J. mar. biol. Ass. India, 1991, 33 (1 & 2) : 40-48

EXPLOITED MARINE FISHERY RESOURCES OF MADRAS*

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ABSTRACT

Data on the exploited marine fishery resources related to 3 major landing centres in Madras have been analysed for 1980-1986 with reference to important pelagic and demersal resources. The centre Kasimedu was taken into account because of large scale operation of trawlers and the other two centres, *viz.* Triplicane and Nochikuppam were selected mainly because of the various types of indigenous gears being operated. The monthly change in catch per unit effort of each gear is presented in the text. The operation of trawl net and mechanised gill net registered multifold increase during the 7 year period ; whereas the CPUE of trawl net increased from 147 kg in 1980 to 174 kg in 1986, the CPUE of mechanised gill net declined from 257 kg in 1980 to 60 kg in 1986. In the non-mechanised sector, operation of ara valai, thuri valai and shore seine declined, but the operation of eda valai and kavala valai increased. New non-mechanised nets like mani valai and pannu valai were introduced during the 7 year period. The paper also discusses the catch trend of important groups of fishes and prawns during the study period.

INTRODUCTION

MADRAS is one of the important fishing centres of India. The city has several landing centres from where different types of indigenous gears are operated in addition to trawl net and gill net by mechanised vessels. In recent years, there are reports on different aspects of the exploited marine fishery resources of Madras Coast. Vivekanandan *et al.* (1986) have made a preliminary study on the small-scale fishery of Madras Coast based on the data collected during 1980 - 1983. Ramamurthy *et al.* (1988) have prepared a fishery calendar based on Kasimedu landing centre and Dharmaraja *et al.* (1987) have appraised the fishery status based on data collected from trawlers during 1981-1984. The present paper is a detailed analysis of the catch and effort data of mechanised and indigenous gears for the years 1980-1986.

During the 7 year period from 1980 to 1986, the landing centres in Madras experienced changes in the pattern of fishing operations. For instance, there was multifold increase in the operation of mechanised gears, new gears were introduced in indigenous sectors and some other gears were discarded. Hence, it was felt necessary to monitor the operation of various gears and the catch realised from these gears to understand the changes that occur in the fishery. With this objective, a study was undertaken for 7 years from 1980 to 1986 by collecting data on catch and effort of different, gears and also by incorporating the available information wherever necessary.

* Presented at the 'Symposium on Tropical Marine Living Resources' held by the Marine Biological Association of India at Cochin from January 12-16, 1988.

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The authors are thankful to Dr. P. S. B. R. James, Director, CMFRI, Cochin for encouragement and help.

Materials and Methods

To monitor the fish landings from different gears in Madras, three landing centres *viz.*, Kasimedu (also known as Pudumanikuppam), Triplicane and Nochikuppam were selected. Kasimedu is about 8 km north of Triplicane and Nochikuppam is about 2 km south of Triplicane. Though these centres are nearer to each other, they were selected, because of the variety of gears being operated from these centres.

For data on indigenous gears, biweekly observations were made on catch, effort and catch composition of each gear separately for the three landing centres from 0600 hrs to 1800 hrs for 7 years from 1980 to 1986 and the data were subsequently weighed for the month. Landings from indigenous gears occur only during day time in these centres. Some of the gears were operated from more than one centre and in these cases, the data collected from different centres were pooled. The catch and effort data for mechanised gears are available in the publications of C.M.F.R.I. (Anon., 1982, 1983, 1986) and these data were used as base for further analysis.

The catch per unit effort for gear (CPUE) was calculated by dividing the total catch realised from each gear by the total number of operations of the corresponding gear.

