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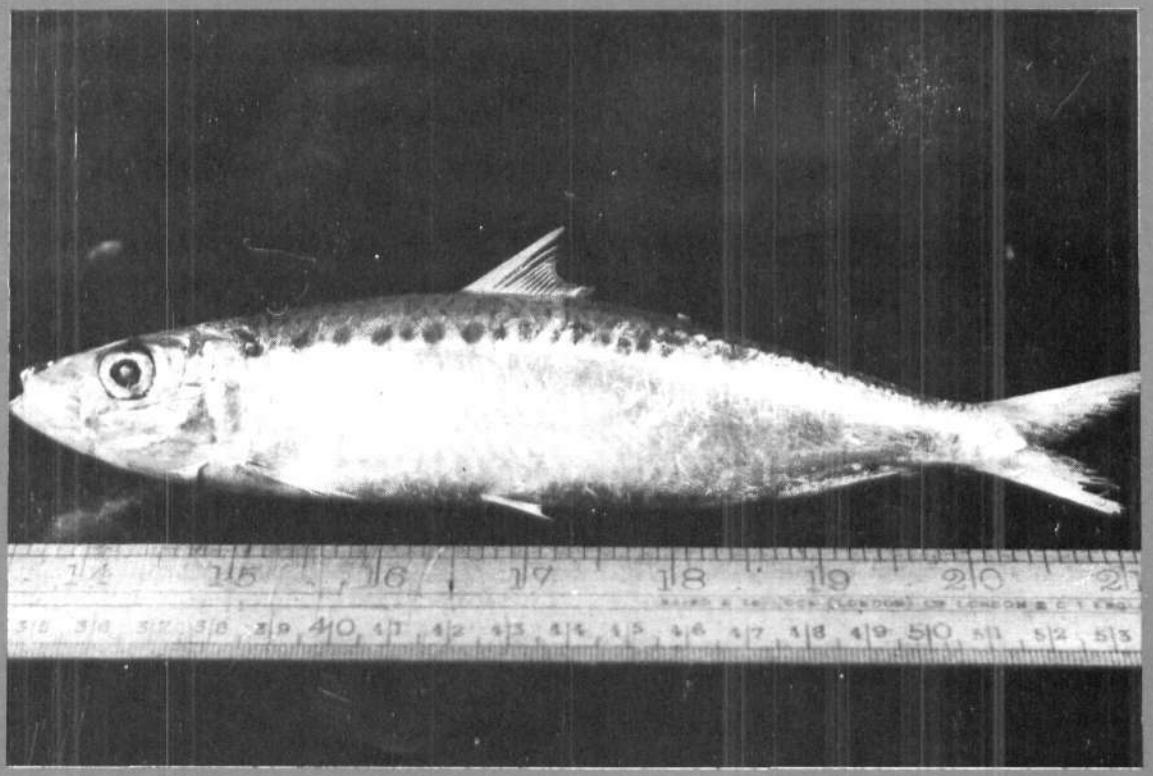

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समुद्री मात्स्यिकी सूचना सेवा : समुद्री मात्स्यिकी पर आधारित अनुसंधान परिणामों को आयोजकों, मत्स्य उद्योगों और मत्स्य पालकों के बीच प्रसार करना और तकनोलजी का प्रयोगशाला से श्रमशाला तक हस्तांतरित करना इस तकनीकी और विस्तार अंकावली का लक्ष्य है।

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Back cover photo : Edible oyster farm set up by a farmer in the Ashtamudi Lake at Dalawapuram, Quilon District, Kerala State.

पृष्ठ आवरण फोटो : केरल के अष्टमुटी झील में एक कृषक द्वारा स्थापित खाद्य शुक्ति खेत

THE CEPHALOPOD FISHERY AT COCHIN, KERALA

V. Kripa, K. Prabhakaran Nair and Mathew Joseph

Central Marine Fisheries Research Institute, Cochin - 682 014

The fishery of cephalopods consisting of cuttlefishes, squids and octopuses has been gaining importance recently. The commercial exploitation of this resource started in India 25 years ago. In the sixties it was considered as trash and thrown overboard, but later in seventies and eighties it was identified as a valuable exportable item and this led the fishermen to save the cephalopod catch. The fishery status of the cephalopods improved tremendously with the fishermen preferring cephalopods to many fin fishes but next only to prawn. This trend is also reflected in the annual cephalopod landings of Kerala which from just about 100 t in 1961 increased to 500 t in 1971, 9,500 t in 1981, 19,500 t in 1991 and an all-time high of 30,600 t in 1992. In 1993, however, there was a slight decline to 28,471 t accounting for 29.6% of the all-India production of 96,052 t. Kerala has ranked first among all the maritime states of India in cephalopod production except in a few years.

The Cochin Fisheries Harbour is a major fish landing centre in Kerala. Cephalopod landings at this centre contribute about 11-23% of Kerala's annual cephalopod catch. They are landed as by-catch by shrimp trawlers which operate off Cochin upto 60 m depth. On an average, about 200 trawlers of 8-13m length range operate every day from Cochin base. The main fishing grounds are situated off Alleppey, Cochin, Beypore, Chavakkad and Chetuva.

Annual cephalopod production

During the 5-year period from 1989 to 1993 the estimated annual cephalopod landings at Cochin Fisheries Harbour varied from 2,597 to 7,230 t with an average of about 5,000 t accounting for about 14% of the total trawl catches landed here. The landings which stood at 4,109 t in 1989 declined to 2,597 t in 1990 but in the subsequent three years there was steady increase with the catch reaching the maximum in 1993 (Fig.1). During the 5-year period there was about 76% increase in the landings. The total trawl catch also increased steadily but in the case of effort (which number of trawl units) it increased till 1991 and then came down during the subsequent two years (Table 1). The annual catch-per-unit-effort (CPUE) varied from 35 kg to the maximum

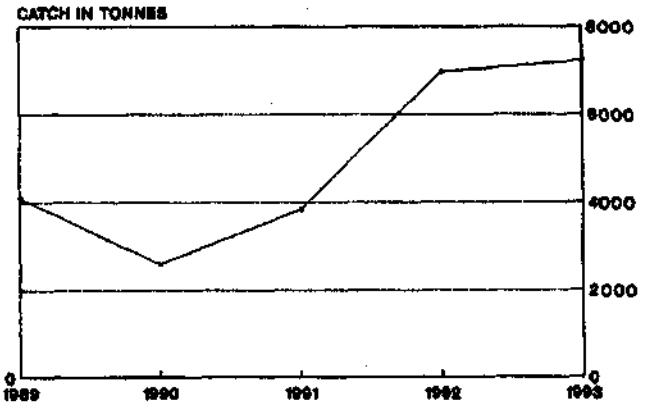

Fig. 1 Cephalopod landings in Cochin Fisheries Harbour during 1989-'93

TABLE 1. *Particulars of the cephalopod landings during 1989 - '93 at Cochin Fisheries Harbour*

	1989	1990	1991	1992	1993	Average
Cephalopod (t)	4,109	2,597	3,839	6,971	7,230	4,949
Total marine fish landed (t)	24,566	27,978	38,580	40,197	46,608	35,585
Share of cephalopod (%)	16.7	9.2	9.9	17.3	15.5	13.9
Trawl units (No.)	63,762	70,546	1,09,011	90,570	92,152	85,208
CPUE (kg)	64.4	36.2	35.2	77	78.4	58

of 78 kg, the average for the entire period being 58 kg. The share of cephalopods in the total fish landings ranged from about 9% to nearly 17%, the average contribution being 14%.

Monthly variation in catch and effort

The cephalopod landings showed wide variations from month to month in the same year, and in the same months in different years (Fig. 2). The highest average monthly catch was in September, the next highest catch being in May, followed by October, March and April. The lowest catch was in July. In general, the major peak season for cephalopods was during September-October and a minor peak of longer duration in March-June. The highest monthly catch of 2,050 t was obtained in September 1989, followed by 1,272 t in the same month in 1991 while the catches in September during the other years were between 191 t and 756 t. In 1992 the highest catch was in February and October, whereas in 1993 it was in May followed by March, with September coming

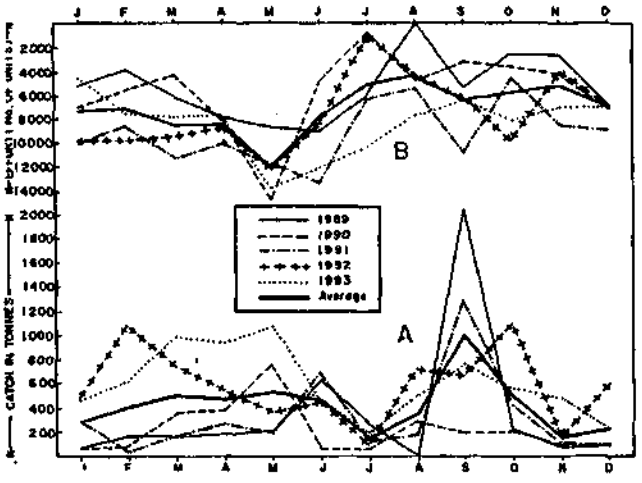

Fig. 2 Monthly cephalopod landings at Cochin Fisheries Harbour (A) and fishing effort (B) for the years 1989-'93. The average monthly values are also shown.

third. In all the years the catches in July were uniformly low, ranging between 55 t and 271 t.

The effort in terms of trawl units also showed wide variation (Fig. 2). Trawl units numbering between 5,000 and 10,000 operated in January have increased to between 8,600 and 14,800 in May in which the maximum average effort expended was 12,146 units. The effort came down to an average of 4,900 units in July and 4,400 in August. The unfavourable fishing conditions due to the southwest monsoon together with the ban on trawling during some part of this period are the reasons for the reduction in effort in these two monsoon months.

Cuttlefish, squid and octopus

The cephalopod catch was composed mainly of cuttlefishes and squids (Fig. 3) with very small quantities of octopuses. The annual cuttlefish catch ranged from 1,075 to 3,782 t accounting for 41 to 84% of the total cephalopod catch. The

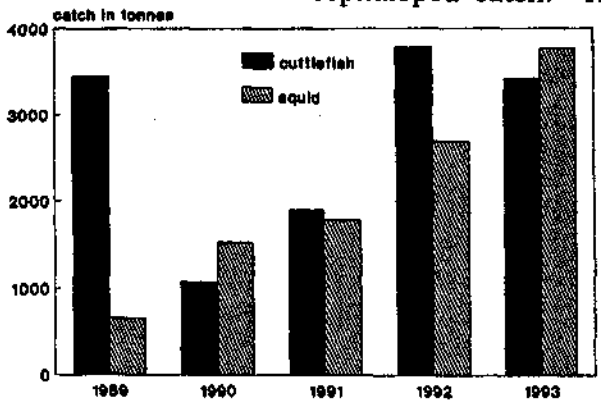

Fig. 3 Cuttlefish and squid landings at Cochin Fisheries Harbour during 1989-'93. Small octopus landings are not shown in the figure.

annual catch came down in 1990 but started increasing in subsequent years and reached the maximum of 3,782 t in 1992 and the annual average catch was 2,723 t; forming 55% of the total cephalopods. Squid catch was only 663 t in 1989 but increased steadily over the years and reached the maximum of 3,769 t in 1993 accounting for 52% of the total cephalopods. The annual average squid catch was 2,087 t (42%). There was no octopus catch in 1989 and 1990 and in the succeeding years the annual catch ranged from 41 t to 498 t (Table 2). The annual average octopus catch was only 139 t, accounting for as little as 3% of the total catch of cephalopods.

