ISSN 0254-380 X

भाकृअनुप
ICAR

# समुद्री मात्स्यिकी सूचना सेवा
# MARINE FISHERIES INFORMATION SERVICE

No. 114

OCTOBER, NOVEMBER, DECEMBER 1991

तकनीकी एवं विस्तार अंकावली
TECHNICAL AND EXTENSION SERIES

केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान कोचिन, भारत
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE COCHIN, INDIA

भारतीय कृषि अनुसंधान परिषद
INDIAN COUNCIL OF AGRICULTURAL RESEARCH

**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 ।

**THE MARINE FISHERIES INFORMATION SERVICE :** Technical and Extension Series envisages dissemination of information on marine fishery resources based on research results to the planners, industry and fish farmers and transfer of technology from laboratory to field.

Abbreviation - *Mar. Fish. Infor. Serv., T & E Ser.*, No. 114 : October, November, December - 1991

## CONTENTS अंतर्वस्तु



---

*Front cover photo :*

A bumper catch of Oil sardine landed at the Cochin Fisheries Harbour.

मुख आवरण चित्र :

कोचीन मात्स्यिकी बंदरगाह में तारलियों की बंपर पकड।

*Back cover photo :*

A view of the Visakhapatnam Fisheries Harbour.

पृष्ठ आवरण चित्र :

विशाखपट्टणम मात्स्यिकी बंदरगाह का एक दृश्य।

# A REVIEW OF PRESENT STATUS OF MARINE FISHERIES OF KERALA

**P. S. B. R. James, K. N. Kurup and N. G. K. Pillai**

*Central Marine Fisheries Research Institute, Cochin - 682 031*

## Introduction

Kerala, located in the southern part of the peninsular India has a narrow stretch of land with a long surf-beaten coast on the western side. With its 590 km long coast line, it enjoys one of world's most productive seas bordering it and produces an average of about 24% of India's annual marine fish landings (Table 1). Its shelf waters are highly influenced by both the monsoons, the characteristic of the subcontinent. The upwelling and other environmental changes brought about by the southwest monsoon strongly influence the spatial and seasonal distribution and abundance of the living resources of the coastal waters which in turn make the dependent fisheries highly dynamic. However, the cyclic behaviour of the climatic events and the physico-chemical characteristics of the fishing grounds make most of the major fisheries predictably repetitive every year although minor deviations occur sometimes due to unknown reasons.

Marine fishing using artisanal tackles like shore seines and boat seines is an age-old tradition of the state. However, Kerala set an example to set marine fishing on modern lines about 3-4 decades ago with the introduction of mechanization of fishing craft and improved fishing techniques like trawling. The early sixties saw an important technological development, say, the shift from cotton to nylon nets. By mid sixties, individual entrepreneurs entered the scene paving way for a fast development of trawl fishery in the coastal waters. Commercial purse-seining started during the late seventies and the process of large scale motorization of traditional carft began in the early eighties. Quite recently, there has been a remarkable innovation in the form of ring seines mainly by conversion of the erstwhile boat seines.

TABLE 1. *Marine fish landings in Kerala compared to landings in India during 1980-'89*

| Year | India | Kerala | % |
|---|---|---|---|
| 1980 | 1,249,837 | 279,543 | 22.4 |
| 1981 | 1,378,457 | 274,395 | 19.9 |
| 1982 | 1,420,624 | 325,795 | 22.9 |
| 1983 | 1,548,475 | 385,765 | 24.9 |
| 1984 | 1,630,678 | 393,472 | 24.1 |
| 1985 | 1,534,726 | 325,997 | 21.2 |
| 1986 | 1,693,377 | 382,907 | 22.6 |
| 1987 | 1,662,550 | 303,286 | 18.2 |
| 1988 | 1,803,817 | 468,807 | 26.0 |
| 1989 | 2,230,225 | 647,526 | 29.0 |

At the time of independence, marine fish production in the state was of the order of 200,000 tonnes. Currently, the production stands at about 6 lakh tonnes. In between, the fishing in the state has undergone tremendous changes in the technology. From an activity confined to traditional fishermen, it has emerged as a capital intensive industry. Currently the export of marine products from the state yields to the nation a foreign exchange of Rs. 240 crores (MPEDA, 1990). An overview of the recent trends and present status of marine fisheries in Kerala is briefly presented in this paper.

## Fishermen population

The fishermen population (marine) stood at 639,872 in 1980. But in a recent publication of State Fisheries Department, the fishermen population in Kerala during 1985 is reported to be 650,143. This indicates an annual growth rate of 0.3%. Hence a conservative projection of the population in 1990 would be 661,000. Survey by State Fisheries Department has further revealed that fishermen in the productive age groups (18-59 years) is 53.7%. The number of active fishermen form 22.74% (150,000). It is further reported that 61.94% of this number is engaged in real fishing activity. Hence, a conservative estimate of number of fishermen actively engaged in fishing currently will be 93,000. The per capita production of fish (in respect of fishermen population) would work out to 4.58 tonnes per annum.

## Marine fish production

One of the tasks of Central Marine Fisheries Research Institute in its early days of inception was the collection of statistics on marine fish production in India. Authentic statistics on marine fish production are available from 1950 onwards when the Institute started nation wide sample survey for estimating the marine fish landings in the country. In course of time, the Institute has developed and improved a sample survey design for estimating marine fish production and also has been collecting statistics ever since. Average annual production of marine fishery resources from Kerala during the last four decades are presented in the Table 2.

TABLE 2. *Average annual marine fish landings in Kerala during the 4 decades*

| Period | Average annual production | Rate of growth |
|---|---|---|
| 1950-'59 | 180,508 | — |
| 1960-'69 | 301,401 | 5.3% |
| 1970-'79 | 380,314 | 2.4% |
| 1980-'89 | 378,449 | - 0.05% |

The production which was of the order of 200,000 tonnes in 1950 suffered in subsequent years. But the fishing activities got a momentum only in 1957 when the fish production was a substantial 301,000 tonnes. Thereafter, history of fisheries in Kerala has been that of sustained development. There had been a general increasing trend upto 1964. In 1965 the production was 340,000 tonnes. But in subsequent two decades the production fluctuated between 290,000 tonnes and 450,000 tonnes. Though there were occasional spurts between 1970 and 1975 and between 1980 and 1984, by and large, production was stagnant in these two decades. But the latter half of eighties witnessed spectacular increase in production. A reference to the Table 2 would indicate that in eighties, the annual production showed a decrease of 0.05%. Compared to seventies, the first half of eighties witnessed a reduction rate of 2.6% with an annual production of 331,000 tonnes. But the latter half of eighties recorded an annual production of 426,000 tonnes which registered a growth rate of 5.1% compared to first half.

Traditionally, the trend of marine fish production in the state has been determined by the availability of pelagic resources, mainly oil sardine (*Sardinella longiceps*) and mackerel (*Rastrelliger kanagurta*).

TABLE 3. *Percentage contributions of pelagic and demersal resources*

| Year | Pelagic | Demersal |
|---|---|---|
| 1980 | 52 | 48 |
| 1981 | 74 | 26 |
| 1982 | 69 | 31 |
| 1983 | 71 | 29 |
| 1984 | 64 | 36 |
| 1985 | 63 | 37 |
| 1986 | 57 | 43 |
| 1987 | 50 | 50 |
| 1988 | 57 | 43 |
| 1989 | 68 | 32 |

Table 3 gives the percentage contribution of pelagic and demersal resources to the annual production in the state durig the period 1980 to 1989. Reference to Table 3 would reveal that pelagic resources have been dominant in the production in the state consistently. The landings of major groups of marine fishery resources during the last five years 1985-'89 are given in Table 4. Among the major commercially important groups of fish occurring in Kerala, oil sardine ranks first with a percentage contribution of 19.3 currently. This is followed by shrimps (11.2%). Carangids (9.6%), perches (8.8%), mackerel (8.4%) and *Stolephorus* spp. (8.0%) form the other major groups currently exploited in Kerala waters.

## Trends in mechanization

Mechanized fishing was started in Kerala in mid fifties by the erstwhile Indo-Norwegian Project. By mid sixties, individual entrepreneurs entered the scene paving way for the fast development of trawl fishery in the state. Experiments conducted on motorization of country craft under the Indo-Norwegian Project in mid fifties were found not successful. But in 1970 under Indo-Belgium Fisheries Project about 100 boats were fitted with outboard engines at Muttom in Kanyakumari district. In 1974, Marianad Fisheries Co-operative Society in Trivandrum district initiated a similar experiment. But these were also not successful. The results of Purakkad trials conducted in 1980 showed encouraging results. The successful trials carried out at fishing village, Kannamaly, in Ernakulam district during 1979-'80 attracted the fishermen of this region. Soon motorization programme picked up

TABLE 4. *Landings of major groups of fishes in Kerala during the period 1985-'89*

| Group | Year | | | | | Average | % |
|---|---|---|---|---|---|---|---|
| | 1985 | 1986 | 1987 | 1988 | 1989 | | |
| Elasmobranchs | 6,013 | 6,056 | 4,473 | 6,761 | 4,680 | 5,597 | 1.3 |
| Cat fishes | 5,184 | 8,589 | 4,667 | 9,960 | 4,097 | 6,499 | 1.5 |
| Oil sardine | 79,237 | 40,595 | 44,717 | 60,618 | 184,879 | 82,008 | 19.3 |
| Other sardine | 2,473 | 8,954 | 8,697 | 12,592 | 13,752 | 9,294 | 2.2 |
| *Stolephorus* spp. | 36,235 | 27,158 | 16,599 | 45,994 | 45,127 | 34,223 | 8.0 |
| Perches | 30,710 | 45,990 | 30,133 | 32,367 | 48,985 | 37,637 | 8.8 |
| Croakers | 8,637 | 12,701 | 8,161 | 8,458 | 11,402 | 9,872 | 2.3 |
| Ribbon fishes | 25,146 | 11,880 | 15,295 | 8,952 | 7,179 | 13,690 | 3.2 |
| Carangids | 12,899 | 71,570 | 22,772 | 47,066 | 50,219 | 40,905 | 9.6 |
| Silverbellies | 3,419 | 6,029 | 6,027 | 6,522 | 5,354 | 5,470 | 1.3 |
| Pomfrets | 892 | 1,856 | 2,123 | 1,605 | 1,739 | 1,643 | 0.4 |
| Mackerel | 18,115 | 21,881 | 10,068 | 43,938 | 85,272 | 35,855 | 8.4 |
| Seer fishes | 8,459 | 4,859 | 5,181 | 10,162 | 8,029 | 7,338 | 1.7 |
| Tunnies | 10,857 | 14,840 | 10,611 | 12,913 | 22,288 | 14,302 | 3.4 |
| Shrimps | 26,887 | 37,202 | 53,125 | 67,661 | 53,335 | 47,642 | 11.2 |
| Cephalopods | 8,308 | 15,017 | 7,535 | 15,155 | 23,488 | 13,901 | 3.3 |
| Others | 42,526 | 47,730 | 53,102 | 78,083 | 77,701 | 59,829 | 14.1 |
| Total | 325,997 | 382,907 | 303,286 | 468,807 | 647,526 | 425,705 | |

acceleration in Kerala. Fishermen of Alleppey, Ernakulam and Quilon districts were credited with the initiative and large scale adoption of motorised fishing. From about 50 outboard engines during 1979-'80, the number has now increased to about 10,000.

With the introduction of large scale commercial trawling in Kerala in the inshore waters during the early seventies, the production of marine fish showed substantial increase. Average annual production during 1971-'75 increased to 406,000 tonnes registering an annual growth rate of 3% compared to 349,000 tonnes during 1966-'69. However, the production was stagnant in the subsequent years. The big leap in the production of shrimps since 1965 for a period of over one decade had served as a fillip to the fisheries sector as a whole and trawler operations in particular. Due to increase in catches of prawns and its heavy demand in foreign market, the industry flourished vertically and horizontally. This resulted in overall development of infrastructure facilities, including roads and transport facilities. A number of ancilliary establishments sprang up which gave immense employment potential. Additional production of prawns and its export has significantly contributed to the national income. Foreign exchange earnings had a phenomenal growth. Thus eventhough the total production of marine fish did not show any marked improvement, due to the heavy concentration on shrimp fishery, the economy of the sector improved significantly.

Commercial purse seining in the inshore waters started by the end of 1979. But unlike in Karnataka, where the purse seining is the mainstay in fishery, in Kerala it did not pick up.

A reference to the Table 5 would reveal that the contribution from mechanized craft has been tremendously increasing in recent years. Mechanized craft can be classified into two type (a) where power is used for fishing (b) power used only for propulsion. We can easily see that the

proportion of the contribution from type (a) units has been more or less steady in the decade while that of (b) has been increasing very fast. This is mainly due to the trend setin in the early eighties with the introduction of outboard engines being fitted to traditional craft in the half of eighties and quite recently by the employment of mini purse seines or popularly known as ring seines. The resultant effect has been the drastic reduction in the contribution of non-powered units which was the mainstay in fifties and sixties and to a great extent in seventies. As could be seen from the Table, there was an initial spurt in the total production since 1981 but it cannot be conclusively said that it was due to motorization of the traditional craft. Even though the production by motorized units increased sharply, there was a consistent reduction in the landings by other traditional units which would imply only a shift in catches from non-motorized to the motorized sector. It can further be seen that the increase in these years has, as well, been contributed by other mechanized units.

However, the motorization of country craft has changed the techno-social structure of the traditional fishing industry in Kerala in recent times. From a meagre fifty units in 1979-'80, now the number of such units is in the order of 10,000. Advantages of motorization of traditional crafts by fitting outboard engines are many. The motor replaces human labour for propulsion of the craft. This reduces time taken to reach the grounds and scouting for shoals thereby increasing fishing time and labour efficiency. Encircling of shoals can be effected speedily thereby reducing escapement possibility. Because of the mechanical power, going beyond the conventional limits can be done with ease, thus, widening the operational area and making it possible to tap additional resources. Due to time saving it may be possible to make more than one trip a day. Most important benefit is that the catches can be brought in fresh condition which would fetch a better price. The outboard engine can be declamped easily at the close of operation and removed. Hence beach landing does not create any special problem and safety of engine is assured. The physical strain in rowing is almost eliminated and this helps in better health and leisure time for social engagements. The resultant effect of all these features has been overall improvement in the socio-economic status of fishermen families.

Motorization of country craft has resulted in many changes in the size and shape of craft and gear. Some of the boats are made flat in the rear side so that engine can be fitted there conveniently thereby increasing the propulsion efficiency. In some areas, craft made of plywood are in operation with good performance. Recently, in Trivandrum area, catamarans and fibreglass canoes fitted with outboard engines are becoming popular. In Alleppey area, mini trawlers have been introduced using canoes with engines.

## Artificial reef structures (ARS)

The creation of man-made structures to enhance marine resources is the basis of a specialised branch of marine technology known as artificial reef development. Artificial reefs are

TABLE 5. *Contribution of mechanised and traditional craft to the marine fish production in Kerala during 1980-'89*

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mechanised Type (a)* | 122,540 | 66,986 | 73,817 | 82,182 | 114,634 | 108,519 | 120,155 | 144,817 | 196,729 | 208,013 |
| Percentage | (43.9) | (24.4) | (22.7) | (21.3) | (29.2) | (33.3) | (31.4) | (47.7) | (42.0) | (32.1) |
| Type (b)** | 12,243 | 28,918 | 74,423 | 114,970 | 148,320 | 139,892 | 195,912 | 118,545 | 239,534 | 405,947 |
| Percentage | (4.4) | (10.6) | (22.9) | (29.9) | (37.7) | (43.0) | (51.2) | (39.1) | (51.1) | (62.7) |
| Total | 134,783 | 95,904 | 148,240 | 197,152 | 262,954 | 248,411 | 316,067 | 263,362 | 436,263 | 613,960 |
| Percentage | (48.3) | (35.0) | (45.6) | (51.2) | (66.9) | (76.3) | (82.6) | (86.8) | (93.1) | (94.8) |
| Traditional | 144,238 | 178,074 | 177,127 | 188,128 | 129,939 | 77,125 | 66,824 | 39,924 | 32,545 | 33,566 |
| Percentage | (51.7) | (65.0) | (54.4) | (48.8) | (33.1) | (23.7) | (17.4) | (13.2) | (6.9) | (5.2) |
| Grand Total | 279,021 | 273,978 | 325,367 | 385,280 | 392,893 | 325,536 | 382,791 | 303,286 | 468,808 | 647,526 |

* Where power is used for fishing.