Results and Discussion

Gearwise analysis

Principally, four types of gill net (ara valai, kavala valai, irukka valai and retta aruppu valai), two types of bag net (eda valai and mada valai), hooks and line (thoondil), boat seine (thuri valai) and shore seine (peria valai) were operated from the three landing centres in addition to trawl net and mechanised gill net from Kasimedu landing centre. The total effort expended and the catch realised by these gears for the 7 year period from 1980 to 1986 are presented in Table 1. The catch per unit effort of the two mechanised gears, *viz.*, trawl net and gill net was high. Because of the high CPUE that could be realised, the operation of these gears increased multifold during the study period. For instance, the number of trawler operation increased by nearly 3½ times from 14,585 units in 1980 to 46,524 units in 1986. The CPUE of trawlers increased from 147.2 kg in 1980 to 220.1 kg in 1983 and decreased subsequently to 174.2 kg in 1986 (Fig. 1). Based on the data collected from the commercial trawlers operating off Madras during 1981-1984, Dharmaraja *et al.* (1987) concluded that there is only marginal scope of increasing the fishing effort in the

Table 1. *Estimated total effort (number of units), catch (tonnes) and CPUE (kg/unit) of mechanised and non-mechanised gears at Madras for the years 1980-1986; the values are total for 7 years*

Gear	Effort	Catch	CPUE
Mechanised			
Trawl	222355	38908	174.9
Gill net	15922	995	62.5
Non-mechanised			
Gill net			
Ara valai	17060	162	9.5
Kavala valai	67193	2296	34.2
Irukka valai	562	16	28.8
Retta aruppu valai	1444	15	10.7
Pannu valai	3887	7	12.1
Bag net			
Eda valai	10431	1972	189.1
Mada valai	1507	85	56.5
Boat seine	9554	92	9.6
Shore seine	1883	65	34.4
Hooks & Line	20395	349	17.1

conventional fishing grounds off Madras. Vivekanandan (1988) also confirmed this conclusion based on trawl data collected during 1984-1986. From the present study, it is evident that an average of 30,083 trawl units/ year were operated off Madras during the 5 year period 1981-1984; the effort subsequently increased to 41,142 and 46,524 units in 1985 and 1986 respectively. The increase in fishing effort during 1985 and 1986 amounting to 50% over that of the previous years, would have resulted in declining trend in the CPUE of trawlers (Fig. 1). The present trawl fishing off Madras is mostly restricted to the fishing areas 12.80/4C, 5C, 6C, 13.80/1C, 2C, 3C and 4C and to a depth of about 30 m. Perhaps concentration of trawling effort in areas deeper than 30 m may be rewarding in the future years.

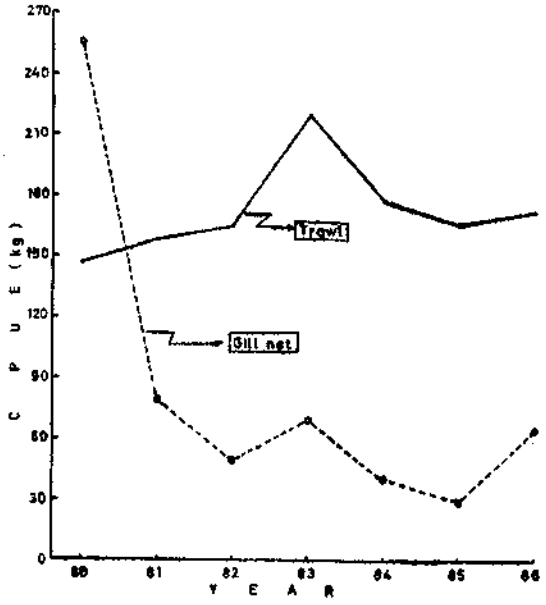

Fig. 1. Catch per unit effort of mechanised gears during different years.

The operation of mechanised gill net also increased from 763 units in 1980 to 3,468 units in 1986; the CPUE declined from 257.4 kg in 1980 to 80.1 kg in 1981 and thereafter fluctuated around 60 kg (Fig. 1).

