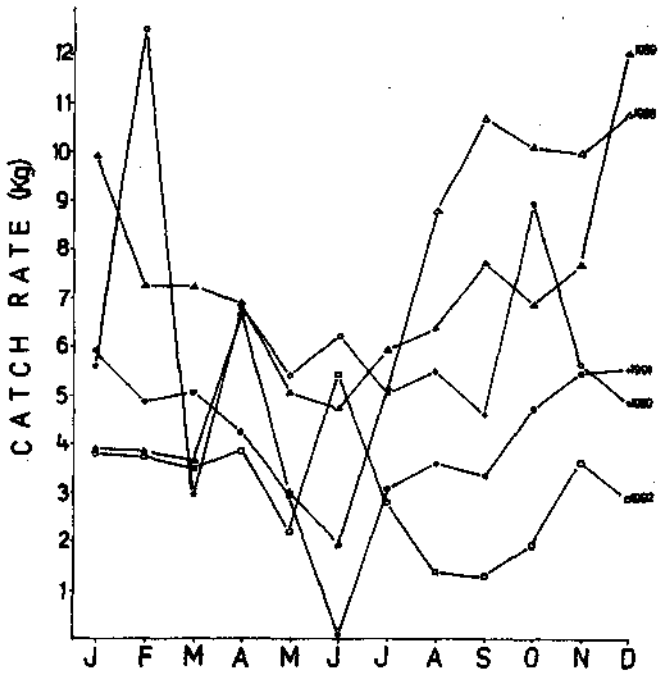

Fig. 1. Seasonal fluctuations in the catch rates of croakers in the Palk Bay during 1988-'92.

The average annual catch rate in the Gulf of Mannar ranged between 5.26 (1992) and 19.04 (1989) with a mean of 9.07 Kg, exhibiting decrease by 47% from 1988 to 1992 (Table 2). The monthly average catch rates varied from 2.92 Kg in May to 15.29 kg in November. The major peaks of production during different years were: February in 1988 and 1991, November in 1989, January in 1990 and September in 1992. The production value of the major peak ranged between 14.18 (1992) and 63.23 kg (1989) showing a general downward trend (Fig. 2).

Species composition

During the present investigation, 5 genera and 5 species of croakers in the Palk Bay and 5 genera and 7 species in the Gulf of Mannar were

TABLE 1. *Estimated effort, total trawl catch, sciaenid catch, catch rate and percentage composition of sciaenids of total trawl catch at Rameswaram landing centre (Palk Bay)*

Year	Total trawl catch (t)	Sciaenid catch (t)	Percentage in total	Effort	Catch rate (kg)
1988	12190.81	339.78	2.79	51301	6.62
1989	12422.10	339.97	2.74	45909	7.41
1990	15976.73	320.46	2.01	52489	6.11
1991	12927.15	305.74	2.37	72870	4.20
1992	13411.82	223.46	1.67	75562	2.96
Mean	13385.72	305.88	2.29	59426	5.15

TABLE 2. *Estimated effort, total trawl catch, sciaenid catch, catch rate and percentage composition of sciaenids of total trawl catch at Pamban landing centre (Gulf of Mannar)*

Year	Total trawl catch (t)	Sciaenid catch (t)	Percentage in total	Effort	Catch rate (kg)
1988	3799.30	115.00	3.03	11583	9.93
1989	3486.20	229.92	6.60	12078	19.04
1990	6225.00	98.34	1.58	16600	5.92
1991	4111.86	81.61	1.98	12204	6.69
1992	3535.93	67.35	1.90	12809	5.26
Mean	4231.66	118.44	3.02	13055	9.07