** Where power is used for propulsion.

man-made under-water structures that provide habitat for many types of fishes. Fishes are attracted towards artificial reefs because the reef shelters the fish from predation and make good feeding sites. The Brotherhood Society of Valiathura coast constructed artificial reefs which are being monitored by CMFRI scientists. The artificial reef was constructed at a depth of 33 m, using discarded tyres, concrete rings, granite stones broken earthen pots, branches of *Cassia* tree and coconut leaf fronds. The cuttlefish congregated around the ARS and an estimated 5.8 t were hooked from this area during 1989. The fish catch comprised mainly of carangids, perches and kilimeen.

**'Karikkadi' fishery and ban on trawling during monsoon period**

It is well known that a good monsoon fishery exists in Kerala, at Sakthikulangara and Cochin for the prawn, *Parapenaeopsis stylifera* popularly known as 'Karikkadi'. Trawling operation during monsoon months has been a subject of controversy between trawler operators and traditional fishermen. Government of Kerala was seized of the problem. Expert committee appointed by Government of Kerala has interalia recommended that trawling should be banned completely in inshore waters during monsoon months on an experimental basis. The study undertaken by the Institute has revealed that maximum abundance of this species is found in Kerala coast upto 60 m depth. Experimental shrimp trawling conducted has shown that during the non-monsoon period (September/ October-May) most of the stocks occupy the coastal waters within the 20 m depth contour. With the commencement of southwest monsoon and consequent changes in the environmental conditions, this leaves the inshore areas and moves to the deeper zones. They remain mostly in the 20-40 m depth zone during July and August/September. Small portion of the stock however exists very close to the shore within 5 to 6 m depth during the monsoon period which is predominantly constituted by adults in spawning condition. 'Karikkadi' is caught throughout the coast mainly by shrimp trawls operated by small mechanized boats (9-13 m size). The major landing centres for this fishery are Sakthikulangara, Cochin, Munambam and Calicut. The trawl fishery usually commences by September or October and extends upto the onset of southwest monsoon except at Sakthikulangara and Cochin where it continues during monsoon reaching a peak in July-August. Trawlers account for about 95% of the total 'Karikkadi' landings in the state. It may be interesting to observe that two thirds of this is caught in monsoon season particularly at Sakthikulangara and Cochin.

Kerala Government imposed partial ban on trawling during monsoon season during the last three years. This was in force except at Sakthikulangara during 1988 and throughout the State in 1989 and 1990. The ban on trawling does not seem to have influenced the production of major demersal fishes like 'Kilimeen' (*Nemipterus* spp.), cat fishes, lizard fish etc. It appears that these resources were available to the fishery even if left unexploited during the monsoon period. On the other hand, a steep decline in the landings of prawns at Sakthikulangara and Cochin during the monsoon period of 1989 and failure of recovery in the post monsoon period indicate that the resources have been lost unexploited.

**The Kerala Marine Fisheries Regulation Act 1980**

In the context of social conflicts on the issue of fishing by mechanised crafts in the near shore waters, Kerala Government promulgated the Kerala Marine Fishing Regulation Act, 1980. In this act, the coast line has been divided into two sectors, a southern sector, 78 km from Kollengode to Edava and a northern sector, of 512 km from Paravoor south to Manjeswaram. In the southern sector, a distance upto 16 fathom depth line from shore and in the northern sector a distance upto 8 fathom depth line has been exclusively reserved for the traditional crafts, and all types of mechanised boats have been prohibited from fishing in this area.

In the second bathymetric division which is the area upto 20 fathom line in the southern sector and 10 fathom line in the northern, fishing by all mechanised boats except motorised country crafts have been prohibited.

In the third division, which is upto the 35 fathom line in the southern sector and the 20 fathom line in the northern sector, fishing by mechanised vessels of 25 gross registered tonnage and above have been prohibited. Since October 1983, the Government has also prohibited the use of bottom trawl with less than 35 mm mesh size.

While demarcation of areas for different types of fishing crafts is to protect the interest of the traditional fishermen, the regulation of mesh size of trawl gears has a conservation angle of protecting young fishes from being caught indiscriminately by the trawlers.

In the situation obtaining in our country, voluntary observation of the specified area-rule by the fishermen is a remote possibility and strict enforcement of these rules by Government is also beset with practical difficulties. These rules may attract modifications when further mechanisation of fishing craft takes place. Our knowledge of the distribution of the coastal pelagic fishes like oil sardine alone the southwest coast suggests that they have a denser distribution in the inshore waters. While keeping the purse-seiners outside the 22 km line is disadvantageous to purse seine operators, it has also got to be viewed from the point of view of social justice to the vast majority of fishermen engaged in traditional fishing in the near shore waters. In this context, it appears necessary to modify these regulations from time to time.

**Mud bank fishery**

Mud bank formation occurs in the Kerala coast especially in Alleppey region during south-west monsoon period. Mud banks are bodies of calm water along the coast largely due to the existence of fine mud in a state of suspension during heavy monsoon days. This provides safe area of operation for the country craft. On a squally surf beaten coast these areas facilitate launching of traditional craft, which otherwise would have to remain idle during inclement weather. The traditional fishermen make bumper catches of prawns, sardines and shallow water miscellaneous species of fishes which aggregate over the calm waters of the mud banks.

**Mariculture**

Kerala has vast potential for development of mariculture to augment fish production. It is estimated that there are about 2.43 lakh ha of brackishwater area and 590 km stretch of shallow coastal waters available in the state where finfish and shellfish culture could be undertaken on commercial scale. Seafarming is gaining importance in the world arena of fish and shellfish production. Realising the vast potential for scientific farming of marine organisms to augment production, the CMFRI undertook several intensive research programmes for the past one and half decades at laboratory as well as field levels, in order to build up the necessary technological base. Most of these investigations are centred around the culture of prawns, lobsters, crabs, mussels, pearl oysters, edible oysters, finfishes and seaweeds and more recently on sea cucumber, clams and top shells because of their commercial importance. Based on the technology developed by the Institute a medium scale prawn hatchery has been established for the "MATSYAFED" at Mopla Bay in Kannur.

KVK established in 1976 at Narakkal under CMFRI, Cochin has been engaged in giving intensive practical training of durations ranging from 5 to 30 days in prawn and fish farming to small and marginal farmers, landless labourers, school drop-outs and the unemployed youth in order to transfer the latest low cost technologies developed by the Institute to the end-users.

**Water pollution in coastal areas and its possible impact on fisheries**

With the increasing urbanisation and industrialisation, the discharge of untreated or partially treated sewage and industrial wastes along with wash out of agricultural pesticides into the sea pollute the marine environment. The fish mortalities in the Chaliyar river and in the Periyar estuary due to industrial effluents are by now well known. The major coastal pollution reported in recent times is from the Trivandrum coast, originating from the titanium factory located in the area. Strict vigil on coastal pollution is to be maitained to safeguard our marine resources. CMFRI has been monitoring the coastal pollution and its effects on the living resources for suggesting several remedial measures.

**Recent developments**

Introduction of mini purse seines (ring seines) in the Alleppey area in 1985 has been a new development. The operation is similar to that of purse seine. The length of the net which was 450 m initially is now even more than 900 m in some parts of the state. The net is essentially a modified boat seine but the catch rate is more than double that of boat seine.

A reference to the Table 6 would reveal clearly that the production by OBE units is increasing in recent years and major share of the increase is contributed by ring seines. Percent-

age contribution of ring seines has been steadily increasing while that of boat seines decreasing. In absolute terms the increase in the landings in recent years has been mainly due to the better availability of oil sardine, mackerel and carangids and other pelagic resources as could be seen from Table 4. During the last receding monsoon season, it has been observed that these ring seine operations have inflicted large scale mortality on juveniles of oil sardine, mackerel and carangids in different parts of the state. This is attributed to the smaller mesh size of ring seines which increases the probability of juveniles being caught.

TABLE 6. *Contribution of ring seines and boat seines in the production by traditional craft with OB engines*

| | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|
| **OBE Units** | | | | |
| Catch | 1,86,362 | 1,11,726 | 2,30,079 | 3,83,804 |
| Effort | 9,37,000 | 7,05,000 | 1,050,000 | 1,057,000 |
| **Ring seine** | | | | |
| Catch | 22,498 (12%) | 31,558 (28%) | 81,886 (36%) | 2,70,903 (71%) |
| Effort | 29,106 | 80,364 | 1,29,636 | 3,23,197 |
| **Boat seine** | | | | |
| Catch | 1,18,433 (64%) | 48,416 (43%) | 87,802 (38%) | 51,477 (13%) |
| Effort | 3,29,713 | 1,70,680 | 1,96,240 | 96,636 |
| **Others** | | | | |
| Catch | 45,431 (24%) | 31,752 (29%) | 60,391 (26%) | 61,424 (16%) |
| Effort | 57,800 | — | — | — |

## Scope and strategy for development of marine fisheries of Kerala

It has already been explained that about 70% of all fish landed in Kerala are pelagic species and the rest demersal, including the prawns. Traditional fishing is practiced normally within the 50 m depth line and the fish populations outside this limit are therefore not subjected to any significant fishing pressure. It has been the considered opinion that increase in fishing effort in the traditionally fished zone can only marginally increase the catches. Shrimp trawling on the southwest coast during the last three decades shows that the increase in effort can only increase the catch upto a point and beyond that signs of economic overfishing or even biological overfishing will tend to be expressed.

Vessels operating from the Kerala bases, particularly the central and south zones could exploit the Wadge Bank perches, the Quilon Bank lobsters and the 'Kalava' on the rocky chain of outgrowths of the shelf.

Lastly, the resources of the oceanic pelagic species of larger tunas like yellowfin and bigeye along with associated bill fishes and sharks could form target species for exploitation from the Kerala based vessels.

While the above suggestions are to be gradually implemented, a close watch on the impact of these on the stocks of fishes, particularly the conventional ones has to be maintained by both the research and developmental agencies.

If development in harvesting additional resources in one or more of the above suggested lines takes place, it is imperative that the shore infrastructure has to be built up to handle the increased catches by way of construction of deep sea harbours, storage, processing and marketing facilities.

Such integrated facility one each for north zone, central zone and south zone with orientation of the infrastructure to the type of catches expected to be landed in those zones is envisaged. While a comprehensive central facility could be maintained at Cochin, infrastructure built up at Vizhinjam and a centre like Beypore or Cannanore should serve the south and north zones respectively.

When actually implemented, the points raised above will have to be looked into in depth, but, for the present, it is hoped that they will stimulate further thinking on the crucial issue of development of the marine fisheries of Kerala.

Recent hike in the production by ring seines is likely to have deleterious effect on the resources as it has been reported that tremendous mortality is inflicted on the juveniles of pelagic resources. Hence as a conservation measure, proliferation of small meshed ring seines has to be, per force, regulated.

Unlike in neighbouring states, where mechanization has resulted in wide spread social conflicts, in Kerala such instances were minimum. It is observed that the production from

artisanal sector has been decreasing over the recent years and this may result in conflicts between artisanal and motorized sector. Hence it is desirable to ensure a coastal fringe zone exclusively for non motorized traditional craft.

The options for development could be suggested on the following lines:

Firstly, marginal increase in the catches of traditionally fishes stocks could be achieved by increased pace of motorisation of country crafts and adoption of gears of better design and operational efficiency to match the improvement of the crafts. Expanding the mechanised gill net fishery in selected areas for coastal tunas, seer fish, pomfrets etc. will augment supply of these valuable table fishes.

Secondly, exploitation of the underfished conventional pelagic and columnar resources like horse mackerel, scads, white baits and ribbon fishes, of which a large part is distributed over the mid shelf, will yield substantial catches.

Thirdly, exploitation of the different demersal, columnar, meso-and bathy pelagic communities of fishes and shell fishes and cephalopods on the deeper shelf and slopes off the Kerala coast would contribute substantially to the food fish as well as industrial fish catches. Here the resources of Threadfin bream, 'Bulls eye', 'Green eye', Indian drift fish, Boar fishes, the Rock cods, the diverse species of penaeid and non-penaeid prawns of the slopes and the deep sea lobster *Peurulus sewelli* would form the core components.

The nearshore waters in 0-50 m depth zone is heavily exploited at present. Attention should be therefore paid for extending fishing ground beyond conventional limits. Resources like oceanic tuna, carangids, perches, squids, deep sea prawns and lobsters have potential in the offshore waters of Kerala. Hence medium sized and large vessels can be employed fruitfully for exploiting these resources.

The fishing industry in Kerala in recent times has become a complex phenomenon with many conflicting interests. Indiscriminate exploitation, needless to say, would be deleterious for a healthy stock. Conservation measures like restricting quota for different sectors and reduction in the mesh size of nets to avoid over exploitation of juveniles have to be thought of and implemented. To advise the Government on such matters and formulating suitable conservation measures and for implementing the same, a statutory body may be established preferably through a legislative process in order to achieve the twin objectives of maintaining the resources at sustainable levels and reducing the inequality in the distribution of benefits between different sectors.

# ECONOMIC FEASIBILITY OF TRAWLING IN MAHARASHTRA

**D.B.S. Sehara, J.P. Karbhari and K.P. Salini**

*Central Marine Fisheries Research Institute, Cochin - 682 031*

## Introduction

The annual marine fish landing in the 5 maritime districts of Maharashtra varies from 3 to 4 lakh tonnes. Of the total catch, about 90% comes from mechanised sector. Bagnet, trawlnet and gillnet are important among the fishing nets. About 40% of total mechanised catch is contributed by trawlers in the state. Important species of trawl include prawns, croakers, ribbon fish and elasmobranchs. In Maharashtra the major concentration of trawlers is found in Greater-Bombay, Raigad and Ratnagiri districts.

The use of mechanised boats in place of traditional boats for fishing operation is on the increase in the state. It is generally reported that catch per trawl unit is decreasing and simultaneously, the acquistion cost of a trawler is increasing. Unit price of fish caught in a trawler also plays an important role to mark the level of profitability. Thus, catch availability and its price at one hand and operating and fixed cost of trawl operation on the other hand are the vital items to be studied to know the economic viability of

trawling. Further, it is not only the quantity of the catch but also its quality which determines the net earnings of a unit. Besides this, internal and external marketing forces also influence the price of the catch. Thus, witht he main objective of finding out profitability level of trawl units in Maharashtra, the Central Marine Fisheries Research Institute, Cochin has conducted a study at selected trawl operating centres in the state during 1987-'88.

**Data base**

Preliminary information about trawl landing centres were collected from two districts of Mahrashtra namely Greater Bombay and Ratnagiri. Considering infrastructre development and number of trawlers in operation, New Ferry Wharf landing centre in Greater Bombay and Mirkerwad in Ratnagiri were selected for the study of economics of trawlers. To collect data from trawlers two enumerators from fishermen group available at the centres were engaged and trained in data collection. The basic data including details of boat, engine,area of operation, number of days in a trip, ownership of trawlers, labour engagement, marketing mechanism etc. were collected from port authorities, fishermen cooperative societies and the catch collectors at the centre. For collecting information on catch, price and cost of fishing a questionaire was framed and pretested. The trained enumerators collected catch details from 30 trawlers in a month selected at random on 10 days systematically selected for a period of 9 months of active fishing during 1987-'88. In this article the period from September to November is referred to as post-monsoon quarter (I quarter), December to February as winter (II quarter) and March to May as pre-monsoon quarter (III quarter).