Among indigenous gears, maximum CPEU was obtained in the bag nets *viz.*, eda valai (189.1 kg) and mada valai (56.5 kg) (Table 1). The CPUE of eda valai ranged between 32.4 kg

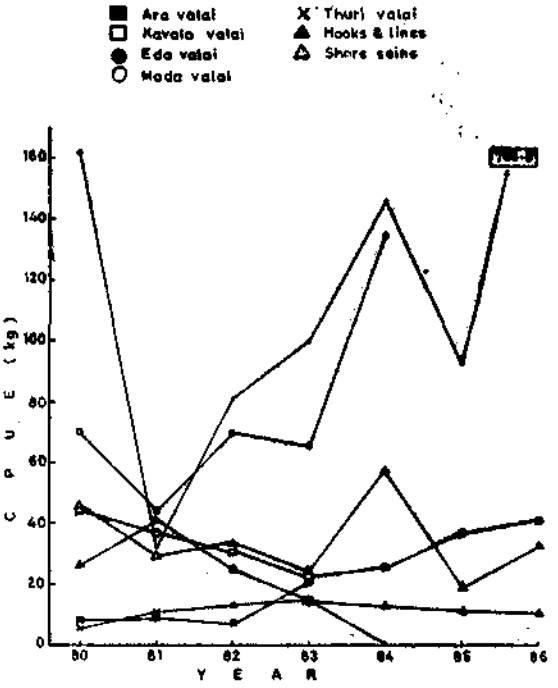

Fig. 2. Catch per unit effort of indigenous gears during different years.

(1981) and 766.8 kg (1986) (Fig. 2). The very high CPUE of eda valai in 1986 was due to unusually heavy landings of mackerel. The CPUE of mada valai ranged between 43.7 kg (1981) and 138.8 kg (1984). Kavala valai, a specialised gear for sardines, also had a fairly high CPUE (34.2 kg). The operation of kavala valai also increased from 6,574 units in 1980 to 14,796 units in 1986 and the CPUE increased from 1984. The increase in effort and CPUE of all the three important pelagic gears suggests that there is scope for increasing the catch of pelagic fishes off Madras. This increasing trend assumes significance considering the fact that there is not much scope for increasing the demersal fish catch from trawlers. Perhaps introduction of more efficient pelagic

gears like purse seine and pelagic trawl net on experimental basis may be rewarding.

The operation of a few gears was greatly reduced during the 7 year period. For instance, the operation of ara valai decreased from 8,247 units in 1980 to 616 units in 1986 ; thuri valai operation decreased from 4,880 units in 1980 to 953 units in 1983 and shore seine operation decreased from 331 units in 1980 to a mere 34 units in 1986. There are two reasons for the reduction in operation of ara valai. Firstly, the CPUE was poor (9.5 kg) and secondly, even though ara valai landed quality fishes like seerfish, mackerel and carangids, this particular gear was replaced by mani valai (trammel net) in most of the landing centres in Madras. Mani valai is a specialised net (Joel and Ebenezer, 1985) for prawns and hence operation of this gear has better returns in terms of value. This has resulted in most of the fishermen in Madras discarding ara valai. Unfortunately, catch and effort details of mani valai are not available now and detailed studies are proposed to be undertaken.

Regarding thuri valai, the gear not only exhibited a poor CPUE (9.6 kg), but also yielded a poor value for the operator. Thuri valai catch consisted of juveniles of ribbonfish, silverbellies and crustaceans. The drastic reduction in the operation of shore seine was due to requirement of large manpower (about 30 persons) for operating the net. Also, decline in anchovy catch (30.8 kg/unit in 1980 and 7.8 kg/unit in 1986), the major group landed by the gear, would have reduced the returns and thereby decreased the operation of shore seine.

Two indigenous gears were introduced in Madras Coast during 1980 - 1986. The first one, pannu valai (gill net) was introduced in Nochikuppam in early 1986 ; the CPUE of pannu valai was 12.1 kg (Table 1) and the catch consisted mainly of mackerel and carangids. The second gear, mani valai (trammel net), was also introduced in Nochikuppam in late 1986.