Species composition

Five species of cuttlefishes, three species of squids and four species of octopus in varying quantities contributed to the fishery. The average monthly catch of important species of squids, cuttlefishes and octopuses is shown in Fig. 4.

A. *Cuttle fishes*

(1) *Sepia pharaonis:* Known as the pharaoh cuttlefish, this species has the distinction of being the largest cuttlefish in the Indian seas growing to a maximum length of 430 mm in dorsal mantle

TABLE 2. *Annual landings of different species of cephalopods at Cochin Fisheries Harbour during 1989-'93*

	1989	1990	1991	1992	1993
A. Cuttle fishes					
Sepia pharaonis	2,900	778	1,589	3,231	2,729
S. aculeata	471	271	183	317	322
S. elliptica	33	2	2	95	37
Sepiella inermis	42	24	121	139	316
Sepia prashadi	-	-	-	-	16
B. Squids					
Loligo duvauceli	443	1,450	1,696	2,173	3,129
Doryteuthis sibogae	179	53	-	476	639
D. singhalensis	41	19	94	42	1
C. Octopuses					
Octopus membranaceous	-	-	107	430	27
O. dollfusi	-	-	23	13	-
O. lobensis	-	-	16	26	14
Cistopus indicus	-	-	9	29	-
Total	4,109	2,597	3,840	6,971	7,230

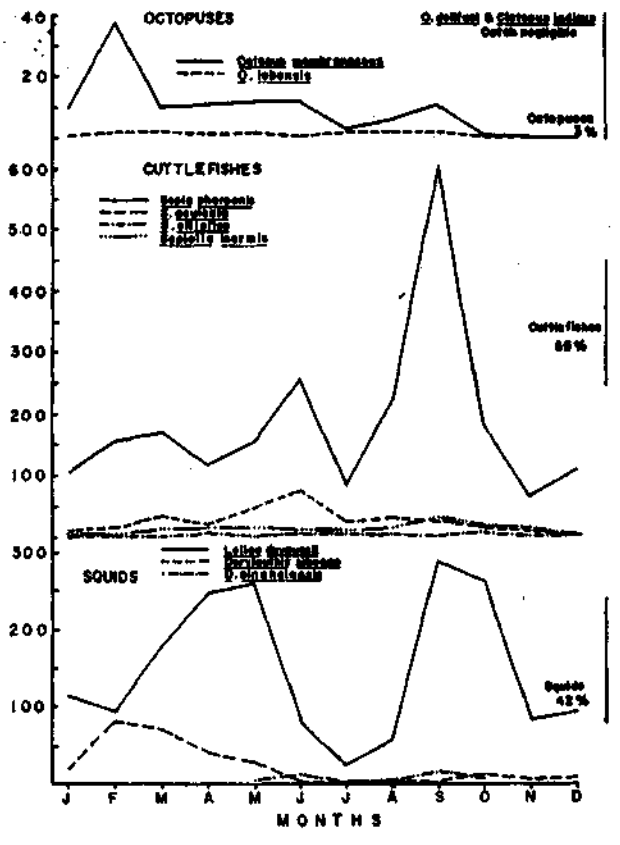

Fig. 4 Average monthly catch of important species of squids, cuttlefishes and octopuses at Cochin Fisheries Harbour during 1989-'93.

length, and commercially the most important. The species has characteristic dark transverse stripes on the mantle, head and oral arms. The annual catch of this cuttlefish varied from 778 t to 3,231 t accounting for 45% on an average of the total cephalopods landed at Cochin Fisheries Harbour (Fig. 5) obtained throughout the year and comparatively better catches were recorded during June - October except July, with peak in September. Heavy catch to the tune of 1,839 t was brought in by 5,332 trawl units at a CPUE of 345 kg in September 1989. The length of this cuttlefish contributing to the fishery ranged from

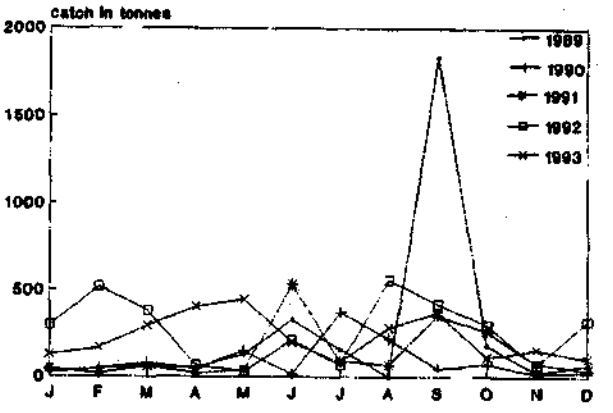

Fig. 5 Monthly landings of *Sepia pharaonis* at Cochin Fisheries Harbour during 1989-'93.

70 mm to 320 mm. Large specimens above 270 mm, weighing two to two and a half kilograms is a common sight at Cochin Fisheries Harbour. During this period the price of *S. pharaonis* ranged between Rs. 35 and Rs. 145 per kilogram.

(2) *Sepia aculeata* : With an estimated annual average catch of 312 t forming 6% of the total cephalopods, this species is the second dominant cuttlefish landed at Cochin. It occurs in the trawl catch almost throughout the year with peaks during May-June and August-September (Fig. 6). The maximum monthly catch of 223 t was taken in June 1989, with a total catch of 471 t, next only

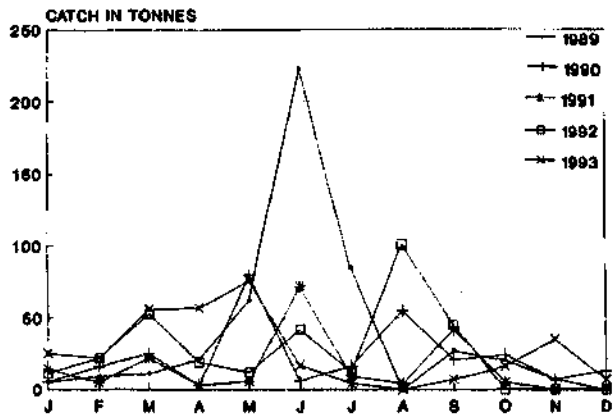

Fig. 6 Monthly landings of *Sepia aculeata* at Cochin Fisheries Harbour during 1989-'93.

to *Sepia pharaonis*. Cuttlefish of size 24 to 198 mm contributed to the fishery during this period.

(3) *Sepia elliptica*: This is a small-sized cuttlefish which formed less than 1% of the total cephalopods during the period 1989-'93. The maximum annual catch was only 95 t, and the highest monthly catch 42 t. The fishery was not regular, the small catches coming occasionally along with other species. During this period cuttlefish of size 33 to 121 mm contributed to the fishery.

(4) *Sepia prashadi*: A smaller species which resembles *S. pharaonis* and rare on the west coast, appeared in the fishery only in September 1993 when 16 t were landed by the trawlers. During the rest of the period this species occurred in stray numbers.

(5) *Septella inermis* : After *Sepia aculeata*, this cuttlefish was next in importance quantity wise, with an average catch of 128 t forming 2.6% of the total cephalopods, within the annual range of 24 t and 316 t. This occurred in the fishery almost in all months, with peaks during March-May and August-November. The highest monthly catch was 83 t in September 1991.

B. Squids

(1) *Loligo duvaucelii*: Known as the Indian squid, this is the most common squid throughout the Indian coast. Among the cephalopods landed at Cochin Fisheries Harbour, *Loligo duvaucelii* is next only to *Sepia pharaonis* in quantity, the annual catch ranging between 443 t and 3,129 t (Fig. 7), at an average of 1,797 t forming 36% of the total cephalopods. There was a continuous increase in the annual landings of this squid. The maximum monthly catch was 680 t in September 1991 as well as in October 1992. In general there were two peaks in the landings, a larger peak in September-October and a smaller one during March - May. The catch was generally poor in July and August in all the years. Females of 40 to 220 mm length and males of 60 to 320 mm contributed to the fishery. The squids are sorted into 3 main groups based on their dorsal mantle length (DVM) and priced accordingly. Squids above 200 mm fetch Rs. 65-120/kg, while those between 150 and 200 mm cost Rs. 30 - 80/kg, and those below 150 mm are priced at Rs. 10 - 35/kg. This method of grouping the squids based on size was started only in 1991. The entire

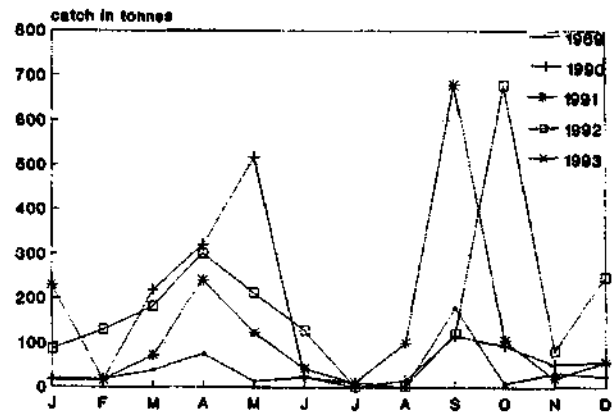

Fig. 7 Monthly landings of *Loligo duvaucelii* at Cochin Fisheries Harbour during 1989-'93.

quantity of large sized squids are purchased by exporters, while a part of the small squids are bought by local vendors and sold in the nearby markets.

(2) *Doryteuthis sibogae*: Commonly known as the Siboga squid or Arrow squid is not in demand

by the exporters because of its smaller size and comparatively slender body than *L. duvauceli*. The species has shown seasonality and its fishery was mostly during the premonsoon period from January to May with peak during February - March (Fig. 8). With an estimated annual average catch of 270 t contributing to 5% of the total

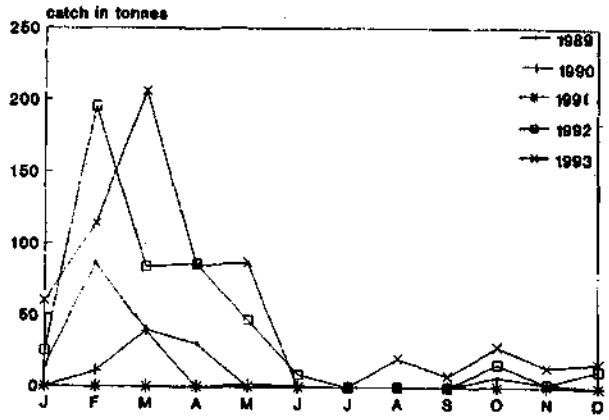

fig. 8 Monthly landings of *Doryteuthis sibogae* at Cochin Fisheries Harbour during 1989-'93.

cephalopods, the catch of this squid was poor in 1989 and 1990. There was no catch in 1991 while the annual catch was 476 t in 1992 and 639 t in 1993. Squids of 70 - 250 mm length contributed to the fishery.

