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THE SMALL COMMERCIAL TRAWL FISHERIES OFF VISAKHAPATNAM DURING 1982 - '83 AND 1983 - '84

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ABSTRACT

Fishing by small commercial trawlers in the Visakhapatnam area has grown from about 4 trawlers operating in 1966 to 196 in 1986. Presently vast areas of fishing within 17°10' to 18°10' N and 82°50' to 84°10' E are covered in depth zones of 10-80 m. The fishing pattern and its seasonal variations have been pointed out. The trawling effort is mainly directed to catch prawns which constitutes 13.8% of the total trawl landings. Other important fishes caught in this gear are nemipterids 14.7%, lizardfish 11.1%, sciaenids 7.2%, ribbonfish 7.2%, silverbellies 6.7%, clupeoids 4.1%, perches 4.2%, crabs 4.0%, carangids 3.9% and cephalopods 3.4%. The major species of these groups, their season of abundance and size range in the fishery are presented. The possibility of *Psenes indicus* and *Decapterus dayi* as indicators of upwelling off Visakhapatnam has been pointed out.

INTRODUCTION

THE COMMERCIAL exploitation by the small-sized trawlers began nearly two decades ago at Visakhapatnam. There has been a continuous increase in the number of these boats from about 4 boats in 1966 to 196 in 1986. The present paper gives an account for the first time on the fishery resources being exploited by the small trawlers operated with Visakhapatnam as the base.

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MATERIAL AND METHODS

The small commercial trawlers operating with Visakhapatnam as the base, fish within 17°-10' to 18-°-10' N and 82°-50' to 84°-10 E (Fig. 1). The trawlers are of the size of 10-11.4 m in OAL and are equipped with 60-93 HP engines. The constructional details of these crafts and gear are given by Muthu *et al.* (1975). The method of data collection and analysis of data are same as given by Narasimham *et al.* (1979). During the present study, however, the number of days of observation has been increased to 15-20 in a month. The catch per hour of trawling (Catch rate) rather than catch per boat has been considered as a suitable index of abundance of fish for reasons furnished later.

SEASONAL TRENDS IN THE TRAWL FISHERY OPERATIONS

During March - October period all the boats go for daily fishing (Fig. 1). They leave the

base in the early morning hours and after reaching the proposed fishing ground make three hauls of 2 hours duration each and return to the base between 1600 and 1800 hours, with the catches in fresh condition. During November - February when the sea off Visakhapatnam is relatively calm, 75-80% of the boats go for night fishing/stay fishing. The boats that go for a single night fishing leave the base in the evening and after making three hauls of three hours duration each, return to the base in the morning. The boats that go for stay fishing also leave the base in the evening hours and after reaching more distant fishing grounds begin trawling operations on the same night making three hauls of three hours duration each. On the following day also they make a further three hauls of 2 hours of duration each during the day and three hauls of 3 hours duration each in the following night and return to the base in the morning hours.