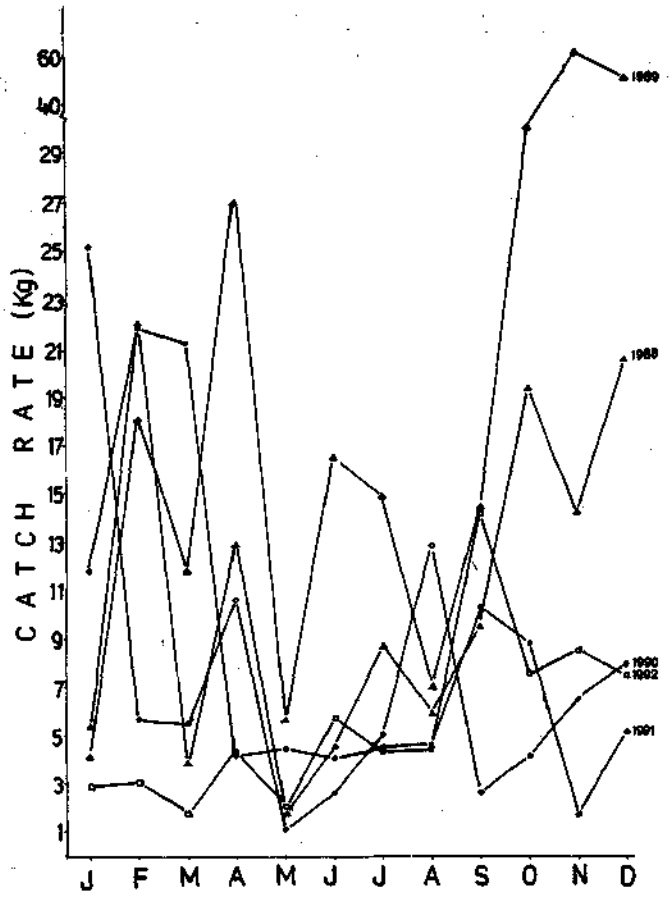

Fig. 2. Seasonal fluctuations in the catch rates of croakers in the Gulf of Mannar during 1988-'92.

observed to contribute to the fisheries. In the Palk Bay, *Pennahia macrophthalmus* contributed to over 60% (by weight) of sciaenid catches in most months, followed by *Otolithes ruber*, *Protonibea diacanthus*, *Dendrophysa russelli* and rarely *Nibea maculata* (Fig. 3). The average annual catch of *P. macrophthalmus* varied from 166.23 t (1992) to 273.08 t (1989), showing a decreasing trend in the annual catch with a mean of 237 t. The percentage contribution of this species, of total croakers fluctuated narrowly between 73.24 (1991) and 80.32% (1989). Eco-

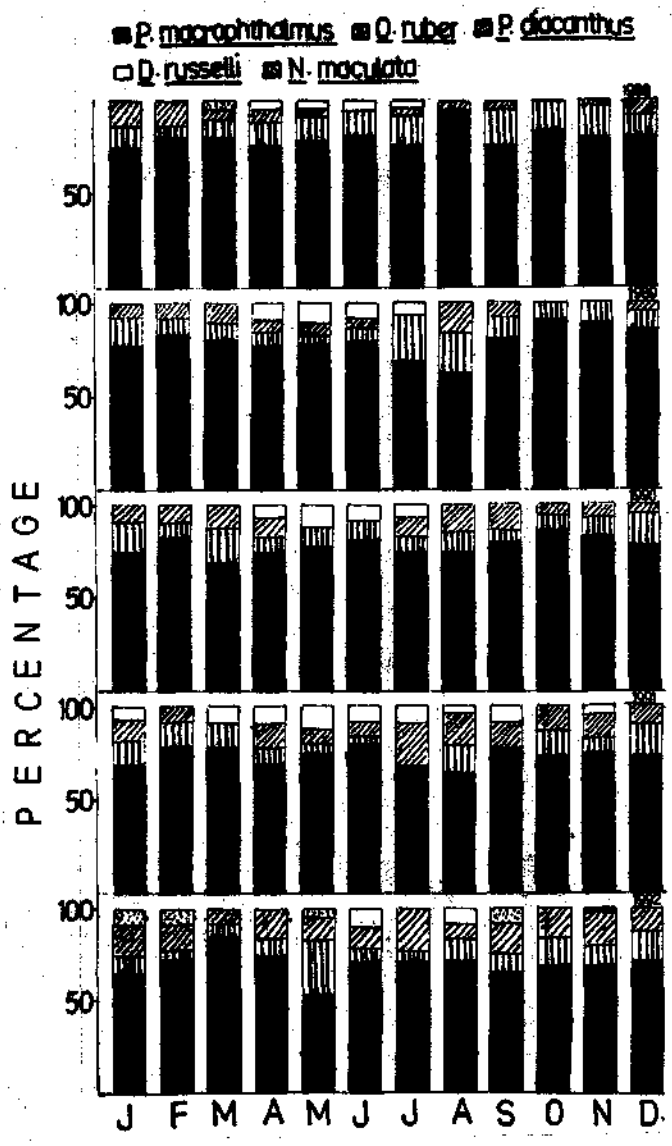

Fig. 3. Monthly percentage composition (by weight) of sciaenid species in the Palk Bay during 1988-'92.

nomically more important species such as *Protonibea diacanthus* and *Otolithes ruber* formed 2.0-5.2% and 3.9-4.8% of croakersr espectively.. Their catches were better during May-August.

Comparatively more species of sciaenids were noticed in the catches from Gulf of Mannar, presumably because it is more productive than the Palk Bay. *Nibea maculata* was in general the dominant species forming 26.06 (1989) to 42.51% (1992) of croakers (Fig. 4). Ranges in the average annual percentage representation of other species were: *Otolithes ruber* : 5.2-10.5%; *Johnius dussumieri* : 3.8 - 6. 4%; *J. carutta* : 1.5 - 4.1%; *J. macropterus* : 1.7 - 2.9%; *Johneiops sina* : 4.2 - 5.7%; *Dendrophysa russelli* : 0.4-0.7%.

