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*Front cover photo:* Spotted sardinella, an important pelagic resource of the east coast of India (Ref. Article 4).

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

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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 constitute 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, Beyapore, 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.
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 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 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. Cuttlefishes

(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

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<td>121</td>
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<td>316</td>
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<td><em>Sepia prashadi</em></td>
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<td>-</td>
<td>-</td>
<td>16</td>
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<td>B. Squids</td>
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<td><em>Loligo duvaucelli</em></td>
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<td>1,696</td>
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<td><em>Doryteuthis sibogae</em></td>
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<td><em>O. lobensis</em></td>
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<td><em>Cistopus indicus</em></td>
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<td><strong>Total</strong></td>
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<td>2,597</td>
<td>3,840</td>
<td>6,971</td>
<td>7,230</td>
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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 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) *Sepiella 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 duvauceli*: Known as the Indian squid, this is the most common squid throughout the Indian coast. Among the cephalopods landed at Cochin Fisheries Harbour, *Loligo duvauceli* 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 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 catch in tonne*

![Graph](https://example.com/graph.png)

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 doyllisi*, (2) *Octopus lobensis* (3) *Octopus membranaceus* and (4) *Cistopus indicus*. Of these, *O. membranaceus* 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 *Loligo 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 simultaneously. Apart from cuttlefish and squid, octopus is also landed now in view of its export demand.
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 dicanthus* 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 dicanthus*, 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 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. dicanthus* and 'all fish' catch by multi-day trawlers at Mangalore during 1988/89 -1993/94**

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<thead>
<tr>
<th>Year</th>
<th>Effort in trawling hours</th>
<th>Total trawl catch in tonnes</th>
<th><em>Epinephelus</em> catch in tonnes</th>
<th>% in total trawl catch</th>
<th>Catch rate (kg/hr)</th>
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<td>1988-89</td>
<td>446891</td>
<td>12121.9</td>
<td>81.4</td>
<td>0.70</td>
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<td>1989-90</td>
<td>233271</td>
<td>6609.6</td>
<td>64.2</td>
<td>0.97</td>
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<td>1990-91</td>
<td>302846</td>
<td>10223.1</td>
<td>61.7</td>
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<td>1991-92</td>
<td>438207</td>
<td>13571.3</td>
<td>96.3</td>
<td>0.71</td>
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<tr>
<td>1992-93</td>
<td>528291</td>
<td>14055.3</td>
<td>241.7</td>
<td>1.72</td>
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<td>1993-94</td>
<td>644879</td>
<td>17076.4</td>
<td>348.3</td>
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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.

![Graph showing monthly landing of Epinephelus diacanthus by multi-day trawlers at Mangalore and Malpe.](image)

**Fig. 2 Monthly landing of *Epinephelus 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.

**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 crustaceans 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 Sea fishes 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.

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<td>2.4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>23.5</td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mean length**

11.9 13.6 16.3 18.2 18.8
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.
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 purview 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 Pallipal 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 mechanised 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 powered 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 60 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 intelligent 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 lifebuoy 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 mechanised 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.

* Prepared by Krishna Srinath and P. Rajeev, C.M.P.R.I., Cochin - 682 014.
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 Visakhapatnam. 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

<table>
<thead>
<tr>
<th>Characters</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average (Mode)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERISTIC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorsal fin rays</td>
<td>16</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Anal fin rays</td>
<td>15+2</td>
<td>18+2</td>
<td>16+2</td>
</tr>
<tr>
<td>Pelvic fin rays</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Pectoral fin rays</td>
<td>16</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Caudal fin rays</td>
<td>23</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Lower gill rakers</td>
<td>38</td>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>MORPHOMETRIC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total length (mm) (TL)</td>
<td>174</td>
<td>223</td>
<td>200.53</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>45</td>
<td>112.3</td>
<td>95</td>
</tr>
<tr>
<td>Proportion in TL:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard length</td>
<td>1.09</td>
<td>2.33</td>
<td>1.18</td>
</tr>
<tr>
<td>Head length (HL)</td>
<td>4.65</td>
<td>5.40</td>
<td>5.01</td>
</tr>
<tr>
<td>Depth</td>
<td>4.83</td>
<td>5.66</td>
<td>5.34</td>
</tr>
<tr>
<td>Proportion in HL:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snout</td>
<td>2.5</td>
<td>3.27</td>
<td>2.82</td>
</tr>
<tr>
<td>Eye diameter</td>
<td>3.28</td>
<td>4.15</td>
<td>3.76</td>
</tr>
<tr>
<td>Inter-orbital length</td>
<td>2.86</td>
<td>4.63</td>
<td>3.77</td>
</tr>
</tbody>
</table>

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 leptocephalli 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. 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 leptocephalli formed the food.