For the convenience of data tabulation, the catch was grouped into 12 categories namely prawns, lobsters, cephalopods, elasmobranchs, croakers, ribbon fish, eels, catfish, perches, lizardfish, pomfret and clupeoids, and valued accordingly. All other fishes were clubbed under miscllaneous category. The sum total of value of all the groups forms the revenue. The value of catch caluculated for this purpose is based on landing centre price.

**Infrastructure development**

New Ferry Wharf landing centre is privileged with sufficient fishery infrastructure facilities. Main town, bus stand, market and railway station are within a distance of 3 km. The centre has water and electric connections. Hand cart, tempo and tucks are used for fish transportation. The boat and engine service station and jetty facility are available within easy reach. Ice plants and cold storages are located in New Bombay and Vasi areas. The ice is supplied by private parties at the centre itself. Maharashtra Rajya Machimar Sangh and 3 private dealers supply diesel to the trawlers. Quality fish like prawns, lobsters, and cephalopods are auctioned and sold to the dealers who supply the catch to processing units and charge commission @ 3-4% of the value of catch. Sometimes these suppliers or fish merchants take money from the exporters/processors and pay to the fishermen as an advance with no charge of interest who in turn sell their catch to these suppliers at a little lower than the prevailing rate. Other catch is sold to the retailers through auction. In case of bumper landings, the catch is sold to the wholesalers and the payment is made later based on prevailing market price on that day.

Mirkarwada which is bout 2 km from the main town has got water and electric connections. Market, bus stand, ice factories, jetty and cold storage facilities are available. Auto, trucks and hand cart are common means of transportation. Boat and engine are serviced at the centre itself.

A fishermen cooperative society is also functioning at the centre but its activities are limited. The fisherwomen have organised a society which deals with the marketing of comparatively cheaper fishes like dhoma, ribbonfish, shark etc. The commercially important catch is purchased by a few Processing companies located in Ratnagiri itself. These companies create a situation of monopoly in dealing with the marketing of quality catch like prawns. Fishermen get advance from the traders and the price paid for their catch is not a competitive one. As reported by fishermen, the entrance of new companies in marketing of exportable species is very difficult if not impossible at this centre.

**Trawl operation**

About 800 trawlers of 11-14m land at New Ferry Wharf centre and as many as 90% of them are owned by the fishermen from Gujarat. The majority of the crafts are fitted with 4-6 cylinder

TABLE 1. *Investment in a trawl unit 1987-'88*

| | Item | Value (Rs) | |
|---|---|---|---|
| | | New Ferry Wharf | Mirkarwada |
| a. | Hull | 245,500 | 270,000 |
| b. | Engine | 165,000 | 175,000 |
| c. | Nets | 18,600 | 15,000 |
| d. | Accessories | 31,500 | 33,500 |
| e. | Miscellaneous items | 9,780 | 8,750 |
| | Total investment | 470,380 | 521,250 |

Ashok Leyland inboard engines. Except a few, most of the trawlers have single ownership system. The number of trawl nets in a unit varies from 4 to 7.

The fishing generally starts in September and terminates in May. Fishing operation takes place upto 40 fathoms of waters during post-monsoon quarter, upto 50 fathom in winter and upto 60 fathoms during pre-monsoon quarters. In monsson a limited number of trawlers operate on selected days. During first quarter, fishing is carried out from Versova to Ratnagiri, during second quarter in Bombay High and during third quarter beyond Bombay High, Madhvad and Jafrabad areas. A fishing trip comprises 4-5 days.

At Mirkarwads centre, about 150 trawlers land their catch. Most of the tralwers are 12-15m in length fitted with 4-6 cylinder inboard engines. Popular engines include Ashok Leyland, Ruston and Bukh. The number of trawl nets in a unit varies from 3 to 6. In the starting of the season the fishing is carried out upto 20 fathoms of water whereas in winter and pre-monsoon it reaches upto 60 fathoms. September to May period is usually treated as active fishing season. In first quarter, a fishing trip is observed from morning to evening while in second and third quarters it involves 2-4 days. The fishing is extended upto Janjira Murud and Vengurla regions.

## Costs involved in trawl fishing

a) *Sunk cost*

The fixed cost associated with trawl fishery is mainly dependent on the initial capital investment in the means of production, the interest paid on the capital and the insurance.

TABLE 2. *Fixed cost*

| Item | Cost (Rs) | |
|---|---|---|
| I. Depreciation | New Ferry | Mirkarwada Wharf |
| a. Trawler (Hull & engine) | 41,050 | 44,500 |
| b. Nets | 9,300 | 7,500 |
| c. Accessories | 6,300 | 6,700 |
| d. Misc. items | 9,780 | 8,750 |
| Sub total | 66,430 | 67,450 |
| II. Interest on initial investment | 70,557 | 78,188 |
| III. Insurance | 13,547 | 14,685 |
| Total fixed cost | 1,50,534 | 1,60,323 |

At New Ferry Wharf, the average capital investment in a trawler was worked out at Rs. 4.7 lakhs including the cost of hull (Rs.2.46 lakhs), engine (Rs. 1.65 lakhs), nets 18.6 thousand) and other equipments, (Rs. 41.3 thousand). The accessories include winch, wire rope, otter boards, gallows, pulleys etc. Most of the trawlers were purchased in seventies nd also in early eighties and there has been rise in the cost price of a trawler in subsequent years. To avoid the problem of appreciation, cost price of a new trawler in the study year has been taken for the calculation of fixed cost.

Taking 10% wear and tear per annum the depreciation on hull and engine is worked out at Rs. 41,050. The life of net has been treated as 2 years and thus the fixed cost for nets is Rs. 9,300 per year. The accessories are depreciated @ 20% and an amount of Rs. 6,300 is taken towards the fixed cost. The miscellaneous items

TABLE 3. *Operating expenses of trawl fishing*

| | Item | Annual expense (Rs) | |
|---|---|---|---|
| | | N. F. Wharf | Mirkarwada |
| 1. | Fuel | 134,190 | 122,500 |
| 2. | Repair & maintenance | 36,675 | 28,700 |
| 3. | Ice | 38,250 | 22,000 |
| 4. | Crew wages | 64,800 | 55,600 |
| 5. | Food and bata | 48,150 | 30,400 |
| 6. | Market commission, wharfage and other misc. expenses | 19,800 | 17,000 |
| | Total | 341,865 | 276,200 |
| | Total annual operating cost (F. C+V.C) | Rs. 492,399 | Rs. 436,523 |

worth Rs. 9,780 have been treated to be fully consumed in a year and thus 100% replacement is required every year for such items. Thus, the total amount of depreciation is calculated at Rs. 66,430 for a trawler.

The annual interest (@ 15% p.a.) on the capital amounted to Rs. 70,557. For an average size of trawler the insurance premium, worked out to be Rs. 13,547 @ 3.3% on the value of hull and engine. Depreciation, interest and insurance totalled to Rs. 1,50,534.

At Mirkarwada landing centre the cost of hull, engine, nets, accessories and minor items is taken at Rs. 2.7 lakhs, Rs. 1.8 lakhs, Rs. 15 thousand, Rs. 33.5 thousand and Rs. 8.8 thousand respectively. The total initial investment in a trawler at this centre is calculated at Rs. 5,21,250.

Taking depreciated rates similar to that of New Ferry Wharf for different items, the amount of annual depreciation is worked out at Rs. 67,450 for a trawler at Mirkarwada. The annual interest on capital investment and insurance premium are calcuated at Rs. 78,188 and Rs. 14,685 respectively. Thus, the total annual fixed cost amounts to Rs. 1.60,323 for a trawler.

b) *Operating expenditure*

For trawl operation the major operating expenses include the cost of fuel, labour, food & bata, ice and repair & maintenance. The cost of diesel and oil for operation of a trawler at New Ferry Wharf comes to Rs. 134,190 for a full fishing season of about 9 months. The next major cost-item is labour charges ie. crew wages. Eight to nine persons form the crew in a trawler. Most of the crew work on contract basis. Each person gets Rs. 700 - 1,000 per month depending on his age, experience in fishing and type of work he attends. The crew wages average to Rs. 64,800 in a unit for the full fishing season. Since the trawlers are observing long trips, there is substantial expenditure on ice in each trawler. The cost of ice for a trawler amounts to Rs. 38,250 at New Ferry Wharf. Another important cost item is food & bata to be provided to crew. An amount of Rs. 48,150 is accounted for food and bata in a trawl unit.

There are two types of repairs. Some repair and maintenance works are attended to day-to-day or on accident while others are mainly undertaken in monsoon. Painting of boat, servicing of engine and replacement of spare parts are attended to in rainy season. The cost of these two types of repairs is found to be Rs. 36,675. The rest of the charges such as water charges, wharfage, commission etc. are clubbed under miscellaneous category and amount to Rs. 19,800 at this centre. The total operating expenses for a trawl unit amount to Rs. 341,865 at New Ferry Wharf.

The operating cost-items for Mirkarwada centre are also categorised in the similar way. The most important among these items is fuel costing Rs. 122,500 in a year. One fishing trip is observed for 2-4 days and thus, ice consumption is comparatively less at this centre. Ice worth of Rs. 22,000 was consumed in a trawler in the study year. The crew comprises 7-9 persons and the average wage in a trawl unit comes to Rs. 55,600. Some labourers work on contract basis, some on monthly payment and others on per trip payment. The food & bata expenses are comparatively less at this centre. An amount of Rs. 30,400 incurred towards food & bata in a trawl unit during 1987-'88.

The regular and seasonal reparis and maintenance cost Rs. 28,700 for a trawl owner at Mirkarwada. Other expenses including that of marketing, minor items and payments amount to Rs. 17,000. Thus, total operating cost of a trawler averages Rs. 2,76,200.

c) *Catch and revenue*

Trawlers are mainly concentrating on prawn catch and accordingly, mesh size of the net is designed by the fishermen. At New Ferry Wharf, 15% of annual catch and about 1/4th of first-quarter catch are formed by prawns. Other important species of annual catch include elasmobranchs (12%), croakers (12%), ribbonfish (10%) and catfish (11%). The miscellaneous species put together form 17% of the annual catch. Rest of the species, individually, contributed not more than 5% to the catch. The total catch of a trawler comes to 56,800 kg for the fishing season. About 37% of annual catch is landed in September - November period.

About 51% of the annual revenue of a trawl unit at New Ferry Wharf accrued from the sale proceeds of prawns alone. Other important groups include lobsters (11%), cephalopods (4%), croakers (10%), ribbonfish (4%) and elas-

TABLE 4 (A). *Catch and revenue of a trawler at N. F. Wharf, 1987-'88*

| Species group | | I Qr | II Qr | III Qr | Annual |
|---|---|---|---|---|---|
| Prawn | C | 5,090 (24) | 1,812 (10) | 1,747 (10) | 8,649 (15) |
| | V | 134,730 (60) | 68,242 (43) | 66,590 (47) | 269,562 (51) |
| Lobster | C | 424 (2) | 181 (1) | 175 (1) | 780 (1) |
| | V | 29,192 (13) | 16,926 (11) | 12,751 (9) | 58,869 (11) |
| Cephalopods | C | 848 (4) | 1,268 (7) | 874 (5) | 2,990 (5) |
| | V | 4,491 (2) | 11,041 (7) | 7,084 (5) | 22,616 (4) |
| Elasmobranchs | C | 1,909 (9) | 2,356 (13) | 2,795 (16) | 7,060 (12) |
| | V | 4,491 (2) | 6,309 (4) | 8,501 (6) | 19,301 (4) |
| Croakers | C | 2,333 (11) | 2,537 (14) | 1,747 (10) | 6,617 (12) |
| | V | 17,964 (8) | 22,081 (14) | 14,168 (10) | 54,213 (10) |
| Ribbonfish | C | 1,485 (7) | 1,993 (11) | 2,271 (13) | 5,749 (10) |
| | V | 4,491 (2) | 6,309 (4) | 7,084 (5) | 17,884 (4) |
| Eels | C | 636 (3) | 544 (3) | 349 (2) | 1,529 (3) |
| | V | 2,246 (1) | 3,154 (2) | 1,417 (1) | 6,817 (1) |
| Catfish | C | 1,910 (9) | 1,993 (11) | 2,096 (12) | 5,999 (11) |
| | V | 4,491 (2) | 4,732 (3) | 4,250 (3) | 13,473 (3) |
| Lisard fish/Bombay duck | C | 848 (4) | 906 (5) | 1,048 (6) | 2,802 (5) |
| | V | 4,491 (2) | 4,732 (3) | 5,667 (4) | 14,890 (3) |
| Perches | C | 848 (4) | 544 (3) | 524 (3) | 1,916 (3) |
| | V | 2,246 (1) | 1,577 (1) | 2,834 (2) | 6,657 (1) |
| Pomfret | C | 424 (2) | 181 (1) | 349 (2) | 954 (2) |
| | V | 6,736 (3) | 3,154 (2) | 4,250 (3) | 14,140 (3) |
| Clupeoids | C | 848 (4) | 544 (3) | 699 (4) | 2,091 (4) |
| | V | 4,491 (2) | 3,154 (2) | 2,834 (2) | 10,479 (2) |
| Misc. Catch | C | 3,607 (17) | 3,261 (18) | 2,796 (16) | 9,664 (17) |
| | V | 4,490 (2) | 6,309 (4) | 4,250 (3) | 15,049 (3) |
| Catch | (kg) | 21,210 | 18,120 | 17,470 | 56,800 |
| Value | (Rs) | 22,4550 | 157,720 | 141,680 | 523,950 |

Note :- Figures in parentheses show the percentage contribution of different groups to catch and revenue.

C = Catch (kg), V = Value (Rs).

mobranchs (4%). The rest of the groups individually, added 1 to 3 per cent to the revenue. The annual revenue of a trawler is worked out at Rs. 5,23,950 and 43% of this was earned in first quarter of the fishing season i.e. September - November period. The second and third quarters contributed an amount of Rs. 1.58 lakhs and Rs. 1.42 lakhs respectively.

The annual average catch of a trawler at Mirkarwada during 1987-'88 was calculated at about 55.3 tonnes. About 16% of total landings was represented by different sizes of prawns. In first three months of the fishing season, prawns formed 26% of the catch. Later, the prawn availability reduced to 10-11% of quarterly catch. An analysis of annual catch revealed that besides prawns, other important groups were croakers (13%), ribbonfishes (15%), eels (6%), catfishes (9%), clupeoids (8%) and perches (4%). Miscellaneous catch formed 20%. Of annual catch 38% landed in first quarter almost equally half of the rest in second and third quarters.

The revenue of a trawl unit at Mirkarwada was worked out at about Rs. 4.56 lakhs during the study period. Of the annual revenue 66% was contributed by prawns and 9% by the corakers. Other groups, individually, added 1 to 4 per cent to the revenue. The first, second and third quarter earned an amount of about Rs.2.2 lakhs, Rs. 1.17 lakhs and Rs. 1.18 lakhs respectively. About 3/4 of the revenue in first quarter was obtanied from the sale proceeds of prawns whereas in seond and third quarter, prawn value accounted for 54 and 56% respectively.

**Level of profit and other efficiency parameters of trawl fishing**

On an average, a trawler fished on 208 days in the fishing season at New Fery Wharf and 217 at Mirkarwada centre with per day catch of 273 kg (Rs. 2,519) and 255 kg (Rs. 2,100) respectively. At these centres annual fuel cost was Rs.1.22 to 1.34 lakhs. The average cost of fuel per kg of fish production comes to Rs. 2.3. The fish production per man-day was calculated at 30-32 kg and the crew expense per kg of fish production was Rs. 1.56 -1.99.

The variable expenditure on trawl fishing during the year ranged from Rs. 2.76 lakhs at Mirkarwada to Rs. 3.42 Lakhs at New Ferry Wharf ie. an amount of Rs. 5-6 was spent to catch a kg of fish. Over-head charges formed Rs. 2.65-2.90 per kg of fish produced. The annual expenses including fixed and variable cost of a trawler aggegrated to Rs. 4.9 lakhs at New Ferry Wharf and Rs. 4.4 lakhs at Mirkarwada, averaging to Rs. 8.67 and Rs. 7.90 per kg of fish production respectively.