(3) *Dorteuthis singhalensis*: This squid, which is larger in size contributed only less than 1% to the total cephalopod landings. The annual landings ranged from one to 92 t, with the average of 38 t.

C. ***Octopuses***

Four species of octopuses together contributed to about 3% of the cephalopod fishery. They were (1) *Octopus dollfusi*, (2) *Octopus lobensis* (3) *Octopus membranaceous* and (4) *Cistopus indicus*. Of these, *O. membranaceous* was the dominant species accounting for 81% of the total octopus catch. The octopus landings showed good improvement in the first half of 1992, after which the fishery declined. The catch was sold at Rs. 5/- 10/kg. The entire catch was salted in the harbour itself. Apart from the above mentioned species, stray numbers of *Loliolus investigatoris* a very small sized squid, occur in the fishery, especially during July-September. This has never been observed in fishable quantities.

Remarks

The cephalopod fishery at Cochin Fisheries Harbour, has improved remarkably during the last five years. Perceivable changes have taken place in the duration of fishing and the area of fishing. The actual fishing period has changed from overnight fishing to fishing for 2 to 3 days. During the peak season, trawl operations are done farther upto Beypore. The depth of operation also has extended from the nearshore areas upto 65 m, with the result that larger cuttlefishes are obtained. The onboard facilities for storage have also improved simulatneously. Apart from cuttlefish and squid, octopus is also landed now in view of its export demand.

EXPLOITATION OF JUVENILES OF THE SPINYCHEEK GROUPER, *EPINEPHELUS DIACANTHUS* BY MULTI-DAY TRAWLERS ALONG DAKSHINA KANNADA COAST

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INTRODUCTION

Till eighties, the trawl fishery along the Dakshina Kannada coast was confined to the inshore waters of 10-40 m depth. With the introduction of stay-over (multi-day) fishing, depths upto 75 m are being fished. This has led to the large scale exploitation of less fished juvenile resource of Spiny cheek groupers. (Zacharia *et al.*, 1991, *Mar. Fish. Infor. Serv., T & E Ser.*, No. 114: 29-31). These juveniles in the size range 9-24 cm are in sizeable quantities during October - May at Mangalore and Malpe landing centres of Dakshina Kannada coast. The present study is undertaken to highlight the magnitude of the exploitation of the juveniles of the Spinycheek grouper, *Epinephelus diacanthus* by trawlers along the Dakshina Kannada coast and its impact on the stock with a brief description on its biology. This species is known to grow to a large size and supports a fishery of some magnitude in other parts of the Indian coast. The results presented

here are based on the data collected on the landing of the species at Mangalore and Malpe during 1988/'89 - 1993-'94.

Fishery

Multi-day trawlers accounted for 97% of the *Epinephelus diacanthus* landed at both centres. These boats exploit this resource from 30-70 m depth by operating two types of nets, a shrimp net of 16-28 m headrope length and 25-28 mm mesh size and a larger fish trawl with 25-32 m headrope length and mesh size of 30-40 mm. The sea bottom off Mangalore-Malpe is generally sandy or muddy.

During 1988/'89 - 1993/'94, *Epinephelus diacanthus*, on an average, accounted for 1.21% of the multi-day trawl catch at Mangalore and 0.5% at Malpe (Table 1). The landing witnessed a sharp increase over the year at Mangalore whereas, a marginal increase was noticed at Malpe (Fig. 1). At Mangalore the catch increased from 81.4 t in 1988/'89 to 348.3 t in 1993/'94 and at Malpe from 35.6 t in 1988/'89 to 39.9 t in 1993/'94. The catch rate at Mangalore increased

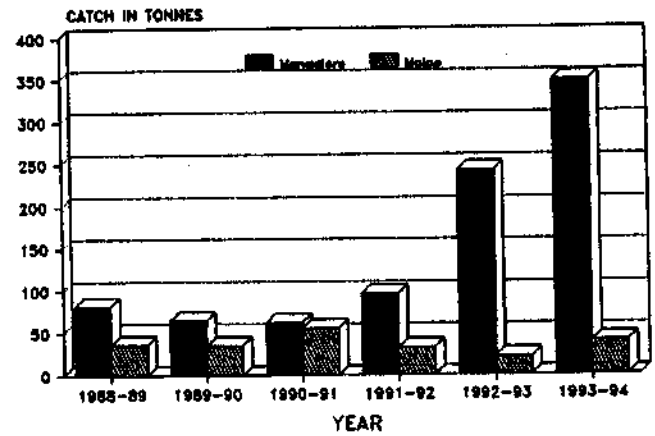

Fig. 1 Annual landings of *E.diacanthus* by multi-day trawl at Mangalore and Malpe.

sharply from 0.18 kg/hr in 1988/'89 to 0.54 kg/hr in 1993-'94 except in 1990/'91 when it showed a slight fall. At Malpe catch and the catch rate showed some fluctuations. The maximum catch of 54.7 t and the catch rate of 0.21 kg/hr were observed in 1990-'91 and the minimum catch of 35.6 t and the catch rate of 0.08 kg/hr were observed in 1988/'89.

TABLE 1. *Annual landings of* E. diacanthus *and 'all fish' catch by multi-day trawlers at Mangalore during 1988/'89 -1993/'94*

Year	Effort in trawling hours	Total trawl catch in tonnes	*Epinephelus* catch in tonnes	% in total trawl catch	Catch rate (kg/hr)
Mangalore					
1988-'89	446891	12121.9	81.4	0.70	0.18
1989-'90	233271	6609.6	64.2	0.97	0.28
1990-'91	302846	10223.1	61.7	0.60	0.20
1991-'92	438207	13571.3	96.3	0.71	0.22
1992-'93	528291	14055.3	241.7	1.72	0.46
1993-'94	644879	17076.4	348.3	2.04	0.54
Average	432398	12276.3	148.9	1.21	0.34
Malpe					
1988-'89	455621	12170.3	35.6	0.29	0.08
1989-'90	187206	8285.1	34.5	0.42	0.18
1990-'91	257895	9548.1	54.7	0.57	0.21
1991-'92	207587	5182.1	32.1	0.62	0.15
1992-'93	209635	5444.2	21.5	0.40	0.10
1993-'94	217371	5271.2	39.9	0.76	0.18
Average	255886	7650.2	36.4	0.48	0.14

The Spiny cheek grouper begins to appear in the trawl fishery by October and peak landing occurs during December (Fig. 2). The catch gradually declines by the end of May. Fishes are sold for Rs. 60-100 per 15 kg basket with the price varying with the size of the fish. Very small fishes are discarded as trash fishes and used for poultry feed.

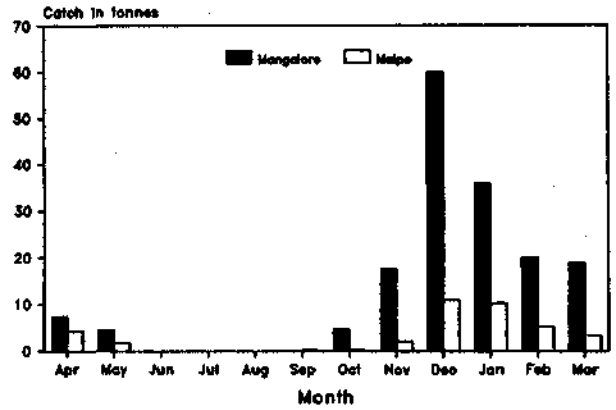

Fig. 2 Monthly landing of *E.diacanthus* by multi-day trawlers at Mangalore and Malpe.

Biology

Length composition

The length-frequency analysis carried out during 1993/'94 at Mangalore showed that the length of *E. diacanthus* ranged from 9.5 to 23.5 cm during November '93-March '94. The monthly length range, modal sizes and mean length are given in Table 2. The Modal size was at 10.5 cm in November, 13.5 cm in December, 16.5 cm in January, 19.0 cm in February and 20.0 cm in March indicating an average growth rate of 2.5 cm per month. The mean weight (g) during each month respectively were 31.9, 44.2, 63.0, 84.2 and 95.4.

TABLE 2. *Monthly length-frequency distribution (in %) and mean size of* Epinephleus diacanthus *during November '93 - March '94*

Mid.-length (cm)	Nov.	Dec.	Jan.	Feb.	Mar.
9.5	2.3				
10.5	30.2	1.6			
11.5	25.6	10.5	1.5		
12.5	20.9	21.1	3.4		1.4
13.5	9.4	28.3	4.8	4.1	3.3
14.5	9.3	26.3	6.7	4.5	2.9
15.5	2.3	9.5	20.5	3.6	5.3
16.5		2.7	28.1	11.1	8.6
17.5			22.4	15.2	10.1
18.5			10.0	23.1	12.1
19.5			2.1	23.3	21.1
20.5			0.5	11.1	22.2
21.5				3.6	10.1
22.5				0.4	2.4
23.5					0.5
Mean length	11.9	13.6	16.3	18.2	18.8

Length-weight relationship

The length-weight relationship was worked out using length (cm) and weight (g) measurements of 108 specimens ranging from 9 cm to 23.5 cm.

The observed maximum length of this species as per FAO sheets is 52 cm (Fischer and Bianchi, 1984, *FAO Identification Sheets for Fishery Purposes, Western Indian Ocean*, Vol. III). As per the length-weight relationship equation the maximum weight attainable by a specimen of 52 cm is 1807 g.

Food and feeding

A total of 65 fish was used for food and feeding analysis. Of this, only 13 fishes showed the presence of some food item in their stomachs in varying degrees of fullness. The diet item consisted of curstaceans and fishes. Among fish groups *Ambassis* sp. and *Leiognathus* spp. formed the main item and among crustaceans, crabs and small prawns dominated. From the study it is inferred that the juveniles of *E. diacanthus* is a carnivore showing no preference for any particular food item.

Remarks

Epinephelus diacanthus landing witnessed a sharp increase over the years at Mangalore. The present 'all-fish' catch in trawl at Mangalore compared to the beginning of the study period has increased by 41% only whereas the catch of spinycheek grouper has increased by 328%. The catch rate also shows a similar increasing trend. At Malpe the trawl fishery has registered a negative growth whereas the catch of *Epinephelus diacanthus* increased by 12%. The catch rates show wide fluctuations over the years. *Epinephelus diacanthus* is known to occur in muddy or sandy bottom. This species is an important component of the grouper fishery off the Kerala coast in depths 63 to 100 m (Talwar and Kacker, 1984, *Commercial Seafishes of India*. 997 pp). Along the Dakshina Kannada coast this species began to form a sizeable portion of the demersal resources after the extension of trawling operations to the distant waters.

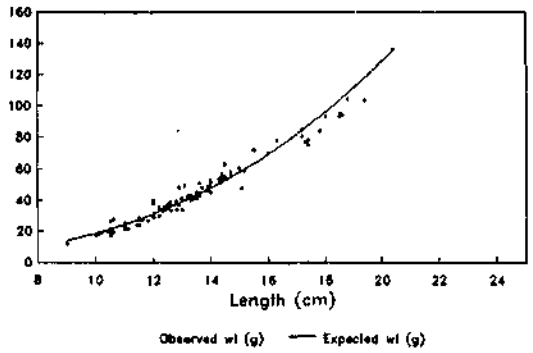

Fig. 3 Length-weight relationship of *E. diacanthus* at Mangalore.