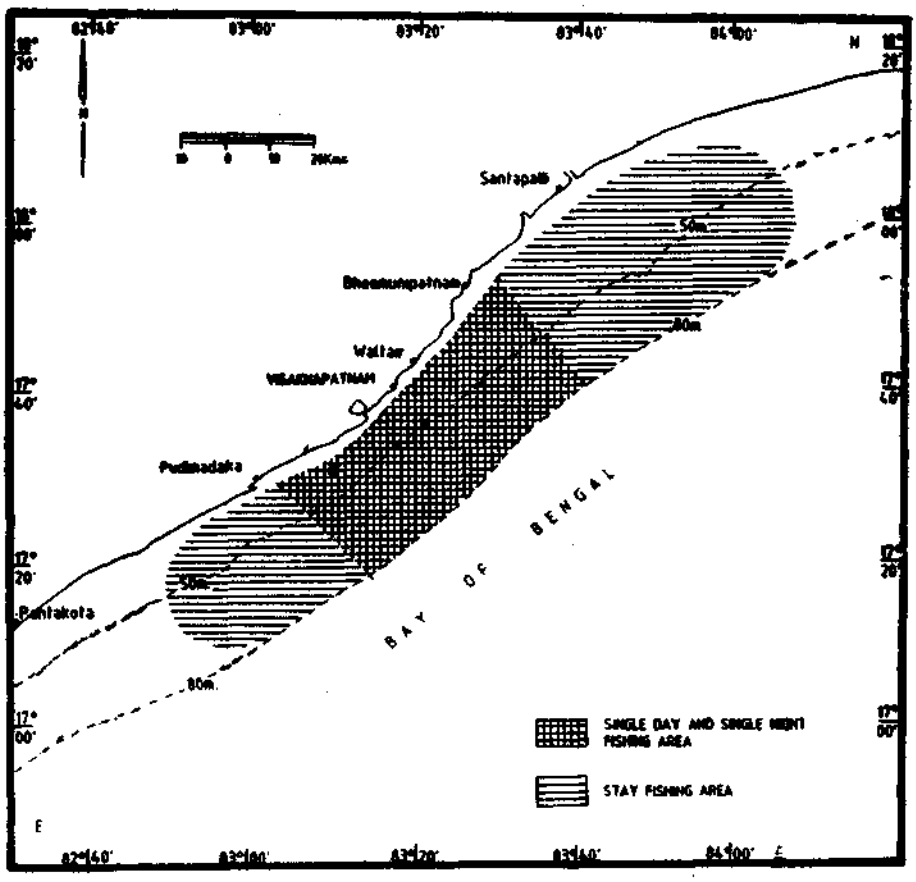

Fig. 1. Areas of fishing operations by small commercial trawlers of the Visakhapatnam base.

Thus, during the course of a single trip a single boat expends about 6 hours of effort in the day fishing and 9 hours during night

fishing and about 24 hours during stay fishing. Owing to such variations in effort ranging from 6 to 24 hours per boat per trip, it is felt appropriate to estimate the catch in terms of hours rather than per boat trip.

Trends in the Trawl Landings

The annual landings by small commercial trawlers at Visakhapatnam ranged between 4,799 tonnes in 1982-'83 and 8,428 tonnes in 1983-'84 (Table 1). The average number of boats that landed the catches per day varied between 81 in 1982 - '83 and 102 in 1983 - '84. The annual fishing effort varied between 211,102 hours in 1982 - '83 and 323,681 hrs in 1983 - '84. This increase in effort in 1983 - '84 has resulted in the increase of the total catch over that of the previous year by 75.6%. An increase in the catch rate from 24.3 kg/hr in 1982 - '83 to 26.04 kg/hr in 1983 - '84 was also observed (Table 1).

Table 1. *Catch (Kg), effort (trawling hours) and catch rates (Kg) for the small commercial trawlers during different years*

	1982–'83	1983–'84
Fishing days	322	333
Total catch	4,798,945	8,427,572
Average No. of boats per day	81	102
Effort	211,102	323,681
Catch per boat per day	192.59	249.28
Catch per trawling hour	24.27	26.04

Monthly trends

The monthly variations in the catch rates and the fishing effort for the small trawlers for the years 1982 - '83 and 1983 - '84 are shown in Fig. 2. During 1982 - '83 the monthly effort ranged from 5,897 to 31,459 hrs, with the average at 17,592 hrs. During July - September and November - December the effort spent was more than the monthly average. The monthly catch rates varied from 15.0 kg/hr to 34.5 kg/hr, with the average at 22.8 kg/hr. High catch rates were recorded during April, July to September and February.

During 1983 - '84 the monthly effort varied between 14,427 hrs and 50,056 hrs with the average at 26,973 hrs. During July, August, December, January and March, the fishing effort exceeded the monthly average. The monthly catch rates fluctuated between 11.9 kg/hr and 59.6 kg/hr with the average at 29.5 kg/hr. The catch rates recorded in April, May and September - November were higher than the monthly average.

A study of the trend of the fishing effort and the relative catches (Fig. 2) indicates that the catches have increased with the increase in fishing effort throughout 1982 - '83 and also during 1983 - '84 except in June 1983. In this month there was a fall in the catches though there was no decrease in the fishing effort. This was mainly due to the very rough weather conditions that prevailed on the fishing grounds.

Total catches as well as catch rates were better during July - September in 1982 - '83 and during April and September in 1983 - '84 Thus the month of September emerged as a good month for the trawl fishery in both the years of study.