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

A close watch was kept on the sardine catches of different gears of this region from December 1994. A. sirm did not appear in any of the gears after March 1993. A. sirm was 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. Inform. Ser., 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.](image)

*Prepared by K. Vijayakumaran, K. Diwakar and P. Achayya, Visakhapatnam Research Centre of CMFRI, Visakhapatnam - 530 003*
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 stranding 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

<table>
<thead>
<tr>
<th>Morphometric characters</th>
<th>Measurements (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip of upper jaw to deepest part of fluke notch</td>
<td>1140</td>
</tr>
<tr>
<td>Tip of upper jaw to centre of anus</td>
<td>975</td>
</tr>
<tr>
<td>Tip of upper jaw to centre of genital slit</td>
<td>870</td>
</tr>
<tr>
<td>Tip of upper jaw to end of ventral grooves</td>
<td>680</td>
</tr>
<tr>
<td>Tip of upper jaw to centre of umbilicus</td>
<td>790</td>
</tr>
<tr>
<td>Tip of upper jaw top of dorsal fin</td>
<td>670</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Date of Stranding</th>
<th>Place</th>
<th>Dead/alive</th>
<th>Total Length (m)</th>
<th>Sex</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>27-01-1990</td>
<td>Pamban</td>
<td>Washed ashore</td>
<td>11.4</td>
<td>Female</td>
<td>Present report</td>
</tr>
<tr>
<td>8.</td>
<td>21-01-1992</td>
<td>Theedal</td>
<td>Washed ashore</td>
<td>14.00</td>
<td>Female</td>
<td>P. Nammalwar et al. (in press)</td>
</tr>
</tbody>
</table>

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

*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, up to 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 in mackerel in the trawler catch along this coast is recorded for the first time.

![Length frequency distribution of mackerel landed by trawlers at Mangalore Bunder](image1)

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

<table>
<thead>
<tr>
<th>Date</th>
<th>Effort (Units)</th>
<th>Total catch</th>
<th>Mackerel catch</th>
<th>C.P.U.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.5.95</td>
<td>92</td>
<td>1,06,746</td>
<td>12,512</td>
<td>136</td>
</tr>
<tr>
<td>20.5.95</td>
<td>80</td>
<td>1,03,560</td>
<td>18,000</td>
<td>225</td>
</tr>
<tr>
<td>23.5.95</td>
<td>65</td>
<td>85,267</td>
<td>29,575</td>
<td>455</td>
</tr>
<tr>
<td>24.5.95</td>
<td>70</td>
<td>80,850</td>
<td>22,050</td>
<td>315</td>
</tr>
<tr>
<td>27.5.95</td>
<td>80</td>
<td>86,360</td>
<td>15,440</td>
<td>193</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>4,61,783</td>
<td>97,577</td>
<td>252</td>
</tr>
</tbody>
</table>

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 indicates 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 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.

![View of mackerel catch brought by the trawlers at Mangalore Bunder](image2)

**Fig. 2.** View of mackerel catch brought by the trawlers at Mangalore Bunder.
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/m² (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 initial 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 10⁷/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, Zoanthamnum 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.

* Prepared by A.P. Lipton, Mandapam Regional Centre of CMFRI, Mandapam Camp - 623 520.
केरल के कोचिन में सेफालोपोड मात्रिकी

बी. कृष्ण, के. प्रभाकरन नायर और मालूम जोएसफ
सी एम एक आर आइ, कोचिन 682 014

सेफालोपोड मात्रिकी में कटल फिसास, सिक्कस और
ओब्सीस शामिल है। भारत में इस संपदा को वाणिज्यिक
विद्युत 25 सालों से होता रहता है। 1960-69 की अवधि
में इसका उत्पादन महत्व नहीं था। लेकिन 1970-79 और 1980-
89 के दौरान नविर्कल वे में इसके प्रमुखता बढ़ी। मालूम जोएसफ
इसकी प्रमुखता में खूब संच रक्कम करने लगे जिसका इसका
केरल के वाणिज्यिक सेफालोपोड क्रांति में प्रमुख होने
लगा। 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 बढ़ गया। उपर्युक्त अवधि के दौरान केरल कुछ
सालों को होड़कर बाकी सभी सालों में सेफालोपोड अवतरण
में भारत के समुदायवादी राज्यों में केरल का स्थान प्रथम था।
1993 में पकड़ में कुछ भी देखा गया।