Monthwise analysis

To understand the seasonal changes in the landings, the data were analysed monthwise and the CPUE is plotted in Fig. 3 and 4.

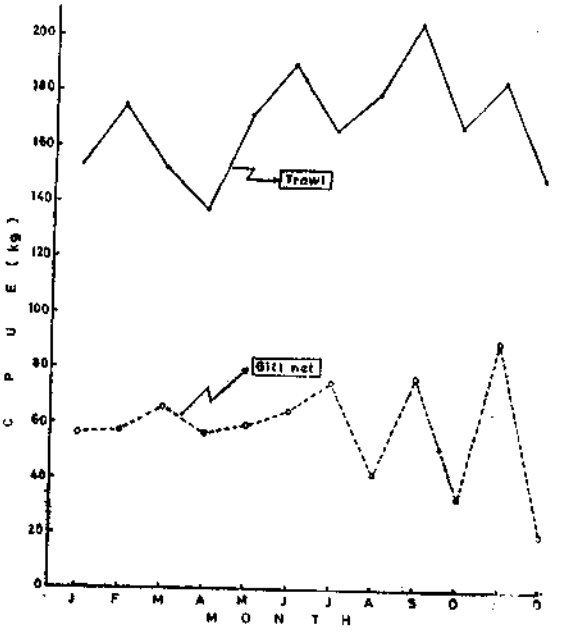

Fig. 3. Monthwise CPUE of mechanised gears ; data pooled for the years 1980-1986.

The CPUE of trawlers was high during June - November with peak in September (206.4 kg). Vivekanandan *et al.* (1983) reported heavy landings especially that of threadfin breams along Madras Coast during September and opined that upwelling along the coast may be the possible cause for higher landings in September every year. Regarding the gill net, the CPUE fluctuated with a peak in November (90.0 kg). However the operation of mechanised gill net was very much limited during November (only 70 operations in 7 years) and December (21 operations) due to monsoon. Barring these two months, the maximum CPUE was, again in September (76.6 kg).

The landings from indigenous gears fluctuated widely (Fig. 4). The maximum CPUE from eda valai was during June and July and from mada valai, it was in May.

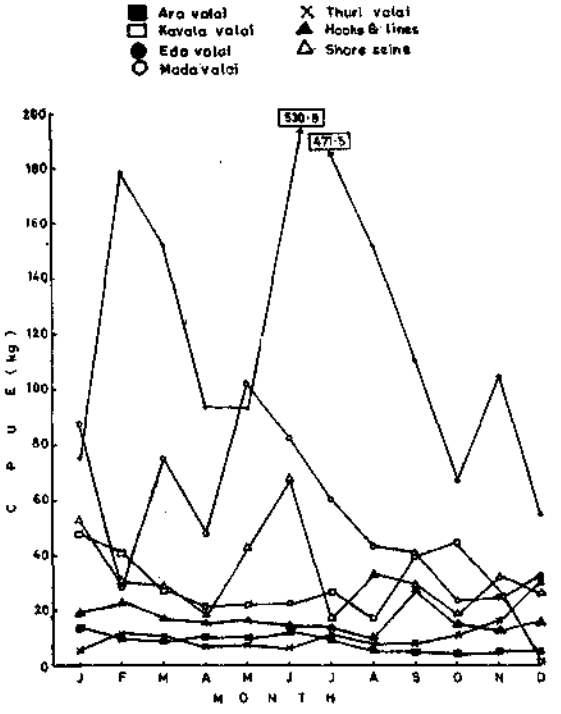

Fig. 4. Monthwise CPUE of indigenous gears ; data pooled for the years 1980-1986.