Though this species is known to grow as large as 52 cm (Fischer and Bianchi, 1984, *op. cit.*) the maximum size of the fish landed off Mangalore-Malpe was 23.5 cm indicating that these are all juveniles. The fishery of *E. diacanthus* consisting exclusively of juveniles from 30 to 60 m depth in the area indicates that these young ones abound the midshelf waters for feeding purpose and stay in the fishing ground for eight months after which they might migrate to the deeper waters for further growth and breeding. This explains the complete absence of any adults in the landings.

According to Chakraborty (1994, *Bull. Cent. Mar. Fish. Res. Inst.*, 47: 130-133) fish upto 47.8 cm size was recorded from Bombay waters and the age of a fish of this size is 4.98 years. Further he has stated that *E. diacanthus* attains 22.9 cm when it completes one year of age. The present observation on the juvenile length data indicated a growth rate of 2.5 cm per month. Considering this, the fish would be of 3 months old when recruitment to the fishery takes place in this area in November every year. The fish of 23 cm would be of nine months old. Hence it is inferred that the fishery of this species in the area is constituted by 0-year class. From the present length-weight relationship the maximum weight attainable by a fish of length 52 cm is calculated as 1807 g. The mean weight of the fish landed was 64 g and the mean length 15.8 cm.

Fig. 4. Catch of *E.diacamthus* ready for auctioning.

The indiscriminate exploitation of juvenile fishes is not a healthy sign in terms of economical as well as conservational point of view because if the fish is allowed to grow to its normal size it would bring much higher return and at the same time the fish will also get a chance to breed. The fishes which are presently sold for Rs. 3-5 per kg if allowed to grow to the adult size would have good export potential and can fetch upto Rs. 25-30 per kg. The heavy removal of young ones of the population from fishing grounds before they can grow to a reasonable size can lead to overfishing. Trawlers, no doubt are responsible for the increased yield from our waters but in instances like this, where indiscriminate fishing of young ones takes place, it may lead to overfishing and tilt the balance of the natural population of the stocks. Hence exploitation of young ones of *Epinephelus diacanthus* by trawlers along Dakshina Kannada coast may be restricted otherwise it will lead to depletion of the stock of the fish from this coast.

The authors are thankful to Shri. C. Muthiah, Officer-in-Charge, Mangalore Research Centre of CMFRI, for correcting the manuscript.

THE USE OF SEA SAFETY MEASURES BY FISHERMEN*

The fishermen in the small-scale sector are engaged in artisanal, motorised and mechanised fishing. In India hundreds of fishermen engaged in sea fishing do encounter with some or the other form of accidents including loss of life. Records have revealed that in mechanised fisheries sector in Kerala State alone 16 persons have lost their lives during 1990-'94 and three persons were reported missing during one season. No detailed figures are available on accidents faced by traditional fishermen.

Considering the risk involved in artisanal and mechanised fishing it is important that government and developmental agencies take steps to promote the use of sea safety measures by fishermen during fishing operations. The agencies such as International Maritime Organisation, International Labour Organisation and Food and Agriculture Organisation have expressed concern over the situation and stressed the need for popularising sea safety measures. Although some regulations are existing in the case of mechanised fishing, traditional

fishery sector has remained out of the perview of these regulations. It is important that the recommended measures be economically affordable and acceptable by the majority of fishermen.

An investigation on the awareness of fishermen regarding the minimum sea safety measures and the extent of their use was carried out in Palliport and Beach Road regions in Cochin where a number of fishermen are engaged in mechanised as well as artisanal fishing. Fifty crafts each from small mechnised and traditional sector were selected for the study. A list of safety equipments suggested by FAO was prepared to check their use by fishermen. Many of the measures include only simple and less expensive equipments that can ensure the survival of fishermen in the case of accidents. These include:

1. A first aid kit
2. Emergency rations (biscuits, glucose, drinking water, packed in air tight tins or cans)
3. Tools and spare parts for engines
4. A signalling torch and batteries
5. An oil lamp
6. A Fire extinguisher (for large powerd boats)
7. One or more anchors, anchor lines and a sea anchor
8. A life line, lifebuoy or float
9. An emergency sail (for power craft)
10. A magnetic compass
11. A set of oars and paddles
12. A whistle, bell or hooter
13. A bucket for scooping water
14. A pair of signalling flags

The study showed that only a few fishermen were aware of the sea safety measures. More than 80 per cent of the small mechanised crafts used some of the suggested equipments such as spare parts, tools, lifebuoy, whistle and bucket. Food such as cooked rice, curry, pickle and drinking water were carried onboard by all the vessels. The magnetic compass was also used by 81 per cent of the mechanised vessels. Lifebuoy was used only by 30 per cent. The motorised and non-motorised crafts did not use any equipment specifically for sea safety.

Accidents generally occur due to fog and mist blocking the vision. During unfavourable weather conditions the risks faced by artisanal fishermen are high. The fishermen reported that by virtue of their long experience and intimacy with the sea they were able to make an intelligient guess on the possible mishaps. By studying the cloud pattern and waves they could forecast the possible calamity and thus take decisions regarding their safety. Most of the accidents occur so swiftly that fishermen do not get enough time to manage the crisis. During cloud bursts and torrential rains associated with winds the fishermen have to make use of their own skills to maintain the balance of their crafts. When there is an engine failure the boats anchor in the sea and await for other boats to tow and bring them ashore. There are also instances when the stranded boats escape the attention of other crafts and remain in the sea continuously for more than a day. The fishermen are generally ill-equipped for the care of the injured and the sick onboard. The fishermen engaged in mechanised crafts were found to have previous experience in artisanal fishing which helped them to escape from the mishaps. Several accidents occur while hauling the catch. Frequently injuries happen during fishing operations. Much of the actions depend upon the intuition and skill of the *amarakkaran* (leader), the most experienced among the crew who directs the craft and controls the fishing operations. Eighty one per cent of the fishermen forming the crew both in the mechanised and non-mechanised crafts selected for the study had more than 15 years of experience in sea fishing.

Many reasons were given by the fishermen for not using safety equipment. The equipment such as life jacket and lifebuoys are too expensive to be used regularly. During accidents neither do they get enough time nor will be in a position to pick up the items from their places.

The government mechanism in Kerala for ensuring sea safety consists of marine patrol boats kept ready to face an emergency and round-the-clock control room functioning during monsoon season. The Marine Enforcement and Vigilance Wing under the control of the Deputy Director (Zonal) in the maritime districts is assigned with the responsibility of enforcing law and order and sea safety measures. The equipments recommended for use in sea include life-jacket, lifebuoy, life rafts, lifebelt and fire-fighter. These items are essential requirements for obtaining registration for mechanised boat. Hiring of these equipments from private agencies and producing them at the time of registration is a usual malpractice observed among the boat owners. The members of the crew are of the opinion that each boat must be provided with minimum equipment to ensure their safety. Though most of the fishermen get information on weather forecast through the radio and newspaper the decision regarding fishing trip is made based on the weather report obtained at the time of departure.

It was seen from the study that the use of sea safety measures was not very popular among the fishermen operating mecahnised and non- mechanised crafts and they relied mostly on their own wisdom and skill in saving their lives. Some kind of negligence is also seen on the part of the boat owners who often hire labour for fishing operations. The most urgent need, besides enforcing legal regulations is to educate fishermen regarding the use of safety measures. Training and other methods of intervention may be used to tell them about measures that could be adopted for management of crisis including the use of first- aid. They should be made aware of the need to invest their efforts in taking precautions to reduce the danger they face in their vocation.

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OCCURRENCE OF SPOTTED SARDINELLA ALONG NORTH ANDHRA PRADESH COAST*

Gill nets operated off Lawsons Bay, Visakhapatnam landed an estimated 530 kg of spotted sardinella *Amblygaster sirm* (Walbaum) during November - December 1992. This species was not observed earlier in the sardine catches from this area. Subsequent to this observation the species was reported in the trawl catches of Kakinada during December. While the catches were very poor during January and February, March recorded an estimated 581 kg and 2331 kg of *A. sirm* in shrimp trawl and gill nets respectively, at Visakhaptnam. By April this species disappeared from the fishery. The meristic and morphometric details are given in Table 1.

TABLE 1. *Meristic and morphometric characters of* Amblygaster sirm *(34 specimens) collected at Visakhapatnam*

Characters	Minimum	Maximum	Average (Mode)
MERISTIC			
Dorsal fin rays	16	18	17
Anal fin rays	15+2	18+2	16+2
Pelvic fin rays	17	17	17
Pectoral fin rays	16	18	17
Caudal fin rays	23	26	24
Lower gill rakers	38	42	39
MORPHOMETRIC			
Total length (mm) (TL)	174	223	200.53
Weight (g)	45	112.3	95
Porportion in TL:			
Standard length	1.09	1.23	1.18
Head length (HL)	4.65	5.40	5.01
Depth	4.83	5.66	5.34
Porportion in HL:			
Snout	2.5	3.27	2.82
Eye diameter	3.28	4.15	3.76
Inter-orbital length	2.86	4.63	3.77

Most of the specimens examined were spent and a few were partially spent. The stomachs of all the partially spent as well as some of the fully spent fishes were empty, indicating a non-feeding phase associated with spawning. A few fully spent specimens had full stomachs. Apart from phytoplankton, copepods, amphipods, megalopa larva, alima larva and other crustacean and molluscan juveniles, fish larvae, juvenile stomatopods, mysids and leptocephalii formed the food.

A flabelliferan isopod parasite (Fig. 1) identified as *Lironeca vulgaris* (Stimpson) was found attached to the middle of the gill arch of nearly fifty per cent of the specimens examined. Except for a specimen with two isopods, one on each gill, all others had a single isopod attached to the gill at one side only (Fig. 2). The infected specimens had a lesion at the point of attachment of the parasite and a cavity accommodating the parasite at the upper hind portion of the gill chamber. While the operculum did not show any visible bulge, the gill arch of the opposite side showed a remarkable bend outwards.

A close watch was kept on the sardine catches of different gears of this region upto December 1994. *A. sirm* did not reappear in any of the gears after March 1993. *A. sirm* was

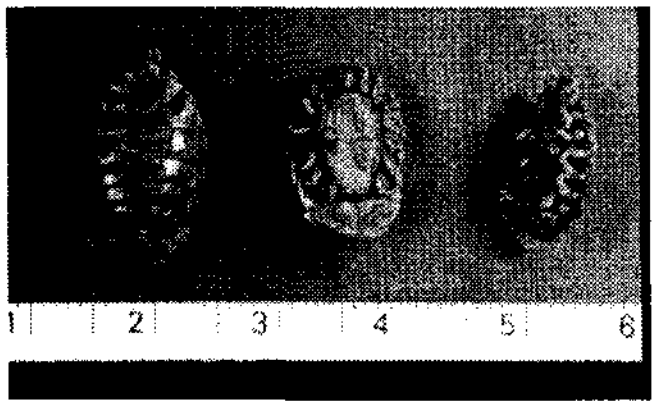

Fig. 1. Dorsal, ventral and dorsolateral views of isopod parasite *Lironeca vulgaris* (Stimpson) collected from the gills of *A. sirm*.

reported to form a fishery of smaller magnitude at Madras, Pondicherry and Tuticorin along southeast coast and Vizhinjam along southwest coast (Bennet, P.S. *et al.*, *CMFRI Spl. Publ.* No. 28, 1986). It could be presumed that *A. sirm* was brought along north Andhra coast by the influence of the currents in the Bay of Bengal as reported for *Scomberomorus* spp. by K. Srinivasa Rao, (In: R.C. Sarma (Ed), *The Oceans - Realities and Prospects*, Rajendra Publication New Delhi, 1985); *A. solandri* by K. Vijayakumar, and S. Chandrasekhar (*Mar. Fish. Infor. Serv., T & E Ser.*, No. 115, 1992) and *Sardinella* spp. by G. Luther, (*ibid.*, No. 133, 1994). This aspect, however, requires further investigations.