Important Trawl Fisheries

Analysis of the trawl landings over the two year period has revealed that nemipterids were the most important component forming 14.7% of the total catches, closely followed by prawns forming 13.8%. The next important

group was lizardfish which accounted for 11.1% of the total catches. Sciaenids 7.2%, ribbonfish 7.2%, silverbellies 6.7% were the fishes constituted the bulk (80.3%) of the trawler landings. The rest of the landings was constituted by eleven groups of fishes. Group/

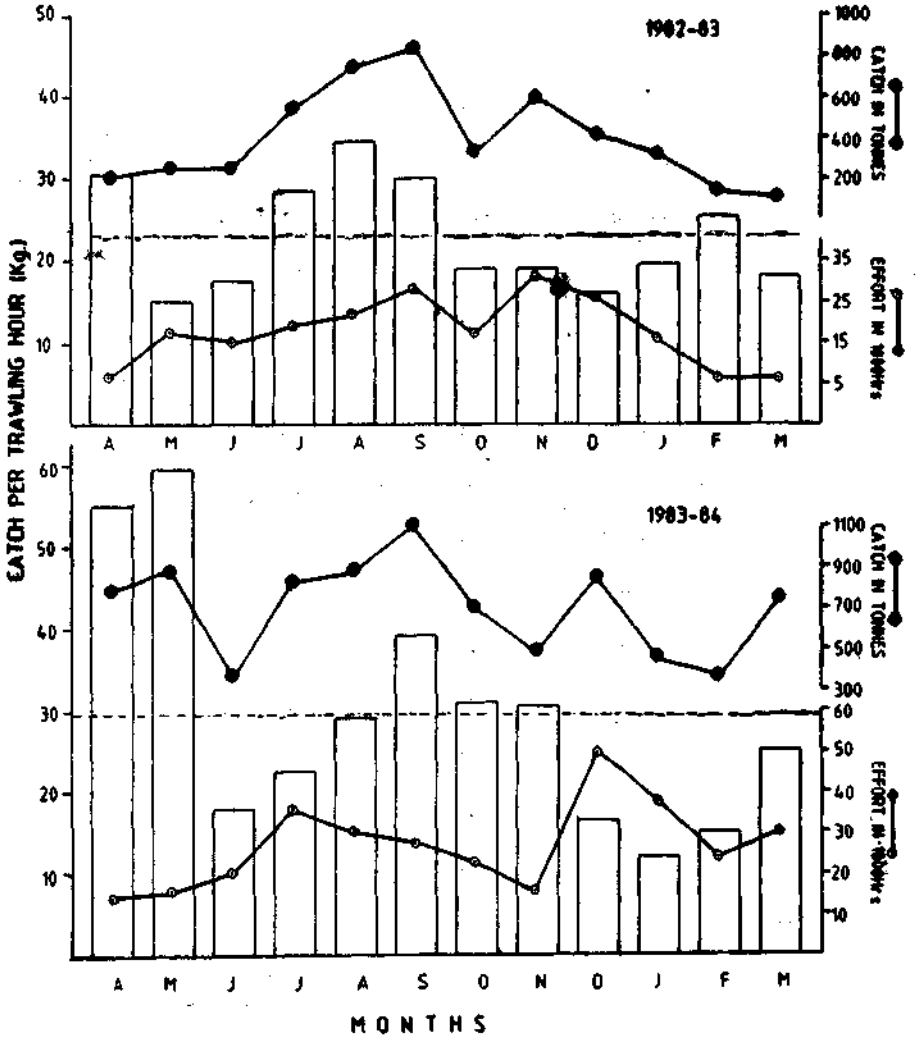

Fig. 2. Trends in the monthly fishing effort and catch rates for trawl landings during 1982-'83 and 1983-'84 (The average annual catch rate is shown by dotted line).

three other important groups of fishes in the trawl landings, followed by clupeoids 4.1%, perches 4.2%, crabs 4%, carangids 3.9% and cephalopods 3.4%. Thus eleven groups of species - wise landings and their relative percentage composition during 1982 - '83 and 1983 - '84 as well as for the two year period are given in Table 2 and the trends in monthly

TABLE. 2 *Group/species-wise landings in kgs and percentage average for* 1982-'83 *and* 1983-'84