Groupwise analysis

The percentage composition of selected groups of fishes, crustaceans and cephalopods are presented in Tables 2 and 3. Demersal groups like threadfin breams, lizardfish and cephalopods were landed exclusively by trawlers. Threadfin breams ranked first (11.7%) in the trawl landings followed by silverbellies (10.1%) and prawns (9.9%). The CPUE of threadfin breams reached a peak in 1982 (27.3 kg) and subsequently fluctuated around 17 kg (Fig. 5). Lizardfish and cephalopods constituted 5.8% and 3.3% of the trawl catch, respectively. The CPUE for silverbellies declined from 34.5 kg in 1981 to 15.1 kg in 1986 (Fig. 6). Silverbellies, which ranked second in the trawler landings, was also landed by four indigenous gears, *viz.* ara valai, mada valai, thuri valai

TABLE 2. *Average percentage composition of important fish groups in the catches of mechanised gears during the years* 1980-1986

Group		Trawl	Gill net
Elasmobranchs	..	2.9	32.6
Mackerel	..	2.4	—
Tuna	..	—	14.7
Seerfish	..	1.5	42.0
Decapterus	..	3.4	—
Anchovies	..	1.3	—
Carangids	..	1.6	3.9
Ribbonfish	..	2.6	—
Silverbellies	..	10.1	—
Threadfin breams	..	11.7	—
Lizardfish	..	5.8	—
Sciaenids	..	4.0	—
Pentaprion	..	1.9	—
Upeneids	..	2.5	—
Prawns	..	9.9	—
Other crustaceans	..	3.6	—
Cephalopods	..	3.3	—
Miscellaneous	..	31.5	6.8

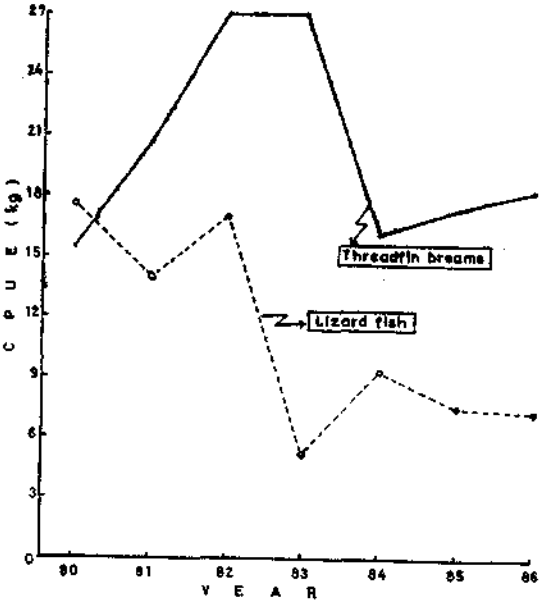

Fig. 5. CPUE of threadfin breams and lizardfish from trawlers.

TABLE 3. *Average percentage composition of important fish groups in the catches of non-mechanised gears during the years* 1980-1986

Group	Ara valai	Kavala valai	Eda valai	Mada valai	Thuri valai	Shore seine	Hooks & Line
Elasmobranchs ..	—	—	—	—	—	—	21.6
Mackerel ..	22.7	—	52.6	5.5	—	2.8	—
Tuna ..	—	—	—	—	—	—	5.7
Seerfish ..	10.4	—	—	—	—	—	27.8
Decapterus ..	—	—	—	36.0	—	—	—
Anchovies ..	—	—	—	—	2.9	33.3	—
Carangids ..	20.2	—	—	44.1	2.6	8.8	27.5
Ribbonfish ..	—	—	—	—	34.9	—	—
Dussumieria ..	—	5.8	—	—	—	—	—
Silverbellies ..	7.3	—	—	2.2	11.0	8.5	—
Sciaenids ..	3.8	—	—	—	2.9	—	—
Perches ..	—	—	—	—	—	—	3.3
Thryssa ..	6.5	7.1	—	—	6.5	—	—
Sardines ..	—	83.9	10.0	1.6	—	31.0	—
Hilsa ..	—	—	18.7	—	—	—	—
Ilisha ..	—	—	6.5	—	—	—	—
Mullet ..	—	—	6.1	1.4	—	—	—
Prawns ..	1.8	—	2.7	—	6.1	—	—
Other crustaceans	8.6	—	—	—	13.9	—	—
Miscellaneous ..	18.7	3.2	3.4	9.2	19.2	15.6	14.1

and shore seine. Sciaenids were caught mainly by trawlers and juveniles of sciaenids by thuri valai. The CPUE of sciaenids from trawlers declined from 13.8 kg in 1981 to 4.7 kg in 1986 (Fig. 7).