कोचिन मात्रिकी बन्दरगाह केरल का एक प्रमुख मलय
अवतरण केंद्र है। केरल के वाणिज्यिक सेफालोपोड पकड़ में
कोचिन मात्रिकी बन्दरगाह का योगदान 11-23% था।
कोचिन में 60 मिली गहराई तक प्रचालित चिंगाट आनाकों में
एक उप पकड़ के रूप में इसका अवतरण हुआ। कोचिन
से रोज 8-13 मी तक भारी के 200 आनाकों के प्रचालन होते
है। मुख्य मलय तल आलूणी, कोचिन, बेपूर, चावकाकड़ा
और चेदुआर में है।

सेफालोपोडों का वाणिज्यिक उत्पादन

कोचिन मात्रिकी बन्दरगाह में 1989 से 1993 तक की
पाँच वर्षों की अवधि में औसत 5000 टन के साथ सेफालोपोडों
का चार्ज अवतरण ने 2,597 टन से 7,230 टन तक विभिन्नता
दिखायी। उपर्युक्त पाँच वर्षों के दौरान अवतरण में 76% बढ़ती
हुई। कुल ट्राल पकड़ में भी निरंतर वृद्धि हुई लेकिन प्रचालन
(ट्राल एककों की संख्या) 1991 तक अधिक था, पर अनुयायी
सालों में यह कम हो गया। वाणिज्यिक प्रचालन एकक प्राप्त
35 कि ग्राम से अधिकतम 75 कि ग्राम तक विभिन्नता दिखायी,
पूरी अवधि के लिए औसत 58 कि ग्राम थी। कुल मलय
अवतरण में सेफालोपोडों का योगदान 9% से 17% के बीच,
औसत योगदान 14% के साथ देखा गया।

पकड़ और प्रचालन में माहिक विचित्र

एक ही साल के विभिन्न महीनों में और विभिन्न सालों
के एक ही महीनों में सेफालोपोडों के अवतरण में विभिन्नता
बहुत अधिक थी। सितंबर में अवतरण उच्च था। इसके
अनुसार क्रम के लिए 1989 में अक्टूबर, नवंबर और अगस्त आते
है। जुलाई में पकड़ बहुत कम थी। कुल मिलाकर कहा जाए,
तो सेफालोपोडों का शुरुआत कितना अनुमान-अनुबंध है। मार्च - जून
अवधि को भी अच्छा शुरुआत 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, यह नहीं था यह 8,600 और
14,800 के बीच बद गया। जुलाई और अगस्त में प्रचालन
कम हो गया। इसके कारण यह हो सकता है कि मानसून के
दौरान मलय उत्पाद आसान नहीं और इस अवधि में ट्राल
प्रचालन पर रोक भी लगाता है।
कटलफिस, स्विक्षण और ओक्टोपस

सेफालोपोड पकड़ के मुख्य मिश्रित हैं कटलफिस और स्विक्षण। इसमें ओक्टोपस की मात्रा बहुत कम है। वापसी कटलफिस पकड़ 1,075 टन से 3,782 टन तक विभिन्न थी। स्विक्षण पकड़ 1989 में फेल 663 टन थी। लेकिन नियमित रूप से बढ़ती पाकर 1993 में 3,769 टन तक बढ़ गया। ओक्टोपस 1989 और 1990 को पकड़ में नहीं थी। ओक्टोपस की वापसी औसत पकड़ केवल 139 टन जो कुल सेफालोपोड पकड़ का केवल 3% था।

जाति विभाग

कटलफिस की पाँच जातियाँ, स्विक्षण को तीन जातियाँ और ओक्टोपस की चार जातियाँ मालिकों में बांटी गईं।

क. कटलफिस

1) सीपिया फ्यरोनिस: यह फारिसी कटलफिस नाम से जाना जाता है। यह धिरीक्त 430 मी. मी. तक लंबाई प्राप्त करती है। यह अन्य कटलफिसों से बड़ा है। वाणिज्यिक दृष्टि से भी यह काफी महत्वपूर्ण है।