The income over variable expenses comes about Rs. 1.8 lakhs. The net profit of a trawl unit is calculated at Rs. 31,551 at New Ferry Wharf and Rs. 19,096 at Mirkarwada. Taking Rs. 12,000 as the input value of owner's labour in a year, the return to management comes to Rs. 19,551 at New Ferry Wharf and Rs. 7,096 at Mirkarwada. In 5-6 year period a trawl owner can recover his initial investment. The rate of return to capital is better at New Ferry Wharf (22%) than at Mirkarwada (19%).

The difference between the two centres is recorded in respect of catch availability and total annual operating cost. The lesser net profit at Mirkarwada is due to the comparative low price realised per kg of fish at this centre. As compared to New Ferry Wharf there is bout one rupee difference in overall price of one kg of fish at Mirkarwada.

**Conclusion and remarks**

The investment in a medium size trawler, during 1987-'88, was about Rs. 5 lakhs in Maharashtra. Most of the crafts used for trawling are fitted with 4-6 cylinder inboard engine. The fishing generally starts in September and fag-ends in May. Hardly 5% of trawlers fish in monsoon. Fishing operations are carried out in 20 to 60 fathoms of water. In the first quarter fishing is observed in comparatively shallow water and for a shorter duration of period.

Prawns, lobsters, cephalopods, elsmo branchs, croakers, ribbonfish, eels, catfish, lizard fishes, pomfret and clupeoids are important components of the trawl catch in Maharashtra Prawns which formed 15-16 per cent of catch fetched 51-66 per cent of the annual revenue. Other species contributing 3% or more towards the annual income include cephalopods, croakers, ribbonfish, catfish and clupeoids at Mirkarwada and lobsters, cephaopods, elasmobrancs, corakers, ribbonfish, catfish, lizardfish/Bombay duck and pomfrets at New Ferry Wharf. An amount of about Rs. 5 lakhs was earned by a trawler during the study year. Of total revenue 43-48 per cent was obtained in first quarter.

TABLE 4 (B). *Catch and revenue of a trawler at Mirkarwada (1987-'88)*

| Species group | | I Qr | II Qr | III Qr | Annual |
|---|---|---|---|---|---|
| Prawn | C | 5,464 (26) | 1,720 (10) | 1,877 (11) | 9,061 (16) |
| | V | 171,794 (78) | 63,260 (54) | 66,083 (56) | 301,137 (66) |
| Lobster | C | 42 (0.2) | 69 (0.4) | 17 (0.1) | 128 (0.2) |
| | V | 2,203 (1) | 2,347 (2) | 1,180 (1) | 5,730 (1) |
| Cephalopods | C | 841 (4) | 344 (2) | 341 (2) | 1,526 (3) |
| | V | 6,607 (3) | 4,695 (4) | 4,720 (4) | 16,022 (3) |
| Elasmobranchs | C | 630 (3) | 516 (3) | 683 (4) | 1,829 (3) |
| | V | 1,321 (0.6) | 587 (0.5) | 1,180 (1) | 3,088 (1) |
| Croakers | C | 1,891 (9) | 2,925 (17) | 2,560 (15) | 7,376 (13) |
| | V | 8,810 (4) | 16,431 (14) | 14,161 (12) | 39,402 (9) |
| Ribbonfish | C | 2,942 (14) | 2,065 (12) | 3,072 (18) | 8,079 (15) |
| | V | 6,607 (3) | 5,868 (5) | 8,260 (7) | 20,735 (4) |
| Eels | C | 1,051 (5) | 1,032 (6) | 1,194 (7) | 3,277 (6) |
| | V | 2,202 (1) | 2,347 (2) | 2,360 (2) | 6,909 (2) |
| Catfish | C | 1,471 (7) | 1,892 (11) | 1,365 (8) | 4,728 (9) |
| | V | 4,405 (2) | 7,042 (6) | 4,720 (4) | 16,167 (3) |
| Lizard fish/ Bombay duck | C | 420 (2) | 344 (2) | 512 (3) | 1,276 (2) |
| | V | 881 (0.4) | 704 (0.6) | 1,180 (1) | 2,765 (0.6) |
| Perches | C | 630 (3) | 1,032 (6) | 682 (4) | 2,344 (4) |
| | V | 2,203 (1) | 4,695 (4) | 3,540 (3) | 10,438 (2) |
| Pomfret | C | 210 (1) | 52 (0.3) | 119 (0.7) | 381 (0.7) |
| | V | 4,405 (2) | 1,174 (1) | 2,360 (2) | 7,939 (2) |
| Clupeoids | C | 1,471 (7) | 1,548 (9) | 1,365 (8) | 4,384 (8) |
| | V | 4,405 (2) | 4,696 (4) | 4,720 (4) | 13,821 (3) |
| Misc. Catch | C | 3,952 (19) | 3,666 (21) | 3,277 (19) | 10,895 (20) |
| | V | 4,405 (2) | 3,520 (3) | 3,541 (3) | 11,466 (3) |
| Catch (kg) | | 21,015 | 17,205 | 17,064 | 55,284 |
| Value (Rs) | | 220,248 | 117,366 | 1,18,005 | 455,619 |

Note :- Figures in parentheses show the percentage contribution of different groups to catch and revenue.

C = Catch (kg), V = Value (Rs.).

There is no significant difference between the revenue accrued in second and third quarter.

The fixed cost comprising deprectiation, interest on intitial capital investment and insurance is calculated at Rs. 1.5-1.6 lakhs and the variable expenses at s. 2.8-3.4 lakhs. The most important among the variable cost items is the 'fuel' which accounts for 39-44% of the annual variable cost. Labour wages, food and bata together form the second major item (31-33%). An amount of about Rs. 29-37 thousand is spent on annual repairs and maintenance of hull, engine, nets, and other equipments in a trawl unit and a considerable portion of it is spent during monsoon when trawlers are not going for fishing. Though ice is commonly used for preservation of fish, especially commercially important species, its consumption further increases in case of long trips of fishing, called voyae fishing in northwest coast. The expenditure on ice ranged from Rs. 22 thousand to Rs. 38 thousand per annum. Market expenses, water charges, wharfage and other minor items amounted to Rs. 17-20 thousand which forms about 6% of the annual variable expenditure.

While calculating profit margin it is observed that price realised per unit of fish catch makes much difference in annual profit. About Rs. 50 thousand worth difference was realised in revenue received per trawl unit between the two centre due to one rupee difference per kg of fish. The number of fishing days was 208-217. The fuel cost per kg of fish production averaged at Rs. 2.3 and the productivity per man day 31 kg. Average cost of production of 1 kg of fish is worked out at Rs. 8.3 and 1 kg of fish valued at Rs. 8,73. The annual profit of a trawler aranged from Rs. 19 thousand at Mirkarwada to Rs. 32 thousand at New Ferry Wharf. In a period of 5-6 years the owner of a trawler can recover his initial capital investment. The rate of return on capital ranged from 19-22 per cent which is higher than the accounted rate of interest on capital (15%).

Thus, though the catch per trawl unit has been reported decreasing year after year due to increasing trend in number of trawlers in Maharashtra, the units are still running in profit. The rate of return may touch the prevailing institutional interest rate in the coming years if more units enter into fishing. At some centres a few trawlers have been shifting to purse seiners or gillnetters due to uneconomical operation of trawl net. The dependence of trawlers on prawns and other commercially important species still prevails. Second, though there is growing phase of infrastructure and market facilities in the state, the majority of fishermen still depends on private money lenders/traders for availing loan. Specially, the working capital is managed from private parties and thus, the fishermen have a binding of selling their catch to the private agencies. This results in lower-price-realisation of catch and ultimately in less profit margin to the trawl units. At some centres fishermen cooperative societies are coming forward to help the fishermen in financing and marketing the catch also.

Table 5. *Profitability and other economic parameters of trawl fishing in Maharashtra (1987-'88)*

| Items | New Ferry Wharf | Mirkarwada |
|---|---|---|
| Annual catch (kg) | 56,800 | 55,284 |
| Annual revenue (Rs.) | 523,950 | 455,619 |
| Value of 1 kg of fish (Rs.) | 9.22 | 8.24 |
| No. of fishing days | 208 | 217 |
| Per day catch (kg) | 273 | 255 |
| Per day revenue (Rs.) | 2,519 | 2,100 |
| Annual fuel cost (Rs.) | 134,190 | 122,500 |
| Fuel cost per kg of fish (Rs.) | 2.36 | 2.22 |
| No. of man days | 1,872 | 1,736 |
| Production per man day (kg) | 30.3 | 31.8 |
| Crew wage, food & bata (Rs.) | 112,950 | 86,000 |
| Crew expenses per kg of fish | 1.99 | 1.56 |
| Total variable expenses (Rs.) | 341,865 | 276,200 |
| Variable expenses per kg of fish (Rs.) | 6 | 5 |
| Fixed cost (Rs.) | 150,534 | 160,323 |
| Fixed cost per kg of fish (Rs.) | 2.65 | 2.90 |
| total annual operating cost (Rs.) | 492,399 | 436,523 |
| Cost per kg of fish (Rs.) | 8.67 | 7.90 |
| Income over variable expenses (Rs.) | 1.82 lakhs | 1.79 |
| Annual profit (Rs.) | 31,551 | 19,096 |
| Imputed labour of owner (Rs.) | 12,000 | 12,000 |
| Returns to management (Rs.) | 19,551 | 7,096 |
| Pay back period (years) | 4.8 | 6 |
| Rate of return on capital (%) | 22 | 19 |

At both the centres under study, it is reported that quota of diesel provided at concessional rate for the trawl units in a year is not sufficient and the fishermen have to pay market rate to fulfill their requirement. Seeing the increasing tempo of mechanisation and realising the importance of fuel in total operating cost, the government should increase the quota of diesel provided at subsidised rate to the fishermen since the trawl fishery is substantially contributing towards fish export.

# THE FISHING GEARS USED IN THE EXPLOITATION OF MARINE AND BRACKISH WATER FISHERY RESOURCES ALONG TAMILNADU COAST*

The fishery resources of the marine and brackish waters along the Tamilnadu coast have been traditionally exploited by a number of types of indigenous gears. With the gradual increase of the mechanised boats of which 90% comprised of trawlers numbering about 3,000 (*CMFRI Spl. Publn. No. 37, 1987*). Tamilnadu and the Union Territory of Pondichery together contributed an average of 2.5 lakh tonnes of fishes during the period 1985-'89. Both inshore and offshore waters of the extent 16,058 km$^2$ and 7,197 km$^2$ respectively upto 40 fathoms are being exploited at present in addition to the regular fishing in the brackish water areas using a variety of fishing gears. With three geographical divisions viz., Coromandal coast (Chengalpet, Madras, South Arcot and Tanjore districts and the Union Territory of Pondichery including Karaikal), Palk Bay region (Pudukottai and Ramnad Districts) and Gulf of Mannar region (Tirunelveli and south east coast of Kanyakumari districts) having the coast lengths of 350 km, 590 km and 60 km respectively possesses 16% of the Exclusive Economic Zone of the Indian waters.

In 430 fishing villages studied along the coast, comprising a maximum of 21 and 19% in Chengalpet and Ramnad districts respectively traditional fishing with indigenous gears, is the principal occupation of the fishermen population throughout the year employing chiefly the catamarans which constitute nearly 73% of the total indigenous craft. Moreover by landing the mechanised catch in six centres along the coast, Tamilnadu contributes a substantial share of 17% in the marine fish production of India.

A number of indigenous fishing gears have been modified in recent years along the Tamilnadu coast with changes in the net material to facilitate getting better catches. During the last three decades, the synthetic materials, nylon and high density polypropylene (HDP) are increasingly being used for the fabrication of different kinds of nets.

There are no published records on the classification and specifications of the large number of gears operated along the coast. Hence the present account listing the indigenous gear with their prevalent local names in Tamil in the respective geographical divisions along the coast will be of use to those interested in the fishing industry.

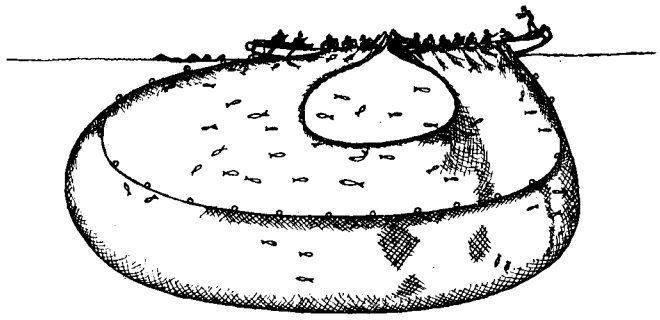


Fig. 1. Encircling net *(Kola Valai)*

The indigenous gears are broadly classified under major heads based on their mode of operation such as bag net, inshore dragnet, encircling net, gill net etc. and the different nets operated at present are listed in addition to the traps and hooks and line which are dealt with separately. Besides, the gears operated in brackish water fishing have also been listed. Additional information collected on the specification of nets like material, dimensions of mesh size, approximate cost of net, mode of operation, important species caught etc. are also being given. The list has been made complete with the inclusion of most of the common brackish water fishing gears in addition to the main nets operated by the mechanised vessels along the Tamilnadu coast.

*Prepared by P. Thirumilu, P. K. Mahadevan Pillai, K. S. Krishnan and P. Poovannan, Madras Research Centre of C. M. F. R. I., Madras-600 008.

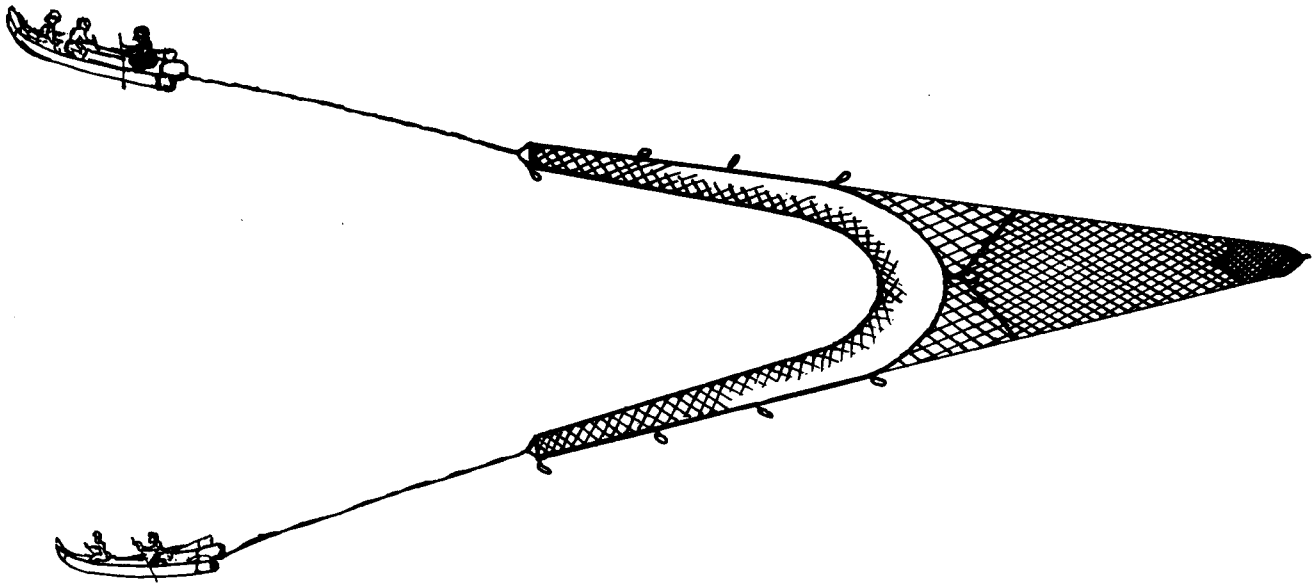


Fig. 2. Bag net *(Thoori valai)*

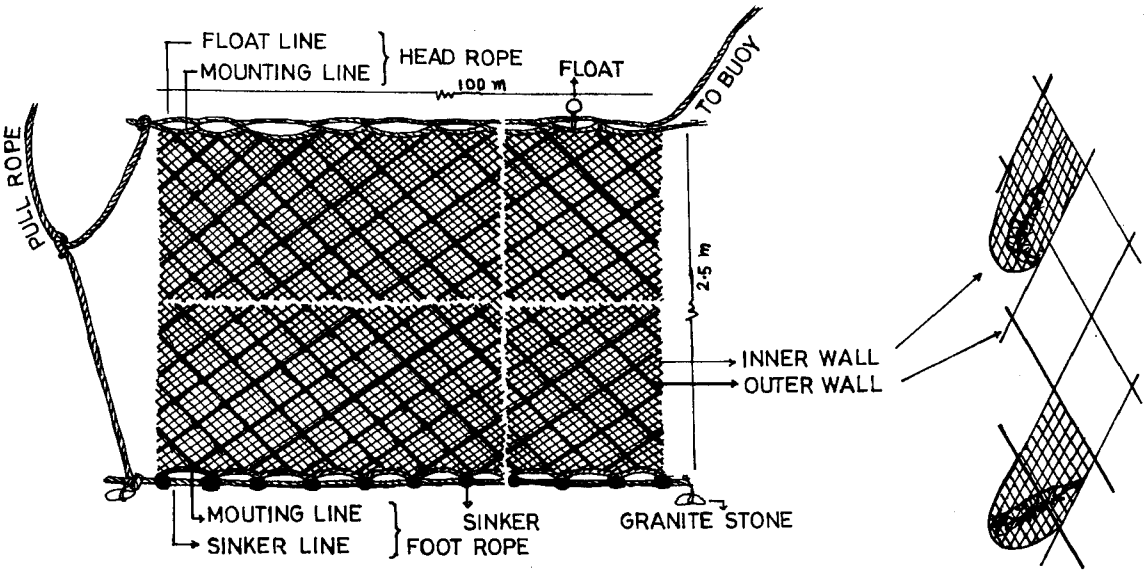



Fig. 3. Trammel net (FAO net or *Mani valai)*

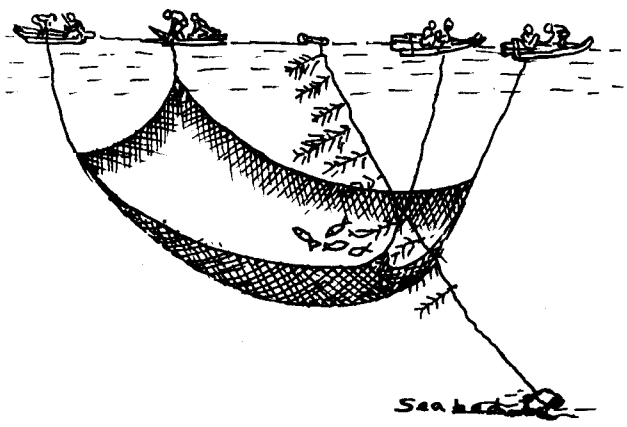



Fig. 4. *Mada valai*

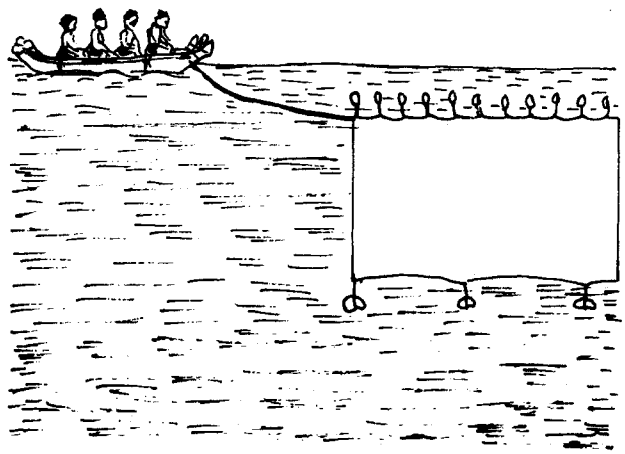


Fig. 5. Drift gillnet (*Vala valai)*

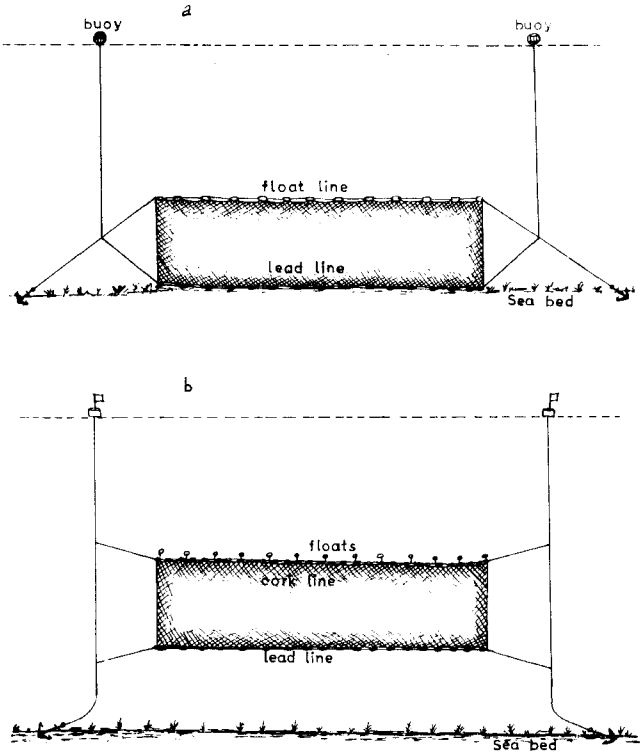
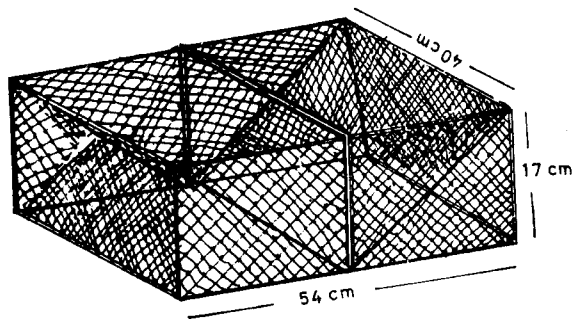



Fig. 6. Set gill nets. a. Bottom set gill net (*Adi valai* or *Motha valai*) b. Midwater gill net (*Eda thanni valai*)



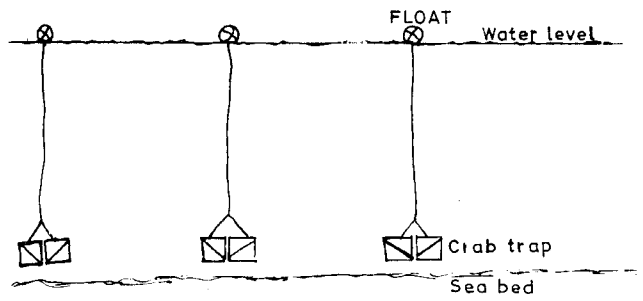




Fig. 7. Traps (*Kodu*)

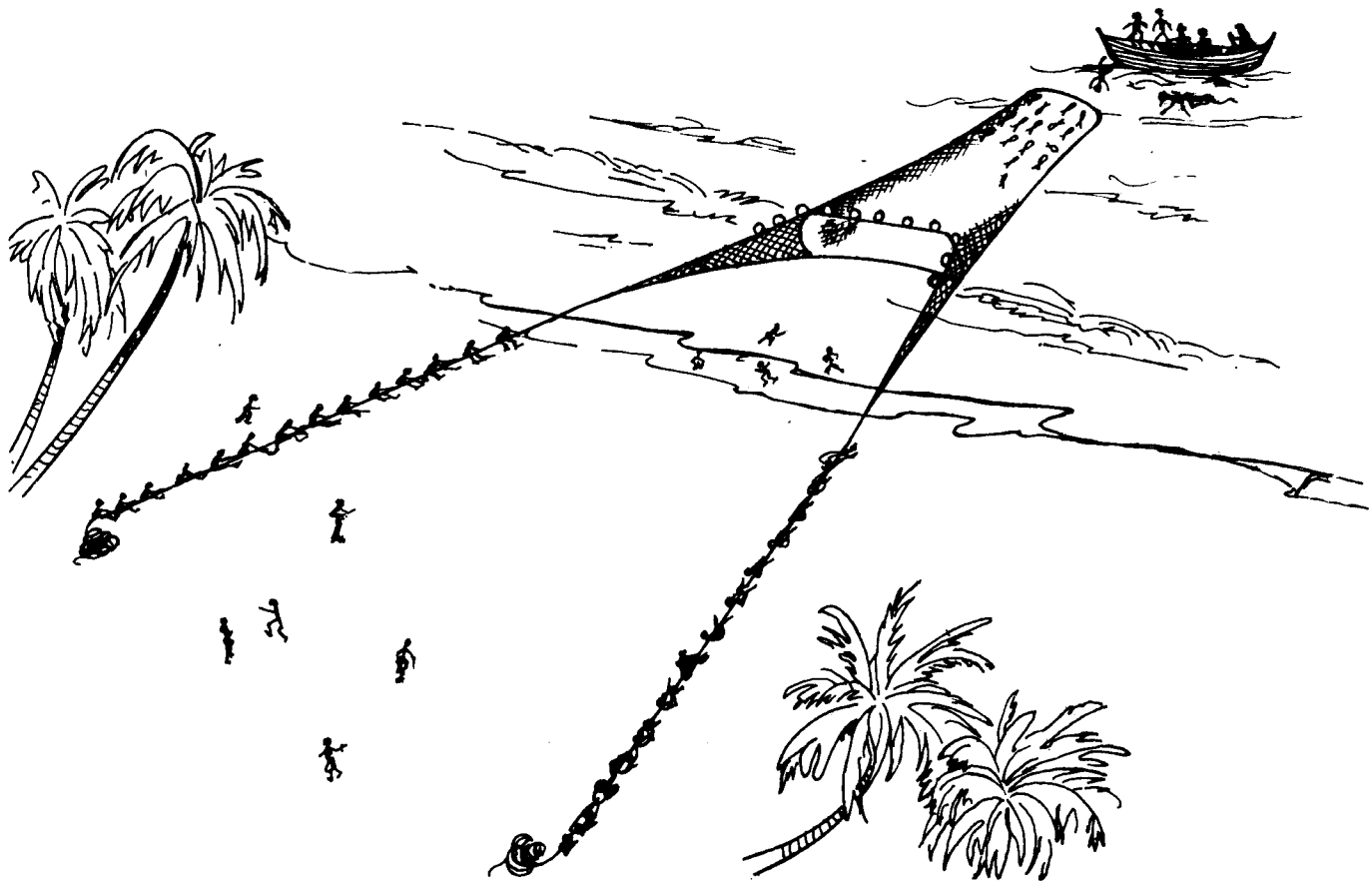


Fig. 8. Inshore drag net (*Kara valai*)

Gear used in sea

| Type of gear | Vernacular name: Coromandal coast | Vernacular name: Palk Bay coast | Vernacular name: Gulf of Mannar coast | Dimensions: Length (m) | Dimensions: Breadth or Height (m) | Dimensions: Size/ of mesh (cm) | Material and colour of net | Approximate cost of net (Rs) | No. of boat/ men required | Mode of operation | Species caught | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | | 3 | | | 4 | 5 | 6 | 7 | 8 | 9 |
| **I. INDIGENOUS GEAR** | | | | | | | | | | | | |
| A. Bag net | Mada valai or Kambi valai or Olai valai | Mada valai or Kambi valai or Olai valai | Mada valai or Kambi valai or Olai valai | 17-20 m | 13-15 m | 6.25cm near the mouth | Nylon (Blue/ Red) | 20,000-25,000 | 4 catamarans and 14 men | Rectangular mouthed bag net with a thick foot rope having two ends and two hauling lines attached to the two loops provided. The net is operated with the help of fish lures locally called kambi which consists of a string of coconut leaves attached to a rope moored in the sea and kept in position with wooden buoys and sinkers. Fish shoals attracted by the shade provided by the kambi crowd around it and the fishermen by clearly manoeuvring, drag the net under the kambi and entangle the shoals. Each net carries more than one dozen kambi for operation. (Fig. 4). | Lesser sardines, Oil sardine, *Hilsa* sp., Carangids, Pomfrets, Mullets, Silver bellies etc. | Season of fishing, January to June |
| | Eda valai | Eda valai | Eda valai | 17-20 m | 13-15 m | ,, | ,, | 20,000 | ,, | Four catamarans boats encircle the shoal and operate the net. No kambi is used during the fishing operations | ,, | January to September |
| | Thuri valai or Chenna kunni valai or Vella valai | Madi valai or karimadi valai or Thallu valai | Madi valai or Illuppu valai | Length of bag, wing and rope are 13 m, 23-25 m and 30-36 m respectively | 10 m | 1.25-2.5 cm | Cotton /Nylon (Brown) | 10,000 | 2 catamarans and 6-8 men | A primitive type of bag net where the mouth is kept stretched by two catamarans sailing in a parallel course at an appropriate distance apart. The net is first shot across the current. The catamarans then turn about, row parallel to each other along with the current and net is dragged along the bottom. (Fig. 2) | Catfish, rays, ribbon fishes, prawns, silver bellies, croakers etc. | January to April |
| | Eru valai | — | — | A small meshed conical bag net with variable diameter | | 2.5 cm | Cotton (white) | 2,000 | 1 catamaran and 4 men | Shot from catamaran but not dragged. The mouth of the bag always faces the shore. The net is designed to be operated at a higher level than the bottom unlike the Thuri valai and is fitted with a number of floats which help to keep it near the surface. | Prawns, shoaling fishes | April to June. Operated only at Nettukuppam near Madras |

| 1 | 2 | | | 3 | | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B. Inshore drag net or Shore seine | Periya valai or Thallu valai | Karaimadi valai or Thallu valai or Karai valai or Illuppu valai | Karaimadi valai or Thallu valai or Marukku valai | Length of bag 1 m, net 12 m, wing 400m | 12 m | 0.65-1.5 cm | Hemp or coir (Brown or black) | 5,000 | 1 boat and 10-15 men | The net consists of two parts viz., a wide funnel shaped madi valai with 2 wings and a rectangular cod-end, madi. The mouth of the bag and the wings are provided with head and foot ropes. Floats are attached to the head ropes at regular intervals. The net is shot near the surf beaten shore from a special boat called Padagu and by rowing round in a circle, a shoal is covered and trapped. Afterwards the net is dragged towards the shore (Fig. 8) | Lesser sardines, carangids, mackerel, *Thryssa*, Seer fishes, ribbon fishes, mullets etc. | Season February to July. Padagu is built with planks without frame or ribs and is will adapted to withstand high waves. |
| | — | — | Vidu valai | Head rope 38.5 m, foot rope 33.25 m | — | 2.5 cm | Nylon/ Cotton (Blue/ white) | 3,000 | 1Padagu 4-5 men | Operation same as above | Carangids, mullets, sciaenids etc. | ,, |
| C. Encircling net | Kola valai | Kola valai | Kola valai | Length of bag 4 cm, wing 15 m | — | 1.0 cm | Nylon (white) | 5,000 | 2 catamarans and 6 men | This is an encircling type of net the mouth of which is kept open with the help of nearly 100 wooden rods fixed to the head and foot rope along with numerous wooden floats attached at regular intervals to the head rope. During the fishigng operation two catamaran units start from the same place carrying half of the net and make a circle by lying the net and come together thus encircling a pelagic shoal. The wing of the net prevents the shoal from scattering. (Fig. 1) | Flying fishes | Season May to July |
| D. Gill nets | | | | | | | | | | | |
| 1. Drift gill nets | Vala valai | Vala valai | Vala valai | 50-60 m | 7-10 m | 3-5 cm | Nylon (white) | 2,500-5,000 | 1 catamaran and 4 men | The net is provided with floats and sinkers as conventional drift nets. The depth of the net is adjusted so as not to exceed 13 m. Most suitable for pelagic species. (Fig. 5C) | Lesser sardines, carangids, *Thryssa*, pomfrets, prawns etc. | Throughout the year except October-December |

| 1 | 2 | | 3 | | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Kanni valai | Kanni valai | Kanni valai | 60-80 m | 5 m | 7.5-10 cm | Nylon (white) | 5,000 | 1 catamaran and 4 men | Operation details same as above | Seer fishes, pomfrets, rays etc. | ,, |
| Ara valai or Pannu valai or Thadachi valai | Pannu valai | Pannu valai | 50-60 m | 5 m | 2.5 cm | Nylon (white) | 4,000-5,000 | 1 catamaran and 2-3 men | Operated as Vala valai | Lesser sardines, carangids, mackerels, *Thryssa*, cephalopods etc. | Throughout the year except monsoon |
| Mani valai or FAO net or Trammel net | Iral valai or Disco valai | Dance valai or Disco valai or Thallu valai | 80-100 m | 2.5-3 m | Inner wall 2-3.5cm, Outer two walls 13.5 cm | Nylon (white or yellow) | 4,000-6,000 | 1 catamaran and 2-3 men | A three-walled net designed for setting at the bottom. It has a fine net of smaller meshes hung loosely between vertical walls of coarser net of much larger meshes so that fish passing through the outer wall carry some part of the finer net through the wall of the outer side and are entangled in the pocket thus formed. Gilling of larger fishes in the outer walls has also been noticed. (Fig. 3) | Mainly operated for prawns but also catch fishes and cephalopods | ,, |
| Kavala valai | Choodai valai | Choodai valai | 50-60 m | 3 m | 2.5 cm | Nylon (green/ Yellow) | 5,000 | 1 catamaran and 2-3 men | Operated as Vala valai (surface drift net) | Sardines | ,, |
| Thattakavala valai | — | — | 50-60 m | 3 m | 4.0 cm | ,, | ,, | ,, | ,, | ,, | ,, |
| Iraga valai | Iraga valai | Iraga valai | 80 m | 4 m | 2.5 cm | Nylon (red/ white) | 5,000-6,000 | ,, | ,, | Sharks, seer fishes, carangids, prawns etc. | ,, |
| — | Sippi valai | Sippi valai | 80-100 m | 5m | 2.5 cm | Nylon (white) | 6,000 | ,, | ,, | ,, | ,, |
| — | — | Nachu valai | Head rope 78-90 m, foot rope 75-90 m | 2.25 m | 8.5 cm, 5 cm, 4.5 cm | ,, | 6,000 | ,, | The net is set in the shallow waters along the coast | Scomberoides spp., carangids, mullets, half-beaks, barracudas, catfish etc. | ,, |
| Kuzhi valai | Kuzhi valai | — | 25 m | 4 m | 3-4 cm | ,, | 2,500 | ,, | ,, | Mullets, barracudas | ,, |

| 1 | 2 | | 3 | | | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| — | Koi valai | — | 50-60 m | 5 m | 3.0 cm | Nylon (white) | 3,000-4,000 | 1 catamaran and 2-3 men | The net is set in the shallow waters along the coast | Pomfrets, barracudas | Throughout the year except monsoon |
| — | Mural valai | — | 50-60 m | 5 m | 2.5 cm | Nylon (white) | 3,000-4,000 | ,, | ,, | Half-beaks, full beaks | ,, |
| — | Kalinga valai | — | 70-80 m | 6 m | 6.5 cm | ,, | 5,000-6,000 | ,, | ,, | ,, | ,, |
| — | Sengani valai | — | 50-70 m | 5 m | 4.5 cm | ,, | 3,500-4,000 | ,, | ,, | *Psammoperca waigiensis* and other perches | ,, |
| — | Kumla valai | — | ,, | 4 m | 5.5 cm | ,, | 3,000-4,000 | ,, | ,, | Mackerels | ,, |
| — | Theraga valai | — | 40-50 m | 3 m | 1.0 cm | ,, | 2,500-3,000 | ,, | ,, | *Allenata forskali* | ,, |
| — | Seriya valai | — | ,, | 3 m | 3.0 cm | ,, | ,, | ,, | ,, | Mullets | ,, |
| Vaval valai | Vaval valai | — | 60-70 m | 4 m | 3.0 cm | ,, | 4,000-5,000 | ,, | ,, | Pomfrets and other fishes | ,, |
| — | Oozhi valai | — | 50-60 m | 4 m | 2.5 cm | ,, | 2,500-3,000 | ,, | ,, | Barracudas | ,, |
| — | — | Kannika valai | 40-50 m | 2 m | 5.5 cm | Nylon (white/red) | 2,000-3,000 | ,, | ,, | *Lethrinus* spp., Mojarras and Catfish | ,, |
| — | Maya valai | Maya valai | 50-60 m | 4 m | 5.5 cm | Nylon (white) | 3,000-3,500 | ,, | ,, | Seerfish, Mackerel, Halfbeaks, etc. | ,, |
| — | Paru valai | Paru valai | ,, | ,, | 14-18.5 cm | ,, | 3,000 | ,, | ,, | Seerfishes, Barracudas, sharks etc. | ,, |
| — | Podi valai | Podi valai | ,, | ,, | 5-7 cm | ,, | 3,500 | ,, | ,, | *Thryssa* spp., Silver bellies and Cephalopods | ,, |
| 2. Set gill net | | | | | | | | | | | |
| a. Midwater gillnet | | | | | | | | | | | |
| Eda thanni valai | Kurukku katti valai | Kurukku katti valai | 40-50 m | 3 m | 3-4 cm | Nylon (white/red) | 3,000-4,000 | ,, | Operated as vala valai in the mid water column. Sufficient floats are attached to the net to maintain the stretch. (Fig. 6b) | Prawns, Crabs and other fishes | ,, |

| 1 | 2 | | 3 | | | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| b. Bottom set gill net | | | | | | | | | | | |
| Adi valai | Kallukatti valai | Kallukatti valai | 50-60 m | 4 m | 3-4 cm | Nylon (white & yellow) | 4,000-5,000 | 1 catamaran and 2-3 men | The net is set at the sea bottom with the help of sinkers attached (Fig. 6a) | Lobsters, crabs and other fishes | Through out the year except monsoon |
| — | Kala valai | — | 40-50 m | 4 m | 12-15 cm | ,, | 3,000-4,000 | ,, | ,, | Threadfins and other fishes | ,, |
| Nandu valai | Nandu valai | Nandu valai | 100-150 m | 2 m | 3-4 cm | ,, | 3,500-4,000 | ,, | The net is made up of 3-4 pieces which are detachable but without sinkers | Crabs and fishes | ,, |
| Singiral valai | Pantha valai | Singiral valai | 60-70 m | 3 m | 4-7 cm | Nylon (white/blue) | ,, | ,, | The net is set at the bottom with the help of sinkers | Lobsters and fishes | ,, |
| Thirukka valai | Thirukka valai | Thirukka valai | ,, | ,, | 8-10 cm | ,, | ,, | ,, | The net is set at the sea bottom with the help of sinkers attached. The buoyancy provided by the floats is sufficient only to maintain the vertical stretch | Exclusively rays | ,, |
| — | Katta valai or Paru valai | — | 80-100m | 5 m | 7.5-15.5 cm | Nylon (yellow/red) | 5,000-6,000 | ,, | ,, | Carangids, seerfishes *Lethrinus* spp. etc. | ,, |
| Motha valai | — | — | 50-60 m | 4 m | 15 cm | Nylon | 4,000-5,000 | 1 catamaran and 3-4 men | ,, | Seerfishes, carangids, tunas, sharks and large perches | ,, |
| Iriga valai | Iriga valai | Iriga valai | ,, | ,, | ,, | ,, | ,, | ,, | ,, | Prawns, carangids, seerfish etc. | ,, |
| E. Hooks and Line | | | | | | | | | | | |
| 1. Hand line | | | | | | | | | | | |
| Kai thoondil | Kai thoondil | Kai thoondil | — | — | — | — | 200-300 | ,, | The fishermen ventures far out to the sea. Usually practiced on rocky banks covered with seaweeds or among coral and sponge colonies. Hook No. 5-14 | Sharks, perches, seer fish, pomfrets, catfish etc. | ,, |

| 1 | 2 | 3 | | | | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ii. Long lines | | | | | | | | | | | |
| Thura thoondil or Ayiramkal thoondil | Thura thoondil or Ayiramkal thoondil | Thura thoondil or Ayiramkal thoondil | — | — | — | — | 1,000-1,500 | 1 catamaran 3-4 men | The line is set as usual with several snoods each containing a hooked bait. Large and small fishes are caught. Hook No. 5 and 6 | Sharks, perches, catfishes, etc. | Throughout the year except monsoon |
| iii. Trolling lines | | | | | | | | | | | |
| — | — | Odu kayaru | — | — | — | — | 1,000-1,500 | ,, | The length of the main line is about 1,000 m to which are attached numerous hooks at regular intervals. Hook No. 1 and 2 | Seer fishes, tunas, carangids, sharks etc. | ,, |
| F. Traps | | | | | | | | | | | |
| a. One entrance trap | | | | | | | | | | | |
| — | Koodu | Koodu | 37.5 cm | 42.5 cm (Width of funnel 15 cm) | 2 cm | Cane | 300 | 1 catamaran 2 men | Usually the traps are set in relatively shallow waters near to the shore at a distance of 100-500 m. Some traps have a bottom of netting over their whole area, while others have only net base in the pocket area (Fig. 7) | Lobsters, crabs, *Lates sp.* and other perches | ,, |
| b. Two entrance Trap | | | | | | | | | | | |
| — | ,, | ,, | 62.5 cm | 43.8 cm (Width of funnel 15 cm) | 2 cm | ,, | 500 | ,, | ,, | ,, | ,, |
| **II. MODERN GEAR** | | | | | | | | | | | |
| a. Trawl net | | | | | | | | | | | |
| 1. Fish trawl | | | | | | | | | | | |
| Meen valai | Meen madi | Meen madi | 32-40 m | 5 m | Wing 8-10cm, belly 5-7 cm, cod end 2-3 cm | Polyetheline or polypropylene | 8,000 10,000 | 1 trawler with 5-7 crew | This net is operated by mechanised boats for conventional trawl fishing in varying depths along the coastal waters for ground fish resources. This is essentially bag type consisting of three parts viz., wings, belly and cod end with varying mesh sizes. During trawling operations, the mouth of the net is kept open by a pair otter boards attached to the wings of the net on either side. | Elasmobranchs, ribbonfish, croakers, prawns, silver bellies, cephalopods, threadfin breams, lizard fishes, carangids, whitebaits catfishes etc. | ,, |

| 1 | 2 | | | 3 | | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2. Shrimp trawl | | | | | | | | | | | |
| | Eral madi | Era madi | Era madi | 30-34 m | 5 m | Wing 7-8 cm, belly 5-6 cm, cod-end 2 cm | ,, | 6,000-8,000 | ,, | ,, ,, | Prawns predominates in shrimp trawl catches | ,, |
| b. Gill net | | | | | | | | | | | |
| 1. Drift gill net | | | | | | | | | | | |
| | Gill net or Gill net valai | Gill net or Pachi valai | Gill net or Pachi valai or Paru valai or Podi valai | 800-1,000 m | 4-8 m | 7-13 cm | Nylon (blue) | 10,000-20,000 | 1 pablo boat 4 crew | The net operated by Pablo type mechanised boats consists of usually 9-12 pieces plied together and is attached with sinkers and floats for maintainig buoyancy. The boats usually leaves their base in the afternoon hours and reach the fishing ground by 20.00 hrs. Setting and hauling time range from 1 to 2 hours whereas soaking time usually range between 3 to 4 hours and land their catches in the next day between 06.00-09.00 hrs. | Sharks, tunas, seerfishes, billfishes, pomfrets, catfishes, carangids, mackerel, perches etc. | Through out the year except monsoon |
| 2. Set gill net | | | | | | | | | | | |
| | Thirukka valai | Thirukka valai | Thirukka valai | 800 m | 10-15 m | 30 cm | ,, | ,, | ,, | Operation same as above but exclusively menat to catch the rays | Rays | ,, |

Gears used in Brackish waters

| Type of gear | Vernacular name | Length (m) | Breadth (m) | Size of mesh (cm) | Material and colour of net | Approximate cost of the net | No. of Crew/ boat required | Mode of operation | Species caught | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| A. Fixed or stationary net | Kattu valai or Oonnu valai or Kalamkatti valai | 15-30 m (Length variable) | Cod end 1-2 cm | | Nylon/ cotton (white) | 2,000-2,500 | 2 Catamarans and 4-6 men | Two lines of nets are hung from parallel series of stakes. The first series projects a foot above the surface of water at high tide while the stakes of the second series are 0.6-1 m longer. A coarse meshed net tied to the first row of stakes lies submerged like a screen and second net is hung from the upper edges of the longer series of stakes. The lower edge of the latter is looped up and tied to the same stakes a little above the water level by a longitudinal pocket like enclosures between the two rows of stakes. Fish encountering the submerged net try to escape by leaping out of the water and are entangled in the curtain of net behind leading to the pocket like enclosures. | Prawns, crabs, mullets, silver bellies, *lates* sp. etc. | Most common net used in the brackish water areas. The net is set during the low tide in the evening hours and hauled in the early morning. Operated throughout the year. |
| | Kol valai | 13 m | 1 m | 3-5 cm | Hemp (brown) | 2,000 | 1 catamaran and 2-3 men | The net is set in the mouth of a channel leading from the backwater to the sea and is tied to the poles driven into the sand. During the high tide, when there is sea water influx, most of the fish groups which show a tendency to swim against the current of water are entangled. | Mullets, *Lates* sp. etc. | Operated throughout the year |
| B. Small drag nets | Konda valai | 30-40 m | 2-3 m | 1-2 cm | Nylon/ cotton (white/ blue) | 2,000 | 4 men | Long and broad strips of net are joined at the sides, the upper and lower margins being connected and distended with spreader sticks. The lower margin of the net is dragged along the bottom of the shallow backwater so as to dislodge fishes that burrow in the soft mud. Several units of this net may be linked together and set in the form of a crescent facing the shore. In this method of collective fishing, the net is not dragged but fishes are driven into | Prawns, crabs, silver bellies, *Gerres* spp. and other small fishes | ,, |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | the area enclosed by the net by dragging and splashing above the water by a scare-line which consists of strips of palm leaves attached to a cord. The crescent shaped arrangement of net closes into a circular enclosure and by joining the two ends of the net fishes inside are enclosed. | | |
| | Bodi valai | 240 m | 4-5 m | 5-6 cm | Nylon | 6,000 | 2 plank-built boats and 20 men | The net made up of two pieces is operated in the same manner as the shore seine and dragged to the shore with the help of more than 15 men. Commonly operated in the Pulicat Lake | Prawns and other fishes | Throughout the year |
| C. Gill Nets | | | | | | | | | | |
| | Kalla valai | 60-80 m | 1 m | 7.5 cm | Nylon/ cotton (white/ yellow) | 4,000 | 1 canoe 4-6 men | Usually operated in the very shallow waters during the early hours of the day. Both ends of the nets are free and hence the net is slack and swayed by the current. Fishes are entangled by gilling. In Ennore back-waters near Madras, the net is also used as a stake net. The ends of net tied to two poles are not kept tightly stretched and fish are driven towards the net with a scare-line. | Threadfins, mullets etc. | Throughout the year |
| | Koduva valai | 12 m | 4 m | 12.5-13.75cm | Nylon/ cotton (white/ yellow) | 3,000 | 5 boats 20-40 men | The structure of the net is similar to the Konda valai. 50 units are employed in collective fishing, arranged end to end in a semicircular way in shallow waters. Fishes are driven into the semi circular wall of net by dragging a scare-line, splashing above the water level. | *Lates* sp., *Etroplus* and other perches | ,, |
| | Ara valai | 40-50 m | 5 m | 3 cm | Nylon/ cotton (white/ blue) | 2,000 | 1 catamaran and 2-3 men | Four pieces of net tied together are provided with floats and sinkers as in drift nets. The net is operated at a maximum depth of 10 m. Generally operated in night during new moon period. | Prawns, mullets, *Gerres* spp., crabs and small percoid fishes. | ,, |
| D. Pouch trap | Iruga valai or Eanthu valai | Circum-ference of mouth 30-40 m | | 5 cm | Nylon/ cotton (white/ yellow) | 4,000 | 2 boat 4-6 men | A portion of the mouth of the net is kept floating on the surface while the opposite portion is fixed near to the bottom. After some time the lower edge is lifted from the bottom and brought into contact with the elevated head rope, enclosing the fish inside. | Mullets | Other 'pouch traps' used are Sinna iriga valai, Kal valai and Thattu valai operated throughout the year |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Siru valai | Circum-ference of mouth 25 m | | 2.5 cm | Nylon/ cotton (white) | 3,000 | 1 catama-ran 2-3 men | Wide mouthed net with a shallow pouch and a small bag-like cod end attached to the middle of the hinder end. 30-40 wooden floats are attached attached to the head-rope, but without sinkers. The net is set tying to two poles driven into the bed of the estuary. Two persons keep the ground rope at the bottom while others by splashing and dragging a scare-line drive the fish towards the mouth of the net. | Prawns and other small fishes | Throughout the year |
| E. Hoop net | | | | | | | | | | |
| | Tookku valai | Diameter of ring 5 m | | 7.5 cm | Nylon/ cotton (yellow) | 300-400 | 1 catama-ran and 3 men | Shallow conical bag suspended from an iron ring. The bait is tied across the mouth. The net is lowered to the bottom of the water and taken after an interval of few hours. | Crabs and other fishes | Throughout the year |
| F. Cast net | | | | | | | | | | |
| | Veechu valai or Vishiru valai | Circum-ference of mouth and height of cone variable | | 1.25 cm | Nylon/ cotton (white) | 600 | 1 boat 2-3 men | Conical net with 20 radial chords attached to the lower circular margin of the net with beads of iron or lead as weights to sink the net. Operated in the same manner similar to other cast nets. | Prawns and other fishes | Eral valai, Sama valai, Thoni valai, and Mani valai are different names for cast nets, which differ only in the size of mesh. Cast nets are also being operated along the coastal waters. |
| G. Hooks and Lines | Tamani kayaru | Length of line 200-300 m. Thickness 0.6 cm. Snoods 45 cm attached to every 2 m length. | | | Poly-ethylene and nylon | 200-300 | 1 catama ran and 2-3 men | Line is kept in buoyancy with light wooden floats. The two ends are fixed to two bamboo poles driven into the bottom. Prawns are used as bait | Perches, catfish etc. | — |

Note :- In addition to the above, a primitive method of fishing prawns and small fishes in shallow brackish waters is by searching and catching by hand locally called 'Kayil pidithal' is prevalent in some areas along the Tamilnadu coast. Fishing in the night time with the help of torch light is common especially in the Pulicat estuarine regions. Locally called sudu, the implement consists of a funnel shaped basket with an opening at the narrow end. Fishes blinded by the light are trapped by placing the basket over them and collected either by hand or spearing.

# BULL'S EYE - AN EMERGING TRAWL FISHERY RESOURCE ALONG DAKSHINA KANNADA COAST*

## Introduction

In recent years, the awareness for diversification of fishing activity has been given priority in order to augment the marine fish production in our country. The shrimp oriented export industry has adversely affected the inshore fishery resources, so much so, further increase in marine fish catch can be achieved only through the extension of fishing activities to deeper waters for exploiting the non-conventional demersal resources.

Priacanthid or 'Bull's eye' has been identified as one of the major demersal resources suitable for such exploitation. Exploratory surveys conducted by Fishery Survey of India have indicated an exploitable stock of 40,000 tonnes of this resource in the Indian EEZ (Sudarsan *et al.*, 1988, *Bull. Fish. Surv. India*, No. 18). Recent studies (Anon., 1991, *FSI Annual Report*, 1990-'91) indicate their occurrence from 30 to 500 metres, but the maximum abundance has been reported to be in the 100 to 200 metre depth zone off the west coast. Based on surveys done by FORV *Sagar Sampada*, Bande *et al.* (*Proc. First Workshop Scient. Resul. FORV Sagar Sampada* 1990, 109-114) have reported the abundance of priacanthids along the shelf at 20-262 m and according to them this group formed 42.5% of the total trawl catch upto 100 metre depth.

Till date, priacanthids are not reported to form any substantial portion of the inshore trawl fishery from any part of the west coast. However, Appa Rao (1984, *Indian J. Fish.*, **31** : 380-382) reported an average annual landing of 236 tonnes of *Priacanthus* spp. by industrial shrimp trawlers operating off Visakhapatnam. Recently, Rao *et al.* (*The Second Indian Fisheries Forum, Mangalore, 27-31 May, 1990, Abstract*) reported the occurrence of *Priacanthus* spp. in the landings by the medium sized trawl units operating along the mid-shelf off Mangalore. Since 1979, trawl units operating from Mangalore have ventured to exploit deeper areas (upto 60 m) in comparison with the smaller units which seldom operate beyond 25 m depth zone. The former fishing fleet has been found to exploit unconventional resources including priacanthids. In order to enhance our current knowledge on the fishery of this resource, some aspects of the biology, seasonal abundance, migratory pattern and the future prospects of this new resource along Dakshina Kannada coast are presented here based on data collected during 1986-'91.

## Fishery

In the year 1990-'91, Priacanthids formed 3% of the trawl landings from Mangalore and Malpe. 'Disco meenu' (local name) which has been occurring in commercial trawl catches since 1979 formed on an average 3.3% of the trawl catch, consequent to the introduction of medium trawlers (9-14 m OAL) at Mangalore (Rao *et al.*, *op. cit.*). The operation of these trawlers commences during Novermber and lasts till May. These boats are locally known as 'night boats' as they are engaged in fishing during night as well (Sukumaran, 1985, *Mar. Fish. Infor. Serv., T & E Ser.*, No. 65 : 7-12). They usually carry two types of nets, viz., a shrimp trawl with 16-28 m head rope length and relatively larger fish trawl with 25-32 m head rope length. These boats have fish holds to keep their catches in ice and this facility enables them to stay out at sea for 3 to 5 days at a stretch by which they usually make substantial saving on fuel expenditure. The area of operation extends from Kasaragod to Malpe in depth belts of 30-60 m.

## Trend of fishery

Priacanthids, on an average, formed 1.5% of the catches of medium trawlers during the period 1986-'87 to 1990-'91. The annual catch varied from a maximum of 603 tonnes in 1990-'91 to a minimum of 59 tonnes in 1989-'90. Maximum catch rate of 23.5 kg/unit has been recorded during 1990-'91. Enquiries revealed that maximum catch of this resource was obtained between 30 and 40 m depth zone.

Abundance was maximum during the pre-monsoon moths with February recording maximum catch rate. However, good catch rate was also seen in the month of January (post-monsoon).

*Prepared by P. U. Zacharia, K. Sunilkumar Mohamed, P. P. Pillai and C. Purandhara, Mangalore Research Centre of CMFRI, Mangalore-575 001.

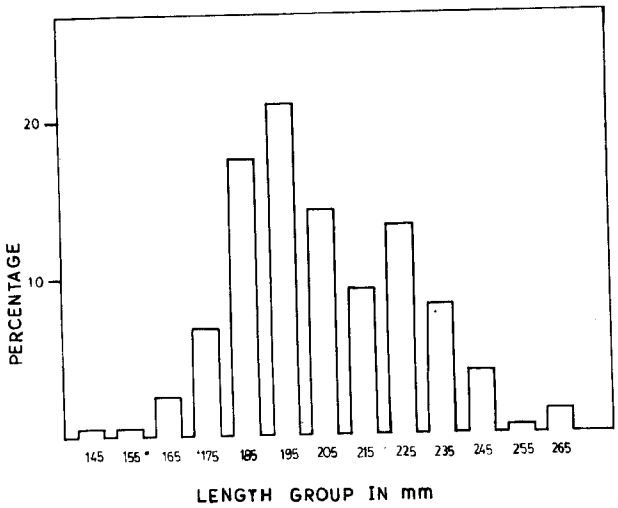



Fig. 1. Size frequency distribution of *Priacanthus hamrur* in trawl catches at Mangalore.

## Biology

The catch was constituted mainly by *Priacanthus hamrur* and to a lesser extent by *P. cruentatus*. The size of *P. hamrur* ranged from 145 to 265 mm with modes at 195 and 225 mm (Fig. 1). Females of *P. hamrur* were found to dominate in the catches (sex ratio - F:M = 1.6: 1.0). Maturing male and female fishes were abundant in samples examined. Mature ones contributed 37% of the female population during May. Stomachs examined during the month of May showed less feeding intensity as fishes with empty stomachs were more abundant in the samples (42%). The gut content analysis showed the highly carnivorus nature of priacanthids (Fig. 2). The same has been reported by Appa Rao (*op. cit.*). *Therapon* sp. which is a shallow water fish is found in small quantities in the guts of these fishes.

## Remarks

Although deep sea fishing has been advocated as the means for increasing fish production, the economic feasibility of such operations are yet to be established. However, Rao *et al.*, (*op. cit.*) have shown that with suitable modification in the existing inshore trawl fleet, the unexploited areas in the mid-shelf can be utilized economically. Further, the use of both shrimp and fish trawl nets by these boats has partly diverted the emphasis of the fishery from shrimp oriented to shrimp-finfish oriented one. This is a positive trend towards diversification of fishing effort.

The surveys done by FSI in 30-50 m depths in the west coast have shown that priacanthids on an average formed 7% of the total trawl catch (Anon., 1991, *FSI Annual Report* 1990-'91). Moreover, Sudarsan *et al.* (*op. cit.*) has estimated the potential of the resource from west coast as 29,000 tonnes. However, Bande *et al.* (*op. cit.*) indicated the abundance of priacanthids along west coast and estimated their potential from these waters as 1.88 lakh tonnes. Nevertheless, it is surprising to note that the traditional inshore trawl fishery has not been able to exploit this abundance. This could be mainly due to the fact that the traditional fishery is confined to 30 m depth and also due to the differences in gears used by these boats and the exploratory vessels. Though medium sized units operate upto 60 m depth off Mangalore, the average percentage occurrence of priacanthids during 1989-'91 is only 1.5%. Philip and Joseph (1988, *Proc. Sem. Problems and Prospects of Marine Fishing and Fish Processing in Karnataka*, 19-21 June, 1989 : 28-35) also reported the absence of priacanthids in smaller survey vessels (17.5 m) operated in 20-60 m depth off Karnataka coast, whereas they formed 10.5% of the total catch in larger vessels operated in the same area. Hence to exploit the available *Priacanthus* stock in the area to the maximum extent, further modifications of the gear seems necessary.

During the period of study, maximum catches were observed in 1986-'87 and 1990-'91 and the intervening period showed very poor landings of priacanthids. Naik (*Seafood Export Journ.*, **22** (12) 1990, 16-18) reported the decreasing abundance of priacanthids in FSI survey vessels upto 1989 and remarked that this could probably be due to the exploitation of this resource by chartered vessels in the Indian EEZ.

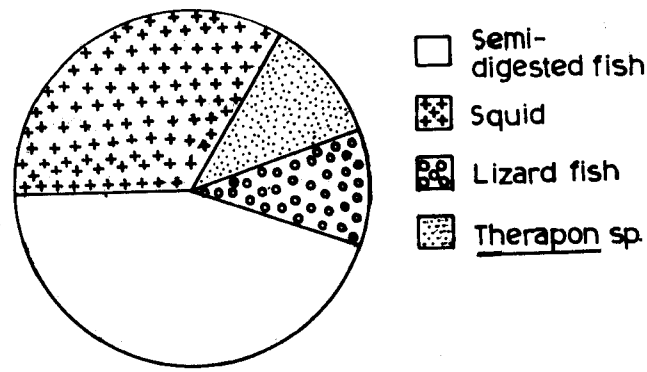



Fig. 2. Percentage occurrence of different food items in the stomach of *P. hamrur*.

Vijayakumaran and Philip (*J. mar. biol. Ass. India*, **32**, 1990, 177-186) have reported the abundance of priacanthids in 200-500 m depth zone during July (monsoon) and in 100-200 m depths during September-November (post-monsoon) off the north Kerala-Karnataka coast. The present study shows peak abundance in the inshore areas (upto 60 m) during February-March (pre-monsoon) and moreover 37% of female fishes were in mature state during pre-monsoon period. Although, Bande *et al. (op. cit.)* have observed the maximum abundance of priacanthids in the south west coast during August, no mention has been made on their depth-wise seasonal abundance. Earlier Vijayakumaran and Naik, (*FSI sp. publ. No. 2*, 1988, 106-119) inferred a southward shallow water migration of *Priacanthus* spp. during pre-monsoon months for breeding purpose. It is apparent that priacanthids along The Karnataka coast undertake an onshore migration from deep waters (200-500 m) in the monsoon period to shallow waters (20-60 m) in the pre-monsoon months for breeding occupying relatively deep areas (100-200 m) during post-monsoon period. Since the deeper areas (200-500 m) in the north Lakshadweep Sea (Eli Kalpeni) are a well known feeding ground for fishes like tuna due to the prevalence of young squids and other forage items (Silas and Pillai, 1982, *CMFRI., Bull. No.* 32), it can be assumed that *Priacanthus* also undertake migration from inshore areas to deeper waters for feeding purposes.

Bull's eye has excellent export opportunities in South East Asian countries (Joseph and John, 1986, *Sem. Potential Marine Fishery Resources, 23 April 1986, CMFRI*). Dhananjaya *et al.* (*Seafood Export Journ.*, 16 (10), 1984, 1-2) analysed the food value of Bull's eye and recommended them as good table fishes. Of late, these fishes are well accepted in markets in Kerala mainly due to the marketing strategy adopted by the local fish vendors (Naik, 1990, *op. cit.*). They are sold as young red snappers (local name:- 'Chemballikutti'). Therefore, the prospects of developing an internal market for bull's eye also appear to be remunerative. From the available account it is apparent that there is vast scope for exploitation of this resource and if properly planned and executed, this will not only help to increase marine fish production, but also help in augmenting marie fish exports of our country.

## INVASION OF CLAMS IN PRAWN CULTURE FIELDS : EFFECTS ON THE GROWTH OF PRAWNS*

The black clam, *Villorita cyprinoides* var. *cochinensis* is distributed in the backwaters along the west coast of India, from Goa to Kerala. It is a euryhaline species thriving in salinities ranging from 30 ppt to near freshwater conditions. It is also known to survive in a wide variety of ecosystems. The Vembanad Lake supports a rich fishery of clams especially the black clam, with an annual production of about 25,000 tonnes.

Traditional prawn farming in the Vypeen Island of Kerala is carried out in two types of ecosystems namely, seasonal fields and perennial fields. Presently around 1,200 ha of brackish-water area is being used for prawn culture practices. The prawn production by this extensive culture method is dependent solely on natural productivity of the culture system.

The invasion of black clam in large numbers in the prawn culture systems has been noticed of late in Vypeen Island and has in certain cases created panic among the prawn farmers. This is turn has resulted in a drastic decline of the lease value of the infested culture systems during 1986-'87. A survey conducted in Vypeen Island has revealed that the clams were absent in most of the perennial systems and coconut groves in the central region of the island from Narakkal to Kuzhippilly.

Bivalves being filter-feeders, harvest large amount of phytoplankton from the overlying water diminishing the overall productivity of the ecosystem. Clams are also known to have profound influence upon sedimentation and on the fluxes of dissolved nutrients and gases across the sediment-water interface. Naturally clam populations in the prawn culture systems influence the processes and properties of aquatic ecosystems.

*Prepared by Saji Chacko and M. M. Thomas, Central Marine Fisheries Research Institute, Cochin - 682 031.

Traditional prawn farming is an important occupation among the coastal farmers of Vypeen Island. Any factor resulting in the decrease of production from the culture systems will adversely affect the fisherfolk of the area. With this in view, it was decided to conduct a study to assess the impact of the invasion of clams into the prawn culture systems. This report is based on the results of a short-term experiment conducted from July to October, 1987 in a perennial prawn culture field having an area of 4 ha. Invasion of black clams was observed in this pond.

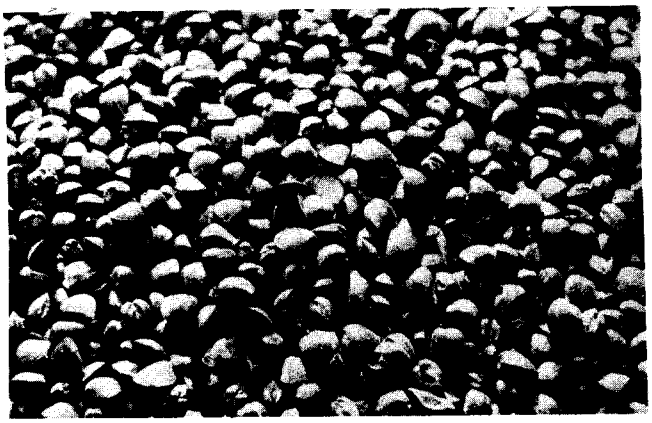


Fig. 1. The black clam, *Villorita cyprinoides* var. *cochinensis*

The experiment was done using two identical pens with five compartments. One pen was placed over a clam bed and the other in an area devoid of clams. The pens were stocked with seeds of the white prawn, *Penaeus indicus* (5 Nos/$m^2$) and the growth rate was monitored for a period of 90 days. Supplimentary feeding was not done during the study period. The water quality and primary production in the pens were monitored during the study. Observations were made on the food and feeding habits of prawns in the culture system.

The culture experiment showed that the growth of prawns was adversely affected by the presence of clams. The prawns with an average initial size of 34.7 mm attained 102.0 mm (6.78 g) in the pen devoid of clams whereas it attained only 93.6 mm (5.07 g) in the pen with clams in a period of 90 days. Among the hydrographic parameters studied there was an increase in the levels of dissolved inorganic nitrogen, whereas there was a decrease in the levels of dissolved oxygen, pH, calcium and primary production in the pen placed over the clam bed. These differences were more marked in the water just above the substratum compared to the surface water of the pens. However, phosphorus levels remained the same.

The distribution of clams in the pond was patchy forming distinct beds in sandy areas of the pen. Clams were absent in the loose muddy substratum. The maximum density of clams observed in the pond was 224 clams/$m^2$ and 150 clams/$m^2$ in the pen placed over the clam bed. The clams had a size range of 30-40 mm during July, 1987. An inverse relation was observed between the density of clams and that of other benthic organisms like polychaetes and amphipods. The density of other macrobenthos was lower in clam beds than in areas devoid of clams. Studies on the food and feeding habits of the prawns showed that the prawns did not consume clams to any considerable extent (Index of preponderence 0.39) inspite of their abundant occurrence in the pond.

The presnt study confirmed that the growth of prawns was adversely affected by the presence of clams. However, the difference in water quality parameters in relation to the presence of clams might not have had any major influence on the growth of prawns in the present study, as the actual differences between the two pens were not considerable. This less marked difference in surface water quality parameters may be attributed to the low density of clams and also to the mixing up of water between the pens. It has been observed that the density of benthic organisms was less in places where clam density was high. The reduction in the density of organisms, the prime food of prawns and the low primary

Fig. 2. Shells of the black clam harvested from a perennial culture field. The pond sluice and canal in background.

production caused by the clams may have resulted in reduced growth of prawns. The effect is more pronounced here as no supplimentary feed was provided and the prawns had to depend only on natural food in the pond.

Though clams may have an indirect adverse effect on the prawns in traditional culture systems as in the present study, they can be beneficially reared together with prawns by providing supplimentary food and careful manipulation of the density of clams. Clams do not compete with prawns for food because clams are filter-feeders depending on suspended organic particles, phytoplankton and bacteria. They form a group of the most efficient primary consumers low in the food chain. Eutrophic condition is characterised by the dense phytoplankton populations and associated depletion of dissolved oxygen levels during early morning hours. In such situations, clams can improve the oxygen regime, avoiding dangerous fluctuations in the dissolved oxygen levels by controlling phytoplankton and bacterial density efficiently owing to their high clearance rate. Clams may also improve the fertility status of the system by returning nutrients from soil through bioturbation and remineralization. Thus, it points to the polyculture of prawns with clams adopting careful management practices.

## BUMPER TRAWL NET CATCHES OF 'KARIKKADI' PRAWNS (*PARAPENAEOPSIS STYLIFERA*) CLOSE TO THE COAST OF KARWAR*

Along the Karnataka coast, Mangaore, Malpe, Tadri and Karwar are the centres from where prawns are fished in fairly good quantites throughout the year. It is estimated that around 4 ot 5 thousand tonnes of prawns are landed in this state annually. The popularly known 'karikkadi' prawn, *Parapenaeopsis stylifera* is one of the commercially important species caught in this region. This species is caught exclusively from the inshore waters. In the first fortnight of September, just after the cessation of the south west monsoon by the end of August 1991, a sudden spurt of unusually heavy 'karikkadi' landings was noticed along the Karwar coast: the peak period being 5th to 9th September.

At Karwar, 380 tonnes of prawns were landed between 5th and 21st September, 1991, with a catch rate of 227.0 kg/unit. This heavy landing has come from 1,674 trawler units. Maximum landing was noticed between 5th-9th September when 700 trawler units landed 227 tonnes of prawns worth Rs. 46.5 lakhs. The number of trawler units increased as trawlers from Mangalore, Malpe, Tadri and Goa also ventured in this area very close to the shore in about 6-8 m depth of water near rocky islands. However, due to religious festivals as well as responding to the call of the boat union, the fishing operations were suspended on 11, 12, 17 & 18th of September.

At Tadri, heavy landings of prawns were observed between 12th and 16th September. The catch/boat varied from 46 to 393 kg/boat. As the industry could not cope up with the unexpected heavy landings by providing storage and transport facilities, the fishing operations were suspended from 17th to 21st. Further, spurt in catches in Kerala and Goa reduced the fishing intensity for prawns in Karwar and Tadri. The catch/unit effort at Karwar decreased from 891 to 65 kg and that of Tadri from 393 to 46 kg. Details regarding the catch/unit effort of both the areas are presented in Fig. 1.

Although prawns were mainly caught by bottom trawl nets, it is worth mentioning here that a few purse seines were able to catch at a rate of 2 tonnes per purse seine during this period.

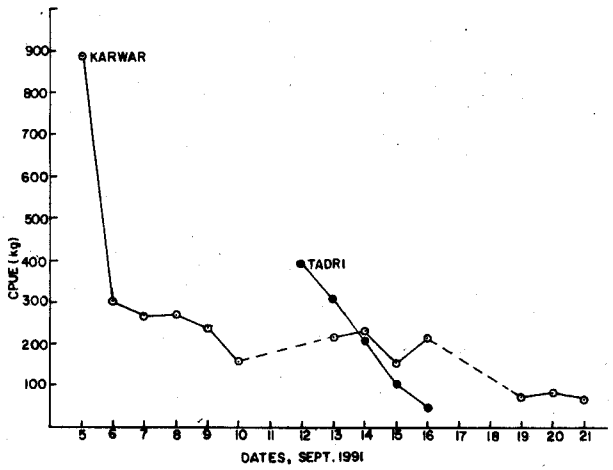



Fig. 1. Catch pe unit effort in kg at Karwar and Tadri by trawl nets (Discontinuous lines indicate no fishery).

*Prepared by V. S. Kakati and C. K. Dinesh, Karwar Research Centre of CMFRI, Karwar.

Hydrographic parameters observed at Karwar waters (6-8 m depth) during the period are as follows.

| Parameters | Surface | Midwater | Bottom |
|---|---|---|---|
| Temperature | 27°C | 27.5°C | 27.5°C |
| Salinity | 15.77‰ | 23.96‰ | 25.86‰ |
| Oxygen | 3.69 ml/l | 2.88 ml/l | 2.88 ml/l |

The prawns ranged in size from 84 to 121 mm (males 84-101 mm and females 92-121 mm). The sex ratio registered more females (72%) than males (28%). Among the females 32% showed gonads in different stages of maturity (8% in stage II, 13% in stage III and 11% in stage IV). The rast were in spent condition.

# ON AN UNUSUALLY HEAVY CATCH OF BLACK POMFRET, *FORMIO NIGER* BY PURSE SEINE ALONG DAKSHINA KANNADA COAST*

The Pomfrets, *Formio niger*, *Pampus argenteus* and *Pampus chinensis* called locally 'Maanji' in Kannada are exploited by purse seines, gill nets and trawl nets and together contribute 0.5-1.0% to the total marine fish production of the Dakshina Kannada district. Among these *F. niger* is the most important, forming more than 80% of the total pomfret catches. The fishing season for the species extends from September to December and February-March, the peak landings being generally in October/November. Occasional heavy landings of a single species of pomfret, particularly *F. niger* by purse seines (Fig. 1) is a common feature in this area. Such heavy catches amounting to 207 t, 161 t and 377 t were recorded at Malpe during October, 1986, September, 1987 and November, 1990 respectively and 855.5 t at Mangalore in October, 1990 (Fig. 2). In all these cases, the bumper catches were obtained only for a short period of about a week and ended abruptly as seen in November, 1990 at Malpe or sometimes continued for another week with the catches decreasing gradually as that observed at Mangalore in October, 1990.

The catch details of *F. niger* recorded in October '90 at Mangalore and in November '90 at Malpe are given in Table 1. In the first week of October '90 at Mangalore, the total estimated catch was 747.7 t with cpue at 1,271.61 kg. At Malpe, it was 372.8 t and 621.38 kg during first week of November, '90. In the second week, the catch decreased considerably to 92 t with cpue

Fig. 1. A purseseine boat showing bumper catch of *F.niger*.

TABLE 1. *Catch details of* F. niger *recorded in October '90 (Mangalore) and in November '90 (Malpe)*

| | Mangalore | | | Malpe | | |
|---|---|---|---|---|---|---|
| Month | October, '90 | | | November, '90 | | |
| Period of occurrence | Effort | Catch (t) | cpue (kg) | Effort | Catch (t) | cpue (kg) |
| First week | 588 | 747.7 | 1271.61 | 600 | 372.8 | 621.38 |
| Next week | 525 | 92.0 | 175.24 | 222 | no catch | - |
| Total for the month | 2358 | 855.5 | 362.83 | 1225 | 377.3 | 308.03 |

*Prepared by : G.M. Kulkarni, S. Kemparaju, **Madan Mohan, Uma Bhat and C. Purandhara, Mangalore Rearch Centre of CMFRI, Mangalore-575 001. ** Present address : National R. C. on Cold Water Fisheries (ICAR), Haldwani, Nainital (U.P.).

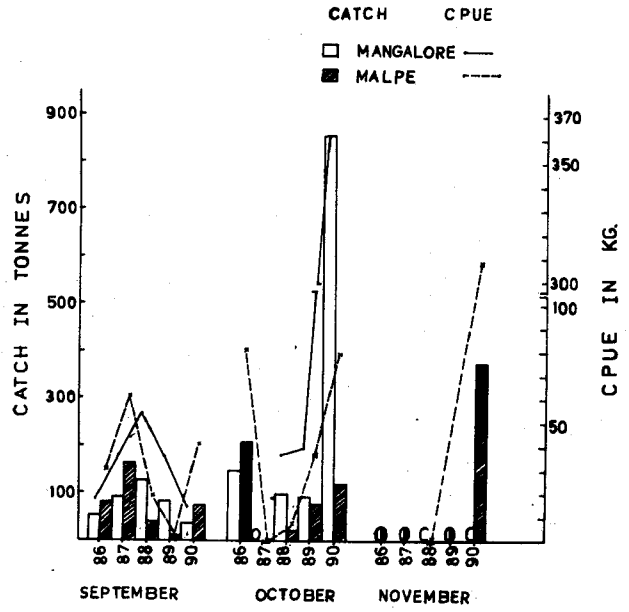



Fig..2. *F.niger* landings during September-November (1986-1990).

at 175.24 kg at Mangalore and there was no landing recorded in November at Malpe. The quantity of pomfret catch ranged from 1.2 t to 3.5 t in each boat.

**Price structure**

Due to heavy landings, throughout the first week of October '90 at Mangalore, the price of *F. niger* fluctuated between Rs. 10/- and Rs. 7.5/ per kg. At Mangalore the total value of the catch in the first week was estimated to be Rs. 63.5 lakhs. Though there was a decrease in the catch during the second week, the price of fish remained as in the first week and the value realised from the landings was Rs. 7.8 lakhs. At Malpe on 7-11-1990 the auction rate varied from Rs. 14,000/- to Rs. 40,000/- per boat catch depending on the quantity. This almost comes to Rs. 15-17 per kg fish and the total estimated value realised on 7-11-1990 alone was Rs. 11.0 lakhs and the week's total was Rs. 52.2 lakhs. All the pomfret catch was transported to Kerala by trucks in fresh condition packed with ice.

**Length-weight relationship of *F. niger***

The size of *F. niger* sampled on 7-11-1990 at Malpe from purse seine ranged from 270 to 480 mm. The major mode was at 360 mm which contributed to 21.6% of the pomfret catch. There were three secondary modes at 330 mm (9.8%), 390 mm (5.8%) and 420 mm (3.9%) (Fig. 3). The weight of individual fish ranged from 385 g to 1,600 g.

The average calculated weights for different length groups are given in Table 2.

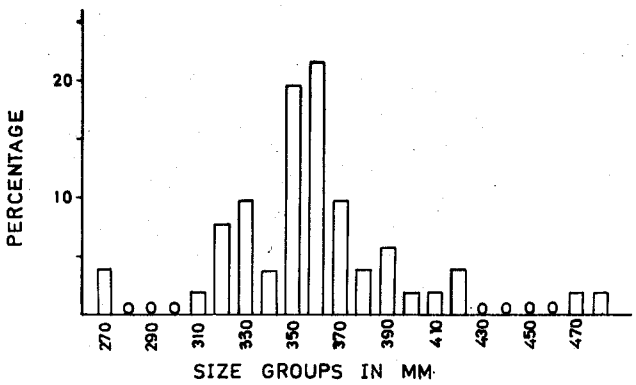



Fig. 3. Size frequency distribution of *F.niger* (Malpe).

TABLE 2. *Average calculated weight for the different length group*

| Length group (mm) | Average weight (g) | Length group (mm) | Average weight (g) |
|---|---|---|---|
| 120 - 129 | 46.96 | 310 - 319 | 529.00 |
| 130 - 139 | 57.46 | 320 - 329 | 574.10 |
| 140 - 149 | 69.31 | 330 - 339 | 621.49 |
| 150 - 159 | 82.55 | 340 - 349 | 671.22 |
| 160 - 169 | 97.25 | 350 - 359 | 723.34 |
| 170 - 179 | 113.47 | 360 - 369 | 777.89 |
| 180 - 189 | 131.26 | 370 - 379 | 834.90 |
| 190 - 199 | 150.67 | 380 - 389 | 894.43 |
| 200 - 209 | 171.77 | 390 - 399 | 956.50 |
| 210 - 219 | 194.59 | 400 - 409 | 1021.17 |
| 220 - 229 | 219.20 | 410 - 419 | 1088.47 |
| 230 - 239 | 245.64 | 420 - 429 | 1158.44 |
| 240 - 249 | 273.97 | 430 - 439 | 1231.11 |
| 250 - 259 | 304.23 | 440 - 449 | 1306.54 |
| 260 - 269 | 336.47 | 450 - 459 | 1384.76 |
| 270 - 279 | 370.73 | 460 - 469 | 