The landings from mechanised gill net comprised large fishes like seerfish, elasmobranchs and tuna (Table 2). As the market value of these fishes is high, the operation of gill net increased 4½ times during the 7 year period. In tune with the reduction in the CPUE of total fish (Fig. 1), the CPUE of elasmobranchs also decreased drastically from 240.6 kg in 1980 to 36.0 kg in 1981 and further declined to 3.7 kg in 1986 (Fig. 8). In contrast, the CPUE of seerfish from the gill net increased from 13.8 kg in 1980 to 40.0 kg in 1986 (Fig. 9). The contrasting trend in the CPUE of elasmobranchs and seerfish, which form 32.6% and 42.0% of the total gill net landings (Table 2),

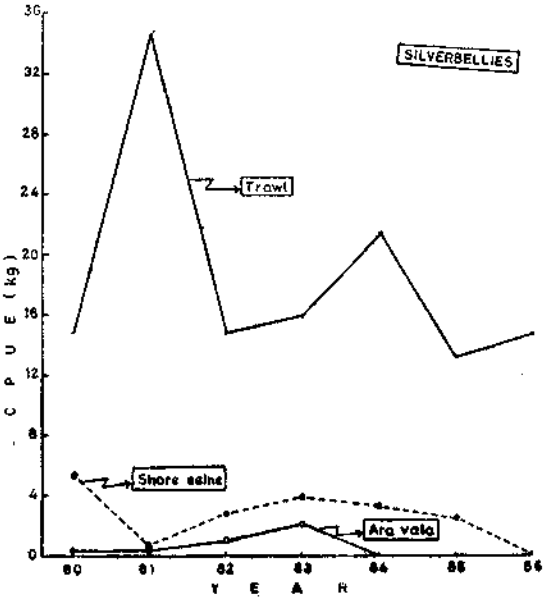

Fig. 6. CPUE of silverbellies from different gears.

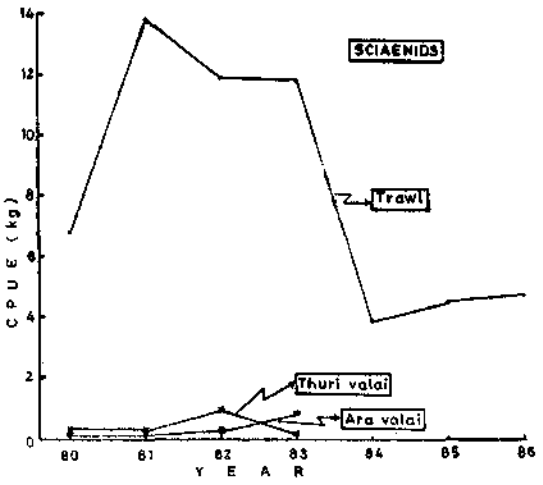

Fig. 7. CPUE of sciaenids from different gears.