कोचीन मालिकों के बंदरगाह में इसकी वापसी पकड़ 778 टन और 3,231 टन के बीच थी। यह कुल सेफालोपोड अवसर का 45% था। जून से अक्टूबर तक की अवधि में जुलाई को छोटकर, पकड़ अधिक थी। श्रृंखला संतबर देखा गया। सितंबर 1989 में 5,332 ट्रायल एकदम द्वारा प्रति एक क्रांत्य 345 कि. ग्राम को दर में 1,839 टन पकड़ प्राप्त हुई। 70 मी. मी. से 320 मी. मी. तक लंबाई वाली मछलियाँ पकड़ में उपस्थित थीं, 270 मी. मी. लंबाई और 2-2½ कि. ग्राम बाली मछलियाँ मालिकों में साधारण थी। इस अवधि में एस. फ्यरोनिस का मूल्य प्राप्त कि. ग्राम 35/- से 145/- र. तक देखा गया।

(2) सीपिया अक्युलेटा: कुल सेफालोपोड पकड़ के 6% सीपिया अक्युलेटा है। प्राकृतिक वापसी औसत पकड़ 312 टन है। यह कोचीन में वापसी कटलफिस नाम दूसरे स्थान में आता है। ट्रायल को पकड़ में साल भर यह प्राप्त होता है। जून-जुलाई और सितंबर सितंबर इसका श्रृंखला है। इस अवधि में 24 से 198 मी. मी. तक लंबाई के सेफालोपोडों को पाया गया।

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

(4) सीपिया प्रासादी: यह एक छोटी जाति है। पश्चिम तट में यह बहुत विस्तृत है। इसका अवशेष केवल सितंबर 1993 में हुआ था।

(5) सीपियेरला इन्टरमिस: सीपिया अक्युलेटा के बाद मात्रा में दूसरे स्थान में आनेवाली है यह कटलफिस। साल भर इसका अवशेष होता है। मार्च-मई और अगस्त-नवंबर श्रृंखला है। सितंबर 1991 में उभयक्षेत्र पकड़ 83 टन थी।

ख. स्विक्षण

1) लोलियो जुडेवेली: इन्डियन स्विक्षण नाम से जानेवाली ये स्विक्षण भारतीय तट में साधारण है। इसके वापसी अवसर में लगातार बढ़ती देखी गयी। सितंबर 1991 और अक्टूबर 1992 की अधिकतम मालिक पकड़ 680 टन थी। इसके दो श्रृंखला है। मार्च-मई और सितंबर-अक्टूबर। साधारणतः जुलाई और अगस्त में पकड़ विकृत रूप से बढ़ती है। मालिकों में 40 मी. मी. से 220 मी. मी. तक लंबाई वाली मछलियाँ पकड़ में साधारण थी। इस अवधि में एस. स्विक्षण का मूल्य प्राप्त कि. ग्राम 35/- से 145/- र. तक देखा गया।
स्याईनीचीक ग्रूप (इपिनेफरलस डायाकान्थस)
का अति विद्रोहन

पी. य. जुड़वलिका, अल्पना. सी. गुप्ता और एच. एस. महादेववामी,
सी एन. एक आर आर का मौगलूर अनुसंधान केंद्र

भूमिका

दक्षिण कन्नड तट में ट्रांस मात्रय 10-40 मी. गहराई तक किया करता था। प्राप्त मछली तरण होती थी और उनके आकार 9-24 से मी के बीच में थे। पर भारत के अन्य समुद्र तटों से मिलेवाली यह मछली बड़ी आकार को थी जिस से यह व्यक्त होता है कि मौगलूर से तरण मछलियों का विद्रोहन होता है।

ट्रांस के जरिए मौगलूर और मात्रय में 30 से 70 मी गहराई से इ.ड.डयाकान्थस का विद्रोहन किया जाता है। 1988 से लेकर 94 तक के बच्चों में मौगलूर और मात्रय में इस मछली
की पकड़ दिखाई पड़ी है। मासूर में 1988-89 में मिली पकड़ 81.4 टन थी और 1993-94 में यह 348.3 टन हो गई। इस अवधि में मालय में हुई वृद्धि 35.6 से 39.9 टन थी। यहाँ से अभी पकड़ का समय अवलंबून से दिसंबर तक के महीने है।

बीवीसीआई: इस मछली की आस्था बढ़ती दर एक महीने में 25 से मो देखी गई। 20 से मो तक बढ़ी मछली का भार 95.4 ग्राम था। मिली गई सब से बड़ी जाति 52 से मो की थी। लंबाई - भार समीकरण के अनुसार 57 से मो लंबाई की मछली का आकलित भार 1807 ग्राम है।