The authors express their gratitude to Prof. R. Madhavi and Dr. Jalaja Kumari, Dept. of Zoology, Andhra University for helping to identify the isopod parasite.

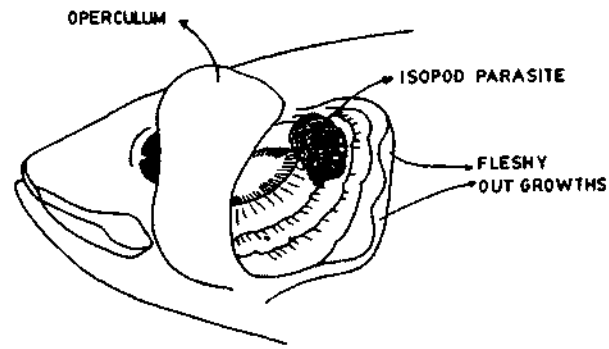

Fig. 2. Diagram showing the point of attachment of isopod parasite in *A. sirm*.

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ON THE SEI WHALE *BALAENOPTERA BOREALIS* LESSON STRANDED ALONG PALK BAY COAST NEAR PAMBAN LIGHT HOUSE*

Instances of whales stranded in shallow waters and subsequently washed ashore along the coasts of India are not uncommon. Further, the frequency of such strandings on the east coast is more than on the west coast. This is the eighth record of strading of Sei whale from the east coast (Table 2).

A Sei whale got entangled in a gill net operated near Katchathievu on 27-1-'90 at a depth of 8.5 m at about 1900 hrs. Four boats joined together and brought the whale ashore near Pamban Light House on the 28th morning in live condition. Attempts were made to push the whale back into the sea but did not succeed. The medium sized female whale measured 11.4 m in total length and weighed about 7000 kg. The specimen was identified as *Balaenoptera borealis* Lesson (Fig. 1) and it had 47 throat grooves. The morphometric measurements are given in Table 1.

Though the whales used to get stranded in all the months of the year, most of the strandings take place during December - January when the sea is very rough during the northeast monsoon.

Table 1. *Details of morphometric measurements of* Balaenoptera borealis *Lesson brought to the light house near Pamban in Palk Bay on 29th January 1990*

Morphometric characters	Measurements (cm)
Tip of upper jaw to deepest part of fluke notch	1140
Tip of upper jaw to centre of anus	975
Tip of upper jaw to centre of genital slit	870
Tip of upper jaw to end of ventral grooves	680
Tip of upper jaw to centre of umbilicus	790
Tip of upper jaw top of dorsal fin	670

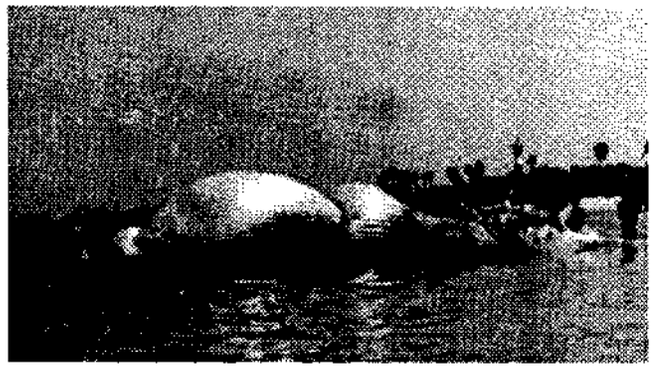

Fig. 1. *Balaenoptera borealis* brought to the light house near Pamban, Palk Bay on Jan. 28th 1990.

Tip of upper jaw to anterior insertion of flipper	340
Outer curvature of flipper	125
Inner curvature of flipper	100
Flipper width	45
Height of body at dorsal fin	190
Height of body at region of anus	115
Body circumference in region from flipper to flipper (ventral region)	1020
Circumference at caudal fluke	160
Number of throat grooves	47
Sex	Female
Weight	7000 kg

TABLE 2. *Stranding of Sei whale* Balaenoptera borealis Lesson *along the east coast of India*

S.No.	Date of Stranding	Place	Dead/alive	Total length (m)	Sex	Reference
1.	23-12-1971 (stranded)	Manakad near Mandapam	Dead	15.53	-	G. Venkataraman *et al.* (1973) *Indian J. Fish.*, **20** (2): 634-638.
2.	31-01-1981 (stranded)	Mallipatnam	Dead	9.90	-	P.S.B.R. James & R. Soundarajan (1980) *J. mar. biol. Ass. India*, **22** (1&2): 175.
3.	18-03-1983 (stranded)	Dhanushkodi	Dead	13.80	-	P.S.B.R. James & Lal Mohan 1987. *Mar. Fish. Infor. Serv., T & E Ser.*, No. 71: 1-16.
4.	26-02-1988 (washed ashore)	Tuticorin	Dead	12.00	Male	K. Venkataramanujam *et al.* 1988. Investigation on Cetaceae. XXI 247-249.
5.	18-05-1988 (stranded)	Kayalpatnam	Dead	10.02	Female	H. Mohamed Kasim & T.S. Balasubramanian (1989). *Mar. Fish. Infor. Serv., T & E Ser., No. 95:* 12-14.
6.	May, 1988 (brought to shore)	Tutcorin	—	7.50	-	CMFRI News Letter, 1988, No. 40:5.
7.	27-01-1990 (brought to shore)	Pamban	—	11.4	Female	Present report
8.	21-01-1992 (washed ashore)	Theedai	—	14.00	Female	P. Nammalwar *et al.* (in press)

***Reported by S. Krishna Pillai, A.A. Jayaprakash, C. Kasinathan and N. Ramamoorthy, Regional Centre of CMFRI, Mandapam Camp - 623 520.**

HEAVY LANDINGS OF MACKEREL BY TRAWLERS AT MANGALORE BUNDER*

The Indian mackerel, *Rastrelliger kanagurta* generally comprises less than 2% of the total annual trawl catch. But unusually heavy landings of mackerel, upto one tonne per unit formed nearly 30% of the total trawl catch during May 1995 (18th - 27th).

The trawlers operating along the Mangalore coast usually stay out at sea for 3 - 5 days and fish mainly for prawns and cuttlefishes. Mackerel are landed in small quantities with a catch rate of 10-25 kg per unit. This year, the unusually heavy landings during the reported period increased the average catch per boat to 252 kg. The catch, effort and the catch per unit effort for mackerel at Mangalore Bunder during the observation period are given in Table 1. Such a steep increase of mackerel in the trawler catch along this coast is recorded for the first time.

TABLE 1. *Effort (trawl units), catch and catch per unit effort of mackerel (kg) at Mangalore Bunder during 18th - 27th May 1995*

Date	Effort (Units)	Total catch	Mackerel catch	C.P.U.E
18.5.95	92	1,06,746	12,512	136
20.5.95	80	1,02,560	18,000	225
23.5.95	65	85,267	29,575	455
24.5.95	70	80,850	22,050	315
27.5.95	80	86,360	15,440	193
Total	387	4,61,783	97,577	252

The catch comprised of only large sized fishes with their total length ranging from 180 to 255 mm. Modes were seen at 200, 220 and 230 mm (Fig.1). The fishes mainly belonged to the 1+ yr group with a dominance of females (52%) over the males. All the fishes landed were either in the ripe (15%) or partially spent (85%) stage which inidcates their peak spawning period.

However, there was no corresponding increase of mackerel in the purse seines and the gill nets. The heavy catches were observed only at Mangalore Bunder.

The unusually heavy landings led to the crash in the price of mackerel at Mangalore as sufficient ice was not available

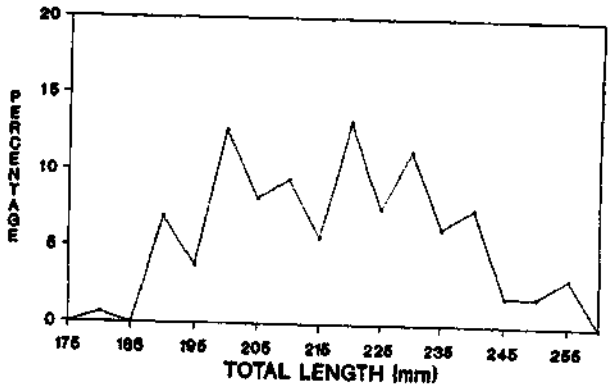

Fig. 1. Length frequency distribution of mackerel landed by trawlers at Mangalore Bunder

to preserve the catch. The price of fish which was Rs. 5/- per piece earlier declined to less than a rupee per piece on the first two days. Part of the catch was taken for drying. However, later, ice was made available and the price stabilised. It is reported that the catch was frozen in the fish hold itself to be unloaded and sold later when the catch was meagre consequent to the ban on the operation of mechanised units during June - August. The unexpected high mackerel landing along the Mangalore coast during the close of the fishing season has thus benefitted the trawl operators immensely.

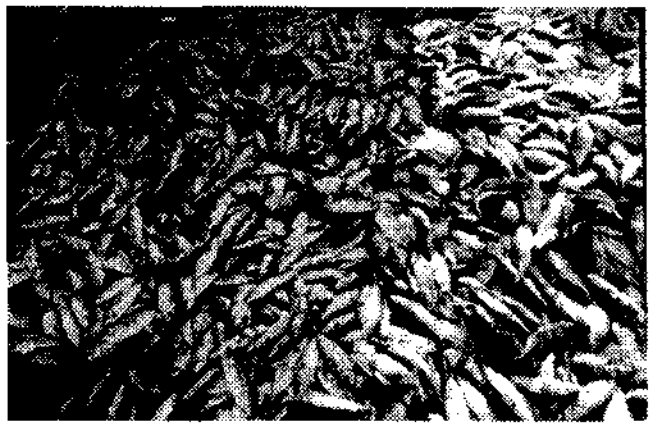

Fig. 2. View of mackerel catch brought by the trawlers at Mangalore Bunder.

***Prepared by: Prathibha Rohit and S. Kemparaju, Mangalore Research Centre of CMFRI., Bolar, Mangalore - 575 001.**

AN APPRAISAL OF A SEMI-INTENSIVE PRAWN FARM AT KANJIRAMKUDI, RAMANATHAPURAM DISTRICT*

Arun Aqua Farm is a semi-intensive prawn farm of medium scale operation with a production target of around 4 - 5 tonnes/crop. The farming operations started in 1992. The farm had a total of 11 ponds each with an area of 0.5 ha for culture purposes. The total developed area was 6.5 ha and another 5 ha were being developed.