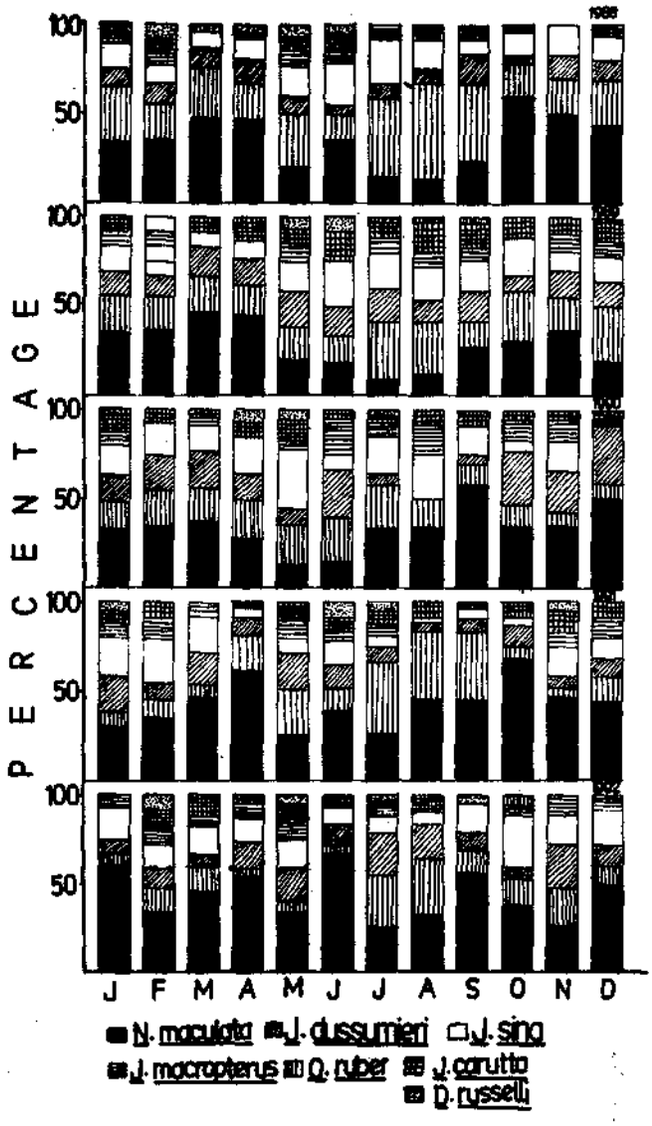

Fig. 4. Monthly percentage composition (by weight) of sciaenid species in the Gulf of Mannar during 1988-'92.

It may be noticed that during May-September, catches of *N. maculata* were poor, while those of *O. ruber* higher. This could be the result of differences in the habits of the two species vis-a-vis their vulnerability to the gear, since *O. ruber* is caught by trawling in the day time (May-September) in greater numbers, whereas *N. maculata* dominates the catch when trawlers operate during night (October-April).

Fishery in relation to some environmental factors

In the Gulf of Mannar, bottom sea water temperature was generally higher during March-May and again during September-October. It remained low during November to February (Fig. 5). Ranges of temperature during different years were: 26.0 - 30.2°C (1988); 26.3 - 32.2°C (1989); 27.0 - 31.4°C (1990); 28.3 - 33.0°C (1991); 26.2 - 32.0°C (1992). Salinity showed almost a progressive increase from February reaching peak in September, followed by a decrease till January. Ranges in salinity during different years were: 28.24 - 35.68‰ (1988); 30.30 - 36.07‰ (1989); 29.66 - 35.20‰ (1990); 29.90 - 36.00 ‰(1991); 28.80 - 36.73‰ (1992). Dissolved oxygen content exhibited a perceptible increase from July to October. It remained