requires explanation. The landings of elasmobranchs from the gill net reduced from 183.6 tonnes in 1980 (91.8% of total gill net landings) to 12.8 tonnes in 1986 (6.4% of total gill net landings). The landings of seerfish increased from 10.5 tonnes in 1980 (5.3% of total gill net landings) to 138.7 tonnes in 1986 (61.5% of total gill net landings). This change in the composition of gill net landings has occurred without any change in the design or mesh size of the gear. During the 7 year period from 1980 to 1986, the gill net was operated from a similar type of mechanised craft (about 30' length) with 4 or 5 crew members; nylon netting material with stretched mesh size of 90 mm (twine : 210/4/3), 110 mm (twine : 210/5/3) and 120 mm (twine : 210/6/3) and with head rope length of about 700 m were used throughout the period. The number of floats (one 100/20 size float for every 4 m) and sinkers (one 250 g stone for every 20 m) also remained uniform. The area and depth of operation of these gill nets also did not change during the 7 year period. It appears that decrease in the CPUE of elasmobranchs and increase in the CPUE of seerfish may be due to biological characteristics of the fish. Working on the population dynamics of the grey dogshark *Rhizoprionodon*

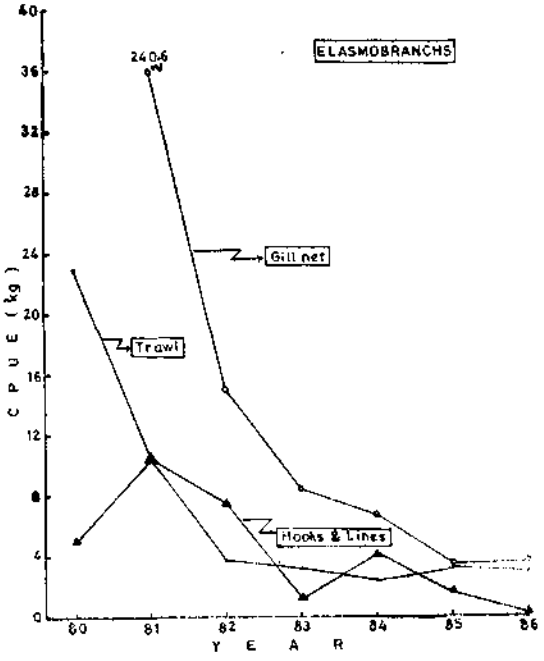

Fig. 8. CPUE of elasmobranchs from different gears.

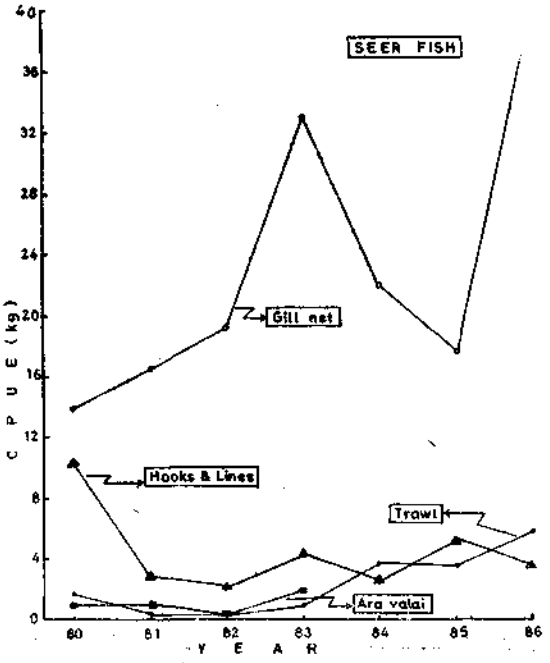

Fig. 9. CPUE of seerfish from different gears.

(*Rhizoprionodon*) *acutus*, which formed 80% of the elasmobranch landings from gill net in Madras, Krishnamoorthi and Jagdish (1986) cautioned that the total mortality of the fish has to be continuously monitored so as to ensure maintenance of the stock.

Among other pelagic resources, mackerel and sardine landings recorded increase during the study period. The CPUE of trawl for mackerel increased from 0.2 kg (1980) to 5.9 kg (1986) in Kasimedu landing centre and the corresponding figures for eda valai were 19.9 kg and 647.2 kg. Considering the sustained increase in mackerel landings especially from eda valai, Radhakrishnan *et al.* (1988) suggested introduction of purse seine along Madras Coast on an experimental basis. In correspondence with the mackerel landings, the CPUE of eda valai for sardines increased from 3.5 kg in 1980 to 46.2 kg in 1986 (Fig. 10).