इसके खासत्वभाव पर चलाये अध्ययन ने ज्ञात किया कि यह मछली माँसाहरी है जो मूलतः क्रेटोसिया और अन्य छोटी मछलियों को खाती है।

पिछले कुछ वर्षों से मासूर में ह्युपॉफोलिस डायफुण्डस की पकड़ में 328% वृद्धि हुई है। मालय में वृद्धि 12% थी। उपलब्ध रिपोर्टों के अनुसार यह मछली 52 से मो तक बढ़ जाती है। मासूर में 30-60 से मो गहराई से मिली ये मछली तरह की जो आहार की खोज में इस तरल में प्रवेश की गई होती। अनुमान के अनुसार यहाँ 8 महीने तक जीवन प्रजनन अवस्था में पहुँचने पर गहरे मध्य में वापस जाती होती।

उपलब्ध मछलियों में वच्चस मछलियों के अभाव का कारण यह अनुमानित किया जाता है।

इस अध्ययन में परिशद की दृष्टि से इसके तरूणों का जो विदेशों होता है उस पर रोक लगाना चाहिए क्योंकि परिवक्त होने पर इसके भार में वृद्धि होती और प्रजनन से इसकी जीव संख्या बढ़ जाती। इसलिए दक्षिण कनाडा टट में ट्रांस्टाक जीवन के जूतियों होनेवाली मछली के विदेशों पर रोक लगाना चाहिए।

समुद्री मछली में लगे हुए मछुओं के लिए सुरक्षा उपाय*

भारत में समुद्री मछली में लगे हुए सैकड़ों किसानों को कई परिवक्तों का आश्रय करना पड़ता है। केकल में वृद्धि मत्स्य में लगे हुए 16 मछुओं की मूल 1990 से लेकर 1994 तक के बार वहाँ में हुई है। परिवक्त मत्स्य में लगे जीवनवालों के समाधः में इस पर सुधार उपरांत नहीं है।

मछुए जो वृद्धि और परिवक्त मत्स्य में लगे हुए हैं उनकी जीवन सुरक्षा उपयोगों पर मोर्चा चाहिए। सरकार और अभियंताओं जैसे इन्टरनाशनल महाराज संगठन, इन्टरनाशनल लेफ्टेंट संगठन और पूर्व कुल अधिकारियों संगठन इस पर विचार कर रहे है। सुरक्षा विनियम जो बनाये गए हैं वृद्धि मत्स्य सेक्टर के अनुरूप में हैं। परिवक्त मत्स्य खरीदने और बिकाय से लगे होने चाहिए।

केकल के प्रलेखन में मछुओं के बीच इस पर एक सर्वेक्षण चलाया था। एक ऐसे ऐसे द्वारा निष्ठूल सुरक्षा उपकरण के उपयोग पर चलाये सर्वेक्षण ने ज्ञात किया कि उनके जूतियों कम बीमारता के और नाम के बाल्के के उपयोग का उपयोग होता है। इसके अलावा सुरक्षा उपकरणों के पारे में कई मछुओं का अवयोग नहीं है। 80% वृद्धि यात्रों में यंत्र के लिए
उत्तर आन्ध्रप्रदेश तट में चिलियाँबाली तारली

की उपस्थिति*

विश्वकुटनम में लॉकस्क खाड़ी में नवम्बर - दिसंबर 1992 में प्रवालित गिल जालों से लगभग 530 कि. ग्रा. चिलियाँबाली तारली अक्वागॅस्टर सिरम (वालगॉ) प्रथम हुई। तारलियों
की पकड़ में इस जाली की उपस्थिति पहली है। इसके बाद
दिसंबर में काफीनडा के यूंला पकड़ों में इस नमूने की
उपस्थिति थी। विश्वकुटनम में जनवरी और फरवरी के
दौरान पकड़ बढ़त कम थे तो मार्च महीनों में चिलियाँ अनाजक
और गिल जालों में इसकी पकड़ क्रमवर्त 581 और 3231
कि. ग्रा. थी। अप्रैल तक व्यापार नहीं के बादर रह
गई।

अधिकांश जालियों आंदोलन और कुछ भागी रूप में
पाम्बान लाइट हाउस के पास पाक तट पर धाँस गयी समुद्री तिथि
बालिनोपटीरा बोरियालिस *