Name of the group/species	1982-1983	%	1983-1984	%	Percentage in total catches 1982-'83 & 1983-'84
Nemipterids	488751	10.18	1451018	17.22	14.67
Prawns	627281	13.07	1203141	14.28	13.84
Lizardfish	884120	18.42	58138	6.90	11.08
Sciaenids	315145	6.57	638785	7.58	7.21
Ribbonfish	273646	5.70	672353	7.98	7.15
Silverbellies	338229	7.05	544618	6.46	6.67
Perches	114424	2.38	444894	5.28	4.23
Clupeoids	231402	4.82	312278	3.71	4.11
Crabs	126751	2.64	401059	4.76	3.99
Carangids	159840	3.33	356780	4.23	3.91
Cephalopods	212403	4.43	239676	2.84	3.42
Goatfish	195660	4.08	250026	2.97	3.37
Psenes indicus	57121	1.19	262555	3.12	2.42
Catfish	165767	3.45	140803	1.67	2.32
Elasmobranchs	122092	2.54	107749	1.28	1.74
Lactarius lactarius	12391	0.26	144312	1.71	1.18
Flatfish	53745	1.12	64345	0.76	0.89
Mackerel	12511	0.26	76653	0.91	0.67
Polynemids	24809	0.52	44787	0.53	0.53
Pomfrets	11842	0.25	6350	0.08	0.14
Miscellaneous	371015	7.73	484002	5.74	6.46
Total	4798945		8427572		

catch rates for nine groups of important demersal fishes together with the annual catch rates separately for the two years are given in Fig. 3.