The farm is located near the mouth of a creek and has good water exchange facilities. The ponds are in two parallel rows with the supply canal running in between them. The outlet canals run along the periphery of the ponds on either side and empty to the creek. Water exchange was adjusted according to tide level, i.e., the ponds were drained during low tide and water pumped in during high tide.

The dimension of the rectangular ponds are 125 X 40 m and depth of water column is between 1.2 to 1.5 m. Approximately 10-15% of water was exchanged during initial stages of operation and a maximum exchange of about 50% towards the end of the cropping period. Each pond is provided with 4 - 6 paddle wheel aerators of 1 HP rating, with provision to increase it to 8 per pond in case of necessity. Paddle wheels were operated throughout the night and also during afternoon (2-4 PM) for mixing of water to reduce water temperature.

Initially *Penaeus monodon* at a rate of 30/m^2 (3.00 lakh/ha) were stocked but the survival rate was very poor (60%). Later the stocking rate was reduced to 1.4 - 1.5 lakh/ha. The farm produced 4-5 tonnes/ha/crop, with the maximum production of 6 tonnes/ha/crop. Except for an occasional problem of tail rot, the animals were healthy. The salinity of pond water tended to increase in summer months to above 35 ppt and became almost fresh during north-east monsoon period.

A Taiwanese feed is being imported directly by the farmer. The feed gave an FCR of 1.4 - 1.5 in semi-intensive culture and around 1 in extensive culture (60,000/ha stocking). Feed was given 4 times daily in the inititial stages and upto 6 times in the final stages. Feed consumption and health of prawns were monitored regularly by observing the check nets, 4 in each pond. One of the ponds when harvested, gave a yield of 2.25 tonnes; 1.75 tonnes of *P. monodon* and 0.5 tonnes of *P. indicus*.

On visual examination, the prawns appeared to be healthy with normal behaviour. However, beginning of tail rot was seen in a few prawns. The salinity (37-38 ppt) and water temperature (30.6°C at 0900 hrs) appeared to be on the higher side. All the other water quality parameters were within acceptable limits for prawn farming.

Histopathological examination did not indicate any disease situation in the samples collected. Bacterial studies revealed that the total bacterial count was low (1.2 X 10^3 /ml) for the water samples. The bacterial colonies isolated were of circular, spreading and convex type. Both gram negative and gram positive bacteria were observed. The isolates were found to be non-pathogenic.

The plankton was typically marine and no bloom was recorded. In the *P. monodon* pond, *Zoothamnium* sp. was recorded, which could cause problems if the water quality deteriorates.

Based on background information and analyses of data collected, the farm appears to be a well maintained and well managed one. However, a serious disease problem was reported in a farm about 3 km away, where the same creek water was used. Arun Aqua Farm stopped pumping water for a few days to prevent introduction of the pathogens. They were also advised to reduce feeding and operate paddle wheel aerators more frequently.

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* **Prepared by A.P. Lipton, Mandapam Regional Centre of CMFRI, Mandapam Camp - 623 520.**

केरल के कोचीन में सेफालोपोड मात्स्यिकी

वी. कृपा, के. प्रभाकरन नायर और मात्यु जोसेफ

सी एम एफ आर आइ, कोचीन 682 014

सेफालोपोड मात्स्यिकी में कटल फिशस, स्क्विडस और ओक्टोपस शामिल है । भारत में इस संपदा की वाणिज्यिक विदोहन 25 सालों से होता रहता है । 1960-69 की अवधि में इसका उतना महत्व नहीं था। लेकिन 1970-79 और 1980-89 के दौरान निर्यात के क्षेत्र में इसकी प्रमुखता बढी । मछुआरे इसकी पकड में खूब रुचि प्रकट करने लगे जिसकी झलक केरल के वार्षिक सेफालोपोड अवतरण में प्रकट होने लगी । 1961 के 100 टन से यह 1971 में 500 टन, 1981 में 9,500 टन, 1991 में 19,500 टन और 1992 में 30,600 टन तक बढ गया । उपर्युक्त अवधि के दौरान केवल कुछ सालों को छोडकर बाकी सभी सालों में सेफालोपोड अवतरण में भारत के समुद्रवर्ती राज्यों में केरल का स्थान प्रथम था । 1993 में पकड में कुछ कमी देखी गयी ।

कोचीन मात्स्यिकी बन्दरगाह केरल का एक प्रमुख मत्स्य अवतरण केन्द्र है । केरल की वार्षिक सेफालोपोड पकड में कोचीन मात्स्यिकी बन्दरगाह का योगदान 11-23% था । कोचिन में 60 मी गहराई तक प्रचालित चिंगट आनायकों में एक उप पकड के रूप में इनका अवतरण हुआ । कोचीन से रोज़ 8-13 मी लंबाई के 200 आनायकों के प्रचालन होते है । मुख्य मत्स्यन तल आलप्पी, कोचीन, बेपूर, चावक्काड और चेटुवा में है ।

सेफालोपोडों का वार्षिक उत्पादन

कोचीन मात्स्यिकी बन्दरगाह में 1989 से 1993 तक की पाँच वर्षों की अवधि में औसत 5000 टन के साथ सेफालोपोडों का वार्षिक अवतरण ने 2,597 टन से 7,230 टन तक विभिन्नता दिखायी । उपर्युक्त पाँच वर्षों के दौरान अवतरण में 76% बढती हुई । कुल ट्राल पकड में भी नियमित वृद्धि हुई लेकिन प्रयास (ट्राल एककों की संख्या) 1991 तक अधिक था, पर अनुवर्ती सालों में यह कम हो गया । वार्षिक पकड प्रति एकक प्रयास 35 कि ग्रा से अधिकतम 75 कि ग्रा तक विभिन्नता दिखायी, पूरी अवधि केलिए औसत 58 कि ग्रा थी । कुल मछली अवतरण में सेफालोपोडों का योगदान 9% से 17% के बीच, औसत योगदान 14% के साथ देखा गया ।

पकड और प्रयास में माहिक विविधता

एक ही साल के विभिन्न महीनों में और विभिन्न सालों के एक ही महीने में सेफालोपोडों के अवतरण में विभिन्नता बहुत अधिक थी । सिंतबर में अवतरण उच्च था । इसके अनुगमन करते हुए मई, अक्तुबर, मार्च और अप्रैल आते है । जुलाई में पकड बहुत कम थी। कुल मिलाकर कहे जाए तो सेफलोपोडों का श्रृंगकाल सिंतबर-अक्तूबर है। मार्च - जून अवधि को भी अच्छा श्रृंगकाल माना जा सकता है ।

ट्राल एककों के प्रचालन में भी अत्यधिक विभिन्नता थी । जनवरी में प्रचालित ट्राल एककों की संख्या 5000-10,000 के बीच में थी, मई महीने में यह 8,600 और 14,800 के बीच बढ गया । जुलाई और अगस्त में प्रयास कम हो गया । इसके कारण ये हो सकते है कि मानसून के दौरान मत्स्यन उतना आसान नहीं और इस अवधि में ट्राल प्रचालन पर रोक भी लगाता है ।

कटलफिश, स्क्विड और ओक्टोपस

सेफालोपोड पकड के मुख्य मिश्रित हैं कटलफिश और स्क्विड्स । इसमें ओक्टोपस की मात्रा बहुत कम है । वार्षिक कटलफिश पकड 1,075 टन से 3,782 टन तक विभिन्न थी । स्क्विड पकड 1989 में केवल 663 टन थी । लेकिन नियमित रूप से बढती पाकर 1993 में 3,769 टन तक बढ़ गया। ओक्टोपस 1989 और 1990 की पकड मे नहीं थी। ओक्टोपस की वार्षिक औसत पकड केवल 139 टन जो कुल सेफालोपोड पकड का केवल 3% था ।

जाति मिश्रण

कटलफिश की पाँच जातियाँ, स्क्विडस की तीन जातियाँ और ओक्टोपस की चार जातियाँ मात्स्यिकी में शामिल थीं ।

क. कटलफिश

1) *सीपिया फरोनिस* : यह फारो कटलफिश नाम से जाना जाता है । यह अधिकतम 430 मि मी तक लंबाई प्राप्त करती है । यह अन्य कटलफिशों से बडा है । वाणिज्यिक दृष्टि में भी यह काफी महत्वपूर्ण है ।

कोचीन मात्स्यिकी बंदरगाह में इसकी वार्षिक पकड 778 टन और 3,231 टन के बीच थी । यह कुल सेफालोपोड अवतरण का 45% था । जून से अक्तूबर तक की अवधि में जूलाई को छोडकर, पकड अच्छी थी। श्रृंगकाल सिंतबर देखा गया। सितंबर 1989 में 5,332 ट्राल एककों द्वारा प्रति एकक प्रयास 345 कि ग्राम की दर में 1,839 टन पकड प्राप्त हुई। 70 मि मी से 320 मि मी तक लंबाई वाली मछलियाँ पकड में उपस्थित थी, 270 मि मी लंबाई और 2-2$^{1}/_{2}$ कि ग्रा भार वाली मछलियाँ मात्स्यिकी में साधारण थी । इस अवधि में *एस. फरोनिस* का मूल्य प्रति कि. ग्रा 35/- से 145/- रु. तक देखा गया ।

(2) *सीपिया अक्युलेटा* :- कुल सेफालोपोड पकड के 6% सीपिया अक्युलेटा है । प्राक्कलित वार्षिक औसत पकड 312 टन है । यह कोचीन में अवतरित कट्टिल फिशें में दूसरे स्थान में आता है । ट्राल की पकड में साल भर यह प्राप्त होती है । मई - जून और अगस्त - सितंबर इसका श्रृंगकाल है । इस अवधि में 24 से 198 मि मी तक लंबाई के सेफालोपोडों को प्राप्त हुआ ।

(3) *सीपिया एल्लिप्टिका* :- यह सबसे छोटी आकारवाली है । 1989-93 के दौरान कुल सेफालोपोड पकड में इसका योगदान केवल 1% था । इसकी मात्स्यिकी अनियमित थी ।

(4) *सीपिया प्राशादी* : यह एक छोटी जाति है ; पश्चिम तट में यह बहुत विरल है। इसका अवतरण केवल सितंबर 1993 में हुआ था ।

(5) *सीपियेल्ला इनेरमिस* :- *सीपिया अक्युलेटा* के बाद मात्रा में दूसरे स्थान में आनेवाली है यह कट्टिलफिश । साल भर इसका अवतरण होता है । मार्च - मई और अगस्त - नवंबर श्रृंगकाल है । सितंबर 1991 में उच्चतम पकड 83 टन थी ।