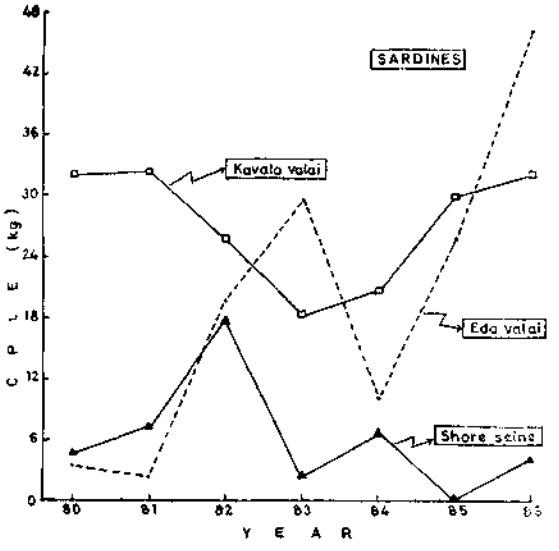

Fig. 10. CPUE of sardines from different gears.

Sardines mentioned here include oilsardine as well as lesser sardine. It is estimated that about 10% of the total sardine landings during 1983-1986 was constituted by oil sardines.

Prawns were landed by 5 gears *viz.* trawl, eda valai, thuri valai, ara valai and mani valai. Trawl operation which was oriented towards prawn fishing, was restricted mostly to the prawn grounds *i.e.* to the depth range of

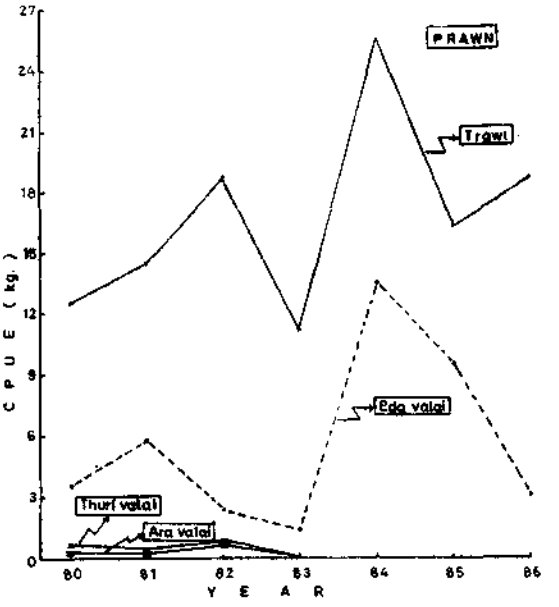

Fig. 11. CPUE of prawns from different gears.

5-30 m. On the other hand, the pelagic net eda valai concentrated on mackerel and sardines. The CPUE for prawn from both these gears exhibited almost a similar pattern *i.e.* increase from 1980 to 1984 and subsequent decrease (Fig. 11). This trend suggests that the prawns inhabiting pelagic as well as bottom areas have been equally harvested and there is a declining trend since 1985. Following introduction of mani valai, prawn fishing in the midwater and bottom areas is further intensified.

During the 7 year period, demersal fishes have constituted the major fishery in Madras The two gears employed for exploiting demersa resources (trawl net and thuri valai) totally landed 39,000 tonnes in 7 years (Table 1), forming 87% of the total fish catch from all

the gears. The remaining 13% was landed by other gears which exploited mostly pelagic resources. However, the increasing trend of some of the pelagic fishes like mackerel, sardine and seerfish during later years of the study period assumes importance considering the conclusion by Dharmaraja *et al.* (1987) and Vivekanandan (1988) that the scope is limited for increasing the demersal landings of Madras Coast.

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