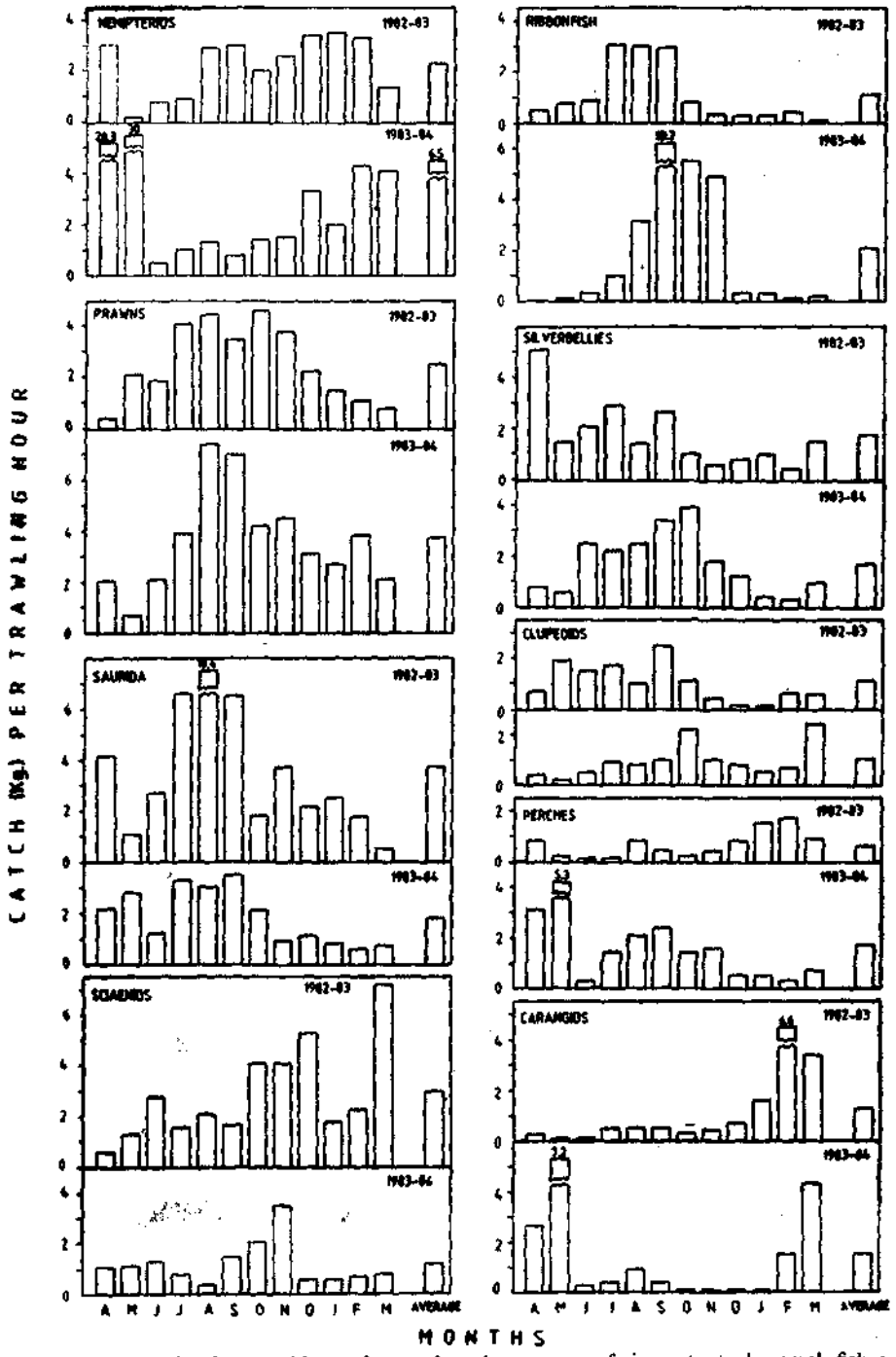

Fig. 3. Trends in the monthly catch rate for nine groups of important demersal fishes.

Nemipterids

The monthly c.p.h. varied between 0.2 and 3.5 kg with annual c. p. h. at 2.32 during 1982 - '83 and between 0.5 and 30.1 kg with the annual c. p. h. at 4.48 kg during 1983 - '84. The monthly catch rates exceeded the annual c.p.h. in April, September, November to February, during 1982 - '83 and April - May during 1983-1984. Over the two year period *Nemipterus mesoprion* accounted for the bulk (66.7%) of the nemipterid catches, followed by *N. japonicus* (28%). Other nemipterids formed the rest of the catch. Though *N. mesoprion* was available in the catches througout the year, the bulk (96%) of the annual catches was obtained during November-May. Very high catches of 400 t at catch rate of 34.4 kg in April 1983 and 441 t at catch rate of 37.9 kg in May 1983 were recorded. The size of *N. mesoprion* ranged between 100 and 190 mm and the bulk of the fish landed were in 85-105 mm range. In contrast to *N. mesoprion* good catches of *N. japonicus* were obtained during July-January during both the years. This species, however, occurred in the catches almost throughout the year. The size range of fish varied between 75 and 235 mm and bulk of the fish landed were in 120 - 180 mm range.

Prawns

The monthly c. p. h. varied between 0.4 to 4.6 kg with annual rate at 3.0 kg in 1982-'83 and 0.7 to 7.4 kg with the annual rate at 2.7 kg in 1983-'84. The monthly catch rates during July - November of 1982 - '83 and July - December of 1983 - '84, exceeded the annual c.p.h. The following are the six species of prawns which formed the bulk of the prawn catches and their size ranges in the fishery, with the range of the bulk of the prawns landed given in brackets. *Metapenaeus monoceros* 63-188 mm (108-153 mm), *M. dobsoni* 63-108 mm (68-88 mm), *Penaeus indicus* 88-193 mm (128-168 mm), *P. monodon* 133-308 mm (188-263 mm), *Trachypenaeus curvirostris* 43-108 mm (53-88 mm), *Parapenaeus longipes* 43-93 mm (53-78 mm).

Lizardfish

The small trawlers yielded catch rates of 1.1 - 10.4 kg (average 3.7 kg) in 1982 - '83 and 0.6-3.5 kg (average 1.8 kg) in 1983 - '84. The catch rates exceeded the annual c.p.h. during April, July to September and November of 1982 - '83 and during April, May, July to October of 1983 - '84. *Saurida tumbil* is the dominant species caught in the size range of 165-335 mm and the bulk of the fish landed were in 220-270 mm range.

Sciaenids

The monthly catch rates fluctuated between 0.6 and 5.3 kg (annual c.p.h. 2.9 kg) during 1982 - '83 and between 0.4 and 3.5 kg (annual c.p.h. 1.0 kg) in 1983-'84. When compared to the annual c.p.h. the catch rates during October - December and in March for the year 1982-'83 and during October - December and March of 1983-'84 were higher. *Johnius carutta* formed 46.7%, *Kathalaa xillaris* 29.8% and *J. maculata* 10.4%. *J. carutta* was in the length range of 70-230 mm (bulk of the fish were in 120-140 mm range) and *Kathala axillaris* was in 30-175 mm length range (110-120 mm size).