भारतीय तटों में तिथियों का ध्यान आसपास जाति नहीं है और प्राप्त: पश्चिम तट में यह ज्यादा भी है ।
कच्चातिव तट के पास 27-1-90 को 8.5 मी गहराई में प्रचालित एक गिल जाति एक समुद्री तिथि प्राप्त हुई ।
धार पहेलियों की सहायता से व्यापक होने पर इस पाम्बान लाइट हाउस के पास जीवित अवस्था में लाया गया । इसे बाहर समुद्र में डालने की कोशिश सफल नहीं हुई । मादा जाति की यह तिथि 11.4 मी लंबी थी और इसका भार 7000 कि.
ग्रा था । यह नमूना बालिनोपटीरा बोरियालिस लेस्सन थी ।
तिथियों का ध्यान यह में सभी महों में होने पर भी
दिसंबर और जनवरी महीनों में यह अधिक होता है जिसका
कारण उत्तर-पश्चिम भारत के दौरान के समुद्र के प्रभाव अधिक
है ।

* ए.कृष्णचन्द्र, प.ए. राजेन्द्र, न.शंकर और
ए.गांधी, सी.एम.एक. आठ के मण्डल क्षेत्र केन्द्र
द्वारा तैयार की गयी रिपोर्ट

माँगलू में ट्रालों के जरिए भारी माेत्रा में बंगाड़ा *

ट्राल के जरिए भारतीय बंगाड़ा राष्ट्रियका योजना की
कुल वर्षिक फ्रेक्युल लघु 2% कम है । लेकिन 1995 मई के तीसरे
- चौथे महीनों में बंगाड़े की भारी पकड़ प्राप्त हुई । यह कुल
ट्राल पकड़ के लगभग 30% देखा गया ।

माँगलू में प्रचालित ट्रालों से मूलतः घाँगे और कटलिकिया
पकड़े जाते हैं । बांगले की पकड़ प्रति एक हजार से केवल 10-
25 फ़ि के प्राप्त होती है । ट्रालों की पकड़ में बंगाड़े की ऐसी
बहुत पहली बार रिपोर्ट की गई है ।

पकड़ में सारे के सारे 180 से 255 मी की बड़ी मछलियाँ
थीं। अधिकांश मछलियाँ एक साल आया की थी और इन
में नर जाति की तुलना में मादा जाति अधिक थी।
"मवका वर्षिक
पकड़ में वर्षिक वार योजना की थी।
रामनाथपुरम जिले में स्थित काँजिरामकुड़ी के अर्थ - तीन
(सेमी - इन्टेंसीव) फार्म का मूल्यांकन *

अरण अक्षर फार्म एक सेमी - इन्टेंसीव झीला फार्म है जिसका उद्योग लक्ष्य एक फसल में 4-5 टन झीली है। यह झीला कृषि 1992 में प्रारंभ हुई। खेत का विस्तार 110.5 हेक्टेयर क्षेत्र है। इसमें खेती करनेवाला क्षेत्र 6.5 हेक्टेयर है और 5 हेक्टेयर खेती करने के लिए सम्भव किया जा रहा है।

खेत एक रंगों की खाड़ी के पास होने के कारण पानी के विनिमय के लिए सुविधा है। ज्वारीय पानी के ऊतार-चढ़ाव के अनुसार यह विनिमय किया जाता है। निवासी के समय पानी का निकास किया जाता है और उज्ज्वल के समय पानी पूरा 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। प्रजातन 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 श्रेष्ठ-कक्ष स्थापित है। इसका प्रचालन रात भर और अपराह्न दो बजे से चार बजे तक होता है। इसका उद्देश्य जल का ताप कम करना है।

शुरूआत में एक हेक्टर पर 3 लाख की दर में फेंकवास मोनोडोन का संभार किया था। लेकिन अतिशीतोष्ण दर बहुत निराशा झेलक थी। बाद में संभार दर प्रति हेक्टर से 1.4 - 1.5 लाख फेंक झीलों में कम कर दी गई। अधिकांश उपगुण प्रति फसला में प्रति हेक्टर पर 6 टन अधिकांश उपगुण के साथ औसत उत्पादन 4 - 5 टन झीलों में। पुख़ पहला (tail rot) के सिवा और कोई रोग के बाद में रिपोर्ट नहीं है। गर्मी के मौसम में लक्षणा बढ़कर 35 घी पी दी
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 advice 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, inspire 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.