ख. स्क्विड्स

(1) *लोलिगो डुओसेली* : इन्डियन स्क्विड नाम से जाननेवाली ये स्क्विड भारतीय तट में साधारण है । इसके वार्षिक अवतरण में लगातार वृद्धि देखी गयी । सितंबर 1991 और अक्तूबर 1992 की अधिकतम माहिक पकड 680 टन थी । इसके दो श्रृंगकाल है । मार्च - मई और सितंबर - अक्तूबर । साधारणतया जुलाई और अगस्त में पकड बिलकुल कम होती है । मात्स्यिकी में 40 मि मी से 220 मि मी लंबाई वाली मादा जाति और 60 मि मी से 320 मि मी लंबाई का नर जाति उपस्थित थे । आयाम के अनुसार स्क्विडों को तीन बर्गों में बाँट सकते है । इसके अनुसार मूल्य भी तय किया जाता है । इस प्रकार 200 मि मी, लंबाइ के

स्क्विडों को प्रति कि. ग्रा 65/- से 120/- रु तक मिलते हैं जब कि 150 और 200 मि मी के बीच के स्क्विडों को प्रति कि. ग्रा 30-80 रु मिलते है और 150 मि मी से कम आयाम के स्क्विडों को 10/- और 35/- रु के बीच दाम मिलता है । बडे आयाम के स्क्विडों को एक साथ निर्यातक लोग खरीदते है ।

(2) *डोरीथिस सिबोगे* : सिबोगे स्क्विड या आरो स्क्विड नाम से पुकारे जानेवाली इस जाति की माँग निर्यात बाज़ार में इसके छोटे आयाम और दुर्बल शरीर के कारण बहुत कम है । जनवरी से मार्च तक की मानसून पूर्व अवधि में इसकी मात्स्यिकी प्रत्यक्ष होती है और श्रृंगकाल फरवरी से मार्च के दौरान है । 1992 और 1993 में वार्षिक पकड क्रमश: 476 टन और 639 टन थी । मात्स्यिकी में 70-250 मि मी आयाम के स्क्विड्स उपस्थित थे ।

(3) *डोरीथिस सिगालेनसिस* : यह स्क्विड जो बडे आयाम के है इसका योगदान कुल सेफालोपोड अवतरण का केवल 1% था ।

ग. ओक्टोपस

इसकी 4 जातियाँ माने (1) *ओक्टोपस डोलपुसी* , (2) *ओक्टोपेस लोबेनसिस* (3) *ओक्टोपस मेम्ब्रानसियस* और (4)*सिस्टोपस इन्डिकस* का योगदान कुल सेफालोपोड मात्स्यिकी के केवल 3% थे । इन में प्रमुख जाति *ओ. मेम्ब्रानसियम* थी । 1992 के प्रारंभ में ओक्टोपस अवतरण अच्छा देखा गया । लेकिन इसके बाद मात्स्यिकी की घटती देखी गयी और पकड को प्रति कि ग्रा 5-10/-रु पर बेच दिया गया।

अभ्युक्तियाँ : पिछले पाँच सालों में कोचीन मात्स्यिकी बंदरगाह की सेफालोपोड मात्स्यिकी की अच्छी प्रगति हुई है । मत्स्यन करने की अवधि सिर्फ रात्रि मत्स्यन से बढकर दो या तीन दिन हो गयी । श्रृंगकाल में ट्राल प्रचालन बेपूर तक बढा दिया । प्रचालन की गहराई भी 65 मी तक विस्तृत किया गया, जिसके फलस्वरूप लंबे कट्टिलफिश प्राप्त होने लगे । इसके साथ ही भंडार सुविधाओं का भी सुधार की गयी । कट्टिलफिश और स्क्विडों के अतिरिक्त, निर्यात माँग के कारण ओक्टोपस का भी अवतरण किया जाता है ।

स्पाईनीचीक ग्रूपर (इपिनेफेलस डायाकान्थस) का अति विदोहन

पी. यु. ज़करिया, अल्लि. सी. गुप्ता और एच. एस. महादेवस्वामि,
सी एम एफ आर आइ का माँगलूर अनुसंधान केंद्र

भूमिका

दक्षिण कन्नड तट में ट्राल मत्स्यन 10-40 मी. गहराई तक किया करता था । प्राप्त मछली तरुण होती थी और उनके आकार 9-24 से मी के बीच में थे । पर भारत के अन्य समुद्र तटों से मिलनेवाली यह मछली बडे आकार की थी जिस से यह व्यक्त होता है कि माँगलूर से तरुण मछलियों का विदोहन होता है ।

ट्रालरों के ज़रिये माँगलूर और माल्प में 30 से 70 मी गहराई से *ई. डयाकान्थस* का विदोहन किया जाता है । 1988 से लेकर 94 तक के वर्षों में माँगलूर और माल्प में इस मछली

की पकड दिखाई पडी है । माँगलूर में 1988-89 में मिली पकड 81.4 टन थी और 1993-94 में यह 348.3 टन हो गई । इस अवधि में माल्प में हुई वृद्धि 35.6 से 39.9 टन थी । यहाँ से अच्छी पकड का समय अक्तूबर से दिसंबर तक के महीने है ।

जीवशास्त्र : इस मछली की औसत बढती दर एक महीने में 25 से मी देखी गई । 20 से मी तक बढी मछली का भार 95.4 ग्राम था । मिली गई सब से बडी जाति 52 से मी की थी । लंबाई - भार समीकरण के अनुसार 57 से मी लंबाई की मछली का आकलित भार 1807 ग्राम है ।

इसके खाद्यस्वभाव पर चलाये अध्ययन ने व्यक्त किया कि यह मछली मांसाहारी है जो मूलत: क्रस्टेशिया और अन्य छोटी मछलियों को खाती है ।

पिछले कुछ वर्षें से माँगलूर मे *इपिनोफीलस डायकान्थस* की पकड में 328 % वृद्धि हुई है । माल्प में वृद्धि 12% थी । उपलब्ध रिपोर्टों के अनुसार यह मछली 52 से मी तक बढ जाती है पर माँगलूर में मिली सब से बडी मछली 23.5 से मी की थी । माँगलूर में 30-60 से मी गहराई से मिली ये मछली तरुण थी जो आहार की खोज में इस तल में प्रवेश की गई होगी । अनुमान के अनुसार यहाँ 8 महीने तक जीकर प्रजनन अवस्था में पहुँचने पर गहरे समुद्र में वापस जाती होगी, उपलब्ध मछलियों में वयस्क मछलियों के अभाव का कारण यह अनुमानित किया जाता है ।

ऐसे परिप्रेक्ष्य में परिरक्षा की दृष्टि से इसके तरुणों का जो विदोहन होता है उस पर रोक लगाना चाहिये क्योंकि परिपक्व होने पर इसके भार में वृद्धि होगी और प्रजनन से इसकी जीव संख्या बढ जायेगी । इसलिए दक्षिण कन्नड तट में ट्रालरों के ज़रिये होनेवाली मछली के विदोहन पर रोक लगाना चाहिये ।

समुद्री मत्स्यन में लगे हुये मछुओं केलिए सुरक्षा उपाय *

भारत में समुद्री मत्स्यन में लगे हुये सैकडों किसानों को कई दुर्धटनाओं का सामना करना पडता है । केरल में यंत्रीकृत मत्स्यन में लगे हुये 16 मछुओं की मृत्यु 1990 से लेकर 1994 तक के चार वषो में हुई है । परंपरागत मत्स्यन में लगे जानेवालों के सम्बध में इस पर सूचना उपलब्ध नहीं है ।

मछुए जो यंत्रीकृत और परंपरागत मत्स्यन में लगे हुये हैं उनकी जीवन सुरक्षा उपायों पर सोचना चाहिये । सरकार और अभिकरणों जैसे इन्टरनाशनल मारिटाइम संगठन, इन्टरनाशनल लेबर संगठन और फुड अन्ड अग्रिकल्चर संगठन इस पर विचार कर रहे है । सुरक्षा विनियम जो बनाये गए है यंत्रीकृत मत्स्यन सेक्टर के अनुरूप में है ; परंपरागत सेक्टर पर विचार भी नहीं किया गया है । दूसरी बात यह है कि सुरक्षा उपाय कम खर्चवाले और स्वीकार्य होने चाहिये ।

केरल के पल्लिपोर्ट में मछुओं के बीच इस पर एक सेर्वेक्षण चलाया था । एफ ए ओ द्वारा निर्धारित सुरक्षा उपकरण के उपयोग पर चलाये सर्वेक्षण ने व्यक्त किया कि उनके ज़रिए कम कीमत के और नाम के वास्ते के उपकरणों का उपयोग होता है । इसके अलावा सुरक्षा उपकरणों के बारे में कई मछुओं को अवबोध नहीं है । 80% यंत्रीकृत यानों में यंत्र के लिए

आवश्यक स्पेयर पार्ट्स, टूल्स, लाइफ बॉय, विसिल व बाल्टियाँ थे । अवश्यक खाने के सामान सभी यानों में थे मागनेटिक कोम्पास का उपयोग 81% ने किया था । सिर्फ 30% ने लाइफ बॉय का उपयोग किया था । दोनों यंत्रीकृत और अयंत्रीकृत यानों में समुद्र सुरक्षा के लिए आवश्यक उपस्कर नहीं थे ।

सामान्यत: दुर्धटनायें कोहरा या बादल के कारण होती है । ऐसे समय कारीगरी मछुओं को ज़्यादा मुसीबत होता है । वे अपने अनुभव के बल पर उस समय सुरक्षा के कदम उठाते है । यंत्रीकृत मत्स्यन में लगे जानेवाले ज़्यादातर मछुओं को कारीगरी मत्स्यन में पूर्ववर्ती अनुभव होंगे । फिर भी मत्स्यन परिचालन के दौरान दुर्घटनायें होती रहती है । अध्ययन के लिए चुने गये मछुओं में से 81% को इस क्षेत्र में 15 या इस से ज़्यादा वर्षें का अनुभव था ।

मछुओं के अनुसार सुरक्षा उपस्करों के उपयोग नहीं किये जाने के कई कारण है। उपस्कर जैसे लाइफ जाकेट और लाइफ बॉय बहुत कीमती है । दुर्घटनाओं के समय इन उपकरणों को लेने का या इस्तेमाल करने का मनोसान्निध्य नहीं होगा ।

केरल में मत्स्यन में लगे जानेवालों के सुरक्षा उपायों के रूप में समुद्री पट्रोल बोटें और मान्सून के दौरान पूरे दिवस में कन्ट्रॉल रूम की सुविधा उपलब्ध है । समुद्रवर्ती जिलाओं में शांति और समुद्री सुरक्षा उपाय सुस्थापित करने के लिए मैरैन एनफोर्समन्ट और विजिलन्स विभाग कार्यरत है । इस विभाग के नियमों के अनुसार एक यंत्रीकृत मत्स्यन बोट को पंजीकरण मिलने के लिए लाइफ जाकट, लाइफ बॉय, लाइफ राफ्ट, लाइफ बेलट और फायर फाइटर चाहिये ।

अहध्यन ने व्यक्त किया कि यंत्रीकृत और कारीगरी मत्स्यन में लगे हुये मछुए इन उपकरणों का उपयोग बहुत कम करते है । बोटों के मालिक इसकी उपेक्षा भी करते है । श्रमिकों को इसके उपयोग करने की रीति पर कुछ प्रशिक्षण देना और इसके उपयोग पर अवबोध जगाना भी आवश्यक है ।

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* कृष्णा श्रीनाथ और पी राजीव, सी एम एफ आर आई, कोचीन द्वारा तैयार की गयी रिपोर्ट