Ribbonfish

Though four species of ribbonfishes occur in the catches *Trichiurus lepturus* formed the bulk (70%) of the ribbonfish fishery and occurred for most part of the year. The monthly c.p.h. of ribbonfish in general varied from 0.02 to 3.05 kg (annual c. p. h. 1.3 kg) during 1982-1983 and from zero to 10.2 kg (annual c.p.h. 2.1 kg) during 1983-'84. The catches during the months of July-September of 1982-'83 and August - November 1983-1984 had exceeded the annual c.p.h. The total size ranges,

and the size range of the bulk of the fish landed, of the four species of ribbonfishes are as follows: *Trichiurus lepturus* 150-950 mm (315-615 mm), *T. russelli* 115-500 mm (285-375 mm), *Eupleurogrammus glossodon* 230-620 mm (375-405 mm) and *Lepturacanthus gangeticus* 125-590 mm (345-435 mm).

Silverbellies

The monthly rates fluctuated between 0.4 to 5.1 kg (average 1.6 kg) during 1982-'83 and 0.3 to 3.9 kg (average 1.7 kg) during 1983-'84. Compared with the annual c.p.h. the catch rates were better in April; June - July and September of 1982 - '83 and in July - November of 1983-'84. Size ranges and bulk of the fish landed sizes of the four species of the silverbellies in the catches were as follows: *Leiognathus bindus* 22-122 mm (70-80 mm); *L. splendens* 100-129 mm (115-124 mm); *Secutor insidiator* 47-115 mm (69-90 mm) and *Gazza minuta* 45-125 mm (90-100 mm).

Clupeoids

The monthly catch rates varied between 0.1 and 2.5 kg with the annual rate at 1.1 kg during 1982-'83 and between 0.2 to 2.4 kg with the annual rate at 1.0 kg in 1983-'84. During May to July and September months in 1982-'83 and September - October and March of 1983-'84 the catch rates exceeded the annual c.p.h. *Stolephorus* formed 65.3% of the clupeoid fishes caught by trawlnet, followed by *Thryssa* 20.6% and *Sardinella* 7.9%. The size ranges and common size of the different species constituting the clupeoid fishes are given below: *Stolephorus devisi* 50-90 mm (65-85 mm) and *S. bataviensis* 40-110 mm (55-95 mm). May-September is the period of abundance of these species. *Thryssa mystax* 90-215 mm (105-180 mm), *T. dussumieri* 75-135 mm (85-120 mm) and *T. setirostris* 125-185 mm (135-155 mm). These three species occurred during July to September.

Perches

During 1982-'83 the monthly catch rates ranged between 0.1 and 1.7 kg with the annual c.p.h. 0.5 kg and during 1983 - '84 between 0.3 to 5.3 kg with the annual c.p.h. at 1.4 kg. The catch rates recorded in April, August and September to March of 1982-'83 and in April, May and July - November of 1983-'84 exceeded the respective annual c.p.h. The bulk (80%) of the perch catch is constituted by *Priacanthus hamrur* and *P. holocentrum*. Good catches were obtained during August-September, December - February in 1982 - '83, but during April - May, July - September in 1983-'84. The fishes occurred in the size range of 90-230 mm and bulk of the fish landed were in 150-180 mm range.

Carangids

The monthly c.p.h. of carangids ranged between 0.2 and 6.6 kg (annual c.p.h. 0.8 kg) during 1982-'83 and between 0.01 and (7.2 kg annual c.p.h. 1.1 kg) during 1983 - '84. The monthly c.p.h. exceeded the annual catch rates in January-March in 1982-'83 and during February-May in 1983-1984. Over the two-year period *Decapterus dayi* formed the most dominant species accounting for 70.1% in total carangid catches, followed by *Caranx malabaricus* 24.5%, *Megalopsis cordyla* 5.0% and other carangids 0.4%. Very good catches of *D. dayi* were obtained during February-March in 1982-'83 (90.5%) and during April-May and February - March in 1983 - '84 (98.7%). Thus February - May may be considered to be the fishery season for this species. In contrast to this, good catches of *C. malabaricus* were obtained during July - January in 1982 - '83 (97%), and during June - September in 1983 - '84 (87%). The foregoing observations indicate that the two major species of carangids occurring in the trawling grounds have different fishery seasons.