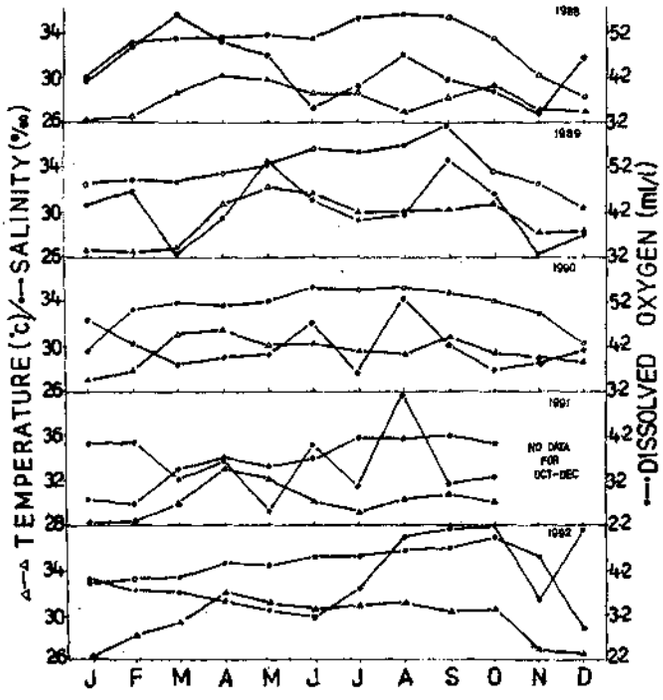

Fig. 5. Trends in the monthly mean variations of temperature, salinity and dissolved oxygen at 10-20 m in the Gulf of Mannar during 1988-'92.

TABLE 3. *Average variations of temperature, salinity and dissolved oxygen at 10-20 m depth in the Gulf of Mannar during 1988-'92*

Year	Average temperature variations (°C)	Average salinity variations (‰)	Average dissolved oxygen variations (ml/l)	Seasonal sciaenid catch* (t)
1988	1.06	0.18	0.60	78.15
1989	1.07	0.96	0.79	178.26
1990	1.14	1.27	0.66	66.06
1991	1.16	0.98	0.98	42.18
1992	1.16	1.07	0.55	45.93

* Catches during June-August and October-December.

relatively low during March - June. Ranges of dissolved oxygen during different years were: 3.39 - 5.58 ml/l (1988); 3.24 - 5.34 ml/l (1989); 3.60 - 5.28 ml/l (1990); 2.52 - 5.10 ml/l (1991); 3.17 - 5.18 ml/l (1992).

As mentioned earlier, June-August and October-December were the periods of higher catches of croakers in the Gulf of Mannar. The ranges in temperature, salinity and dissolved oxygen during these periods were 28.5 - 30.0°C, 32.00 - 35.13‰ and 3.50 - 4.83 ml/l, respectively. When the catches were poor during March-May, their ranges were 29.1 - 31.4°C, 33.21 - 33.93‰ and 3.91 - 4.04 ml/l. This shows that while temperature was higher, salinity and dissolved oxygen were lower during the lean season of fishery. Banse (*Deep Sea Res.*, **15**: 45-79: 1968) reported decline in the demersal fishery when less oxygen was present in the shelf waters off the west coast of India. Low values of salinity in the coastal waters off Cannanore were related to low catches of oil sardine (Bensam, 1970, *Indian J. Fish.*, **17** (1&2): 132-148).

A perusal of seasonal catches of croakers in the Gulf of Mannar in relation to average annual variations in the environmental parameters (Table 3) indicate that the variations were relatively of narrow ranges during 1988 and the highest catch was recorded in 1989. The variations had widest ranges during 1990 while the lowest catch was recorded in 1991. That indicates that the fishery strength of a particular year is dependent on the nature of variations of environmental conditions of the previous year. It is possible that the juvenile fishes are affected by wide fluctuations in the environmental factors, thereby hampering their subsequent recruitment into the fishery. Bensam (*Indian J. Fish.*, **17** (1 & 2): 132-148, 1970) opined that the hydrological parameters could possibly play a more significant role in the abundance of fish population than factors such as food or spawning.

About 74% of total annual rainfall in the Rameswaram Island occurred during October-December, while rainfall was scanty in February and June-August (Table 4). Though the total sciaenid landings from the region during January-February and June-December (abundant seasons) showed a general reciprocal relation with the annual total rainfall, the correlation coefficient was not significant (r=-0.15). Practically no information is available on the effect of rainfall on demersal fishery. In the pelagic fishery, it has been considered as an important factor (Pradhan and Reddy, 1962, *Indian J. Fish.*, **9** A (1): 100-109; Noble, 1972, *Indian J. Fish.*, **19** : 167-170; Yohannan and Balasubramanian, 1991, *J. mar. biol. Ass. India*, **33** (1 & 2): 246-254).

TABLE 4. *Monthly total rainfall (mm) in the Rameswaram Island during 1988-'92*

Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1988	4.6	0	34.6	88.5	5.4	21.3	14.0	37.3	117.8	44.7	119.1	102.7
1989	25.7	0	8.9	98.2	28.2	3.6	18.5	0.2	21.5	247.2	197.5	131.1
1990	157.4	2.9	0.1	1.6	64.4	1.0	0	0	0.9	394.6	119.4	259.8
1991	90.4	7.8	17.5	3.0	4.4	2.4	3.9	1.6	25.0	177.3	265.9	107.4
1992	0.5	0	0	8.7	105.8	2.9	0	17.6	29.0	110.3	360.6	135.2
Mean	48.0	1.8	10.2	36.0	52.6	5.7	6.1	9.5	37.1	220.5	209.3	155.7