उत्तर आन्ध्रप्रदेश तट में चित्तियाँवाली तारली की उपस्थिति *

विशाखपट्टनम में लॉसन्स खाडी में नवंबर – दिसंबर 1992 में प्रचालित गिल जालों से लगभग 530 कि. ग्रा. चित्तियाँवाली तारली *अब्लिगास्टर सिरम* (वालबॉम) प्राप्त हुई । तारलियों की पकड में इस जाति की उपस्थिति पहली है । इसके बाद दिसंबर में काकिनाडा के ट्रालर पकडों में इस नमूने की उपस्थिति थी । विशाखपट्टनम में जनवरी और फरवरी के दौरान पकड बहुत कम थी तो मार्च महीने में चिंगट अनायक और गिल जालों में इसकी पकड क्रमश: 581 और 2331 कि ग्रा थी । अप्रैल तक आते आते यह नहीं के बराबर रह गई ।

अधिकांश जातियाँ अंडरिक्त और कुछ भागिक रूप में

अंडरिक्त अवस्था में थी । इनके पेट खाली थे । पादपप्लवकों के अतिरिक्त कोपिपोड, आंम्फिपोड्स, मेगालोपा डिम्भक, क्रस्टेशियाई और मलस्क किशोरियाँ, माइसिड्स आदि इनके आहार थे ।

निरीक्षण किये गये 50% जातियों के क्लोम में परभोजी आइसोपोड *लिरोनका वलगारिस* को देखा गया । अनुमानित किया जाता है कि बंगाल की खाडियों में होनेवाले उत्प्रवाह से आन्ध्रा तट में नवंबर - दिसंबर के समय इसकी पकड होती है ।

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* सी एम एफ आर आइ के विशाखपट्टनम अनुसंधान केन्द्र के के. विजयकुमारन, के. दिवाकर और पी. अच्चय्या द्वारा तैयार की गयी रिपोर्ट

पाम्बान लाइट हाउस के पास पाक तट पर धँस गयी समुद्री तिमि *बालिनोप्टीरा बोरियालिस* *

भारतीय तटों में तिमियों का धँसना असाधारण बात नहीं है और प्राय: पश्चिम तट में यह ज्यादा भी है ।

कच्चातिवु के पास 27-1-90 को 8.5 मी गहराई में प्रचालित एक गिल जाल में एक समुद्री तिमि प्राप्त हुई । चार पोतों की सहायता से अगले दिन सबेरे इसे पाम्बान लाइट हाउस के पास जीवित अवस्था में लाया गया । इसे वापस समुद्र में डालने की कोशिश सफल नहीं हुई । मादा जाति की यह तिमि 11.4 मी लंबी थी और इसका भार 7000 कि. ग्रा था। यह नमूना *बालिनोप्टीरा बोरियालिस* लेस्सन थी ।

तिमियों का धँसन वर्ष में सभी महीनों में होने पर भी दिसंबर और जनवरी महीनों में यह अधिक होता है जिसका कारण उत्तरपूर्व मानसून के दौरान के समुद्र की प्रक्षुब्ध अवस्था है ।

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* एस. कृष्णपिल्लै, ए. ए. जयप्रकाश, सी. काशिनाथन और एन. राममूर्ति, सी एम एफ आर आइ के मण्डपम क्षेत्रीय केन्द्र द्वारा तैयार की गयी रिपोर्ट

माँगलूर में ट्रालरों के ज़रिए भारी मात्रा में बांगडा *

ट्राल के ज़रिए भारतीय बांगडा *रास्ट्रेल्लिगर कानागुर्टा* की कुल वार्षिक पकड 2% कम है । लेकिन 1995 मई के तीसरे - चौथे हफ्तों में बांगडे की भारी पकड प्राप्त हुई । यह कुल ट्राल पकड के लगभग 30% देखा गया ।

माँगलूर में प्रचालित ट्रालरों से मूलत: झींगे और कटलफिश पकडे जाते है । बांगडे की पकड प्रति एकक से केवल 10-25 कि ग्रा होती है । ट्रालरों की पकड में बांगडो की ऐसी बढती पहली बार रिपोर्ट की गई है ।

पकड में सारे के सारे 180 से 255 मी की बडी मछलियाँ थी । अधिकांश मछलियाँ एक साल आयु की थी और इन में नर जाति की तुलना में मादा जाति अधिक थी । अधिकाँश मछलियाँ पूर्णत: परिपक्व और अंडरिक्त अवस्था की थी ।

लेकिन माँगलूर में प्रचालित गिलजालों और कोष संपाशों में बांगडे की इस प्रकार की भारी पकड नहीं देखी गयी । बाँगडे की भारी पकड केवल माँगलूर बुन्दर में देखी गयी थी ।

पर्याप्त बर्फ नहीं होने के कारण माँगलूर में मिली यह भारी पकड ने बांगडे का मूल्य बहुत कम कर दिया । पहले 5/- रु. में बिकी गयी एक मछली केवल एक रुपये पर बिकने लगी । पकड में एक हिस्सा सुखाने केलिए ली गयी । बाद में बर्फ उपलब्ध होने पर मूल्य पूर्व स्थिति में हो गयी । यह रिपोर्ट की गयी कि पकड को हिमशीतित करके जून - अगस्त मे जब रोध के कारण पकड कम हो जायेगा तब उपयोग करने केलिए रख दिया गया । इस प्रकार माँगलूर में बांगडे के यह अप्रत्याशित भारी पकड ट्रालर प्रचालकों केलिए हितकर सिद्ध हुई ।

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* सी एम एफ आर आइ के माँगलूर अनुसंधान केन्द्र, माँगलूर - 575 001 के प्रतिभा रोहित और एस. केम्पराज द्वारा तैयार की गयी रिपोर्ट

रामनाथपुरम जिले में स्थित काँजिरामकुडी के अर्ध - तीव्र (सेमी - इन्टेनसीव) फार्म का मूल्यांकन *

अरुण अक्वा फार्म एक सेमी - इन्टेनसीव झींगा फार्म है जिसका उत्पादन लक्ष्य एक फसल में 4-5 टन झींगे है । यहाँ झींगा कृषि 1992 में प्रारंभ हुई । खेत का विस्तार 110.5 हेक्टयर क्षेत्र है । इसमें खेती करनेवाला क्षेत्र 6.5 हेक्टयर है और 5 हेक्टयर खेती करने के लिए सज्ज किया जा रहा है ।

खेत एक संकरी खाडी के पास होने के कारण पानी के विनिमय के लिए सुविधा है। ज्वारीय पानी के उतार-चढाव के अनुसार यह विनिमय किया जाता है। निम्नज्वार के समय पानी का निकास किया जाता है और उच्चज्वार के समय पानी पंप किया जाता है। खेती तालाब रूपी खेतों में की जाती है ।

इन तालाबों का विस्तार 125 मी × 40 मी और गहराई 1.2 से 1.5 मी के बीच में है । प्रचालन के प्रारंभ में लगभग 10-15% पानी का परिवर्तन और फसल काटने का समय 50% जल परिवर्तन कर सकता है । हर एक तालाब में 4 - 6 क्षेपणी-चक्र स्थापित है । इनका प्रचालन रात भर और अपराह्न दो बजे से चार बजे तक होता है । इसका उद्देश्य जल का ताप कम करना है ।

शुरुआत में एक हेक्टयर पर 3 लाख की दर में *पेनिअस मोनोडोन* का संभरण किया था । लेकिन अतिजीवितता दर बहुत निराशाजनक थी । बाद में संभरण दर प्रति हेक्टयर से 1.4 - 1.5 लाख शिशु झींगों में कम कर दी गई । अधिकतम उत्पादन प्रति फसल में प्रति हेक्टयर पर 6 टन अधिकतम उत्पादन के साथ औसत उत्पादन 4 - 5 टन झींगे थे । पुच्छ सडन (tail rot) के सिवा और कोई रोग के बारे में रिपोर्ट नहीं है । गर्मी के मौसम मे लवणता बढकर 35 पी पी टी

तक जाने की प्रवणता देखी गयी और उत्तर - पूर्व मानसुन के दौरान जल ताज़ा हो जाएगा ।

कृषक तायवान से आयात किये खाद्य का उपयोग करता है । खाद्य शुरुआत में दिन में चार बार देता है और कृषि के अंत मे आते आते दिन मे 6 बार देता है । झींगों का खाद्य, उपभोग और तन्दुरुस्ती की नियमित जाँच भी की जाती है । तालाब से 2.25 झींगों का संग्रहण किया जिस में 1.75 टन *पी. मोनोडोन* और 0.5 टन *पी. इन्डिक्स* थे। झींगे स्वस्थ और स्वादिष्ट देखे गये । कुछ झींगों में पुच्छ सडन का लक्षण देखा गया । जल की लवणता और तापमान उच्च थे । बाकी जल की गुणता स्थिति झींगा कृषि केलिए उपयुक्त देखी गयी ।

संग्रहित नमूनों के जाँच करने पर रोगों की कोई सूचना नहीं मिली । पानी में जीवाणुओं की संख्या कम दीख पडी। ग्राम नेगटीव और ग्राम पोसिटीव जीवाणु उपस्थित थे । ये रोगजन्य नहीं थे ।

पी. मोनोडोन के तालाब में *जुताम्नियम* जातियों की उपस्थिति रिकार्ड की गयी । जल की गुणता कम होने पर इस से समस्या पैदा होने की संभावना है ।

सिफारिश

संग्रहित डाटा विश्लेषण के अनुसार तालाब सुप्रबन्धित है । यद्यपि फार्म के सन्दर्शन के कुछ दिनों बाद 3 कि. मी दूर में स्थित एक तालाब में एक गंभीर रोग की समस्या पर रिपोर्ट मिली और यहाँ भी उसी खाडी संकर के पानी का उपयोग करता है । इसलिए अरुण अक्का फार्म कुछ दिनों केलिए पानी का पम्पिंग बन्द कर दिया । उन्हें खाद्य कम करने और बारंबार क्षेपणी - चक्र के उपयोग से पानी का तापमान कम करने केलिए सलाह दिया ।

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* सी एम एफ आर आइ के मंडपम क्षेत्रीय केन्द्र, मंडपम केंप के ए. पी. लिप्टन द्वारा तैयार की गयी रिपोर्ट

GUIDE TO CONTRIBUTORS

The articles intended for publication in the MFIS should be based on actual research findings on long-term or short-term projects of the CMFRI and should be in a language comprehensible to the layman. Elaborate perspectives, material and methods, taxonomy, keys to species and genera, statistical methods and models, elaborate tables, references and such, being only useful to specialists, are to be avoided. Field keys that may be of help to fishermen or industry are acceptable. Self-speaking photographs may be profusely included, but histograms should be carefully selected for easy understanding to the non-technical eye. The write-up should not be in the format of a scientific paper. Unlike in journals, suggestions and advices based on tested research results intended for fishing industry, fishery managers and planners can be given in definitive terms. Whereas only cost benefit ratios and indices worked out based on observed costs and values are acceptable in a journal, the observed costs and values, inspite of their transitionality, are more appropriate for MFIS. Any article intended for MFIS should not exceed 15 pages typed in double space on foolscap paper.

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