Other Fisheries

Cephalopods

Though cephalopods form about 3.4% only of the trawl landings they, like prawns, are gaining considerable importance in the export market. During 1982-'83 and 1983-'84 cephalopods formed 4.4% and 2.8% respectively in the total trawl landings. Squids accounted for 32.6% and 47.8% respectively of the cephalopod catches in these two years. Similarly cuttlefish constituted 67.4% and 52.2% respectively of the cephalopods of these two years.

The monthly c.p.h. of squids varied between 0.03 and 2.4 kg with annual c.p.h. at 0.3 kg in 1982-'83 and between 0.1 and 1.05 kg with annual c.p.h. at 0.3 kg in 1983-'84. The monthly catch rates exceeded the annual c.p.h. during April and July in 1982-'83 and during April, May, August-November in 1983-'84. The following were the three species of squids recorded, together their percentage composition in total squid catches given in brackets. *Loligo duvaucelii* (90%), *Loliolus investigatoris* (7%) and *Doryteuthis singhalensis* (3%). *L. duvaucelii* occurred in the size range of 25-175 mm with common size at 55-100 mm in the catches.

For cuttlefishes the small trawlers yielded catch rate of 0.02 - 1.3 kg with annual c.p.h. at 0.7 kg in 1982-'83 and 0.08-1.36 kg with annual c.p.h. at 0.35 kg in 1983-'84. The catch rates exceeded the annual c.p.h. during September - November of 1982-'83 and April, May, September and October of 1983-'84. The following were the five species of cuttle fishes caught together with their percentage composition in total cuttle fishes given in brackets. The size ranges in the fishery with the common size given in the brackets are also furnished for the first four species. *Sepia aculeata* (41%) 55-169 mm (100-149 mm), *Sepia pharaonis* (38%) 75-269 mm (95-165 mm), *Sepiella inermis* (12%) 35-84 mm (40-74 mm), *Sepia brevimana* (7%) 25-95 mm (65-79 mm) and *Sepia prasadhi* (2%).

Significance of *Psenes indicus* and *D. dayi* in Trawl Fisheries

Psenes indicus formed only 2.4% of the trawl landings. Its size ranged between 120 and 195 mm and bulk of the fish were landed in 140-159 mm in range. This species, like *Decapterus dayi* which has been dealt with earlier, is highly seasonal in occurrence with 97% of its annual landings being caught during February - May. The season of abundance of these two species coincides with the season of the occurrence of cold water in the inshore fishing grounds off Visakhapatnam.

General Remarks

Fishing effort by the small trawlers operating off Visakhapatnam is mainly directed to catch prawns which are of greater commercial value and which constitute 13.8% of the total trawl landings. During March-October the trawlers go for day time trawling, a fishing trip lasting for a single day. During November - February the boats go for night/stay trawling, a fishing trip lasting for about 2 days, as the weather conditions become favourable in the area during this period.

Two main seasons could be recongnised for good catches by trawlers, namely July - November and February - April, the former being more pronounced than the latter. Prawns, lizardfish, silverbellies, ribbonfish and sciaenids are the important groups of fishes available in that order during July - November, while carangids, perches, lizardfish and *Psenes indicus* are important groups of fishes available during February - April.

Relatively deep water species such as *Decapterus dayi*, *Psenes indicus* and *Nemipterus mesoprion* occurred in considerable quantities during February - May period. Their occurrence coincides with the period of extensive upwelling known to take place in this area. LaFond (1954) Ganapati and Subba Rao (1957) and Murthy and Varadhachari (1968) have reported extensive upwelling to take place off Visakhapatnam during February - June. Also Muthu *et al.* (1975), Narasimham *et al.* (1979) and Anon. (1981) have reported the occurrence of *Decapterus* spp., *Psenes indicus* and *Nemipterus* spp. in considerable quantities off Kakinada during February-April. Thus *Psenes indicus* and *Decapterus dayi* could be considered as possible indicators of upwelling off Visakhapatnam. The relation between upwelling and the occurrence of *N. mesoprion* remains to be investigated in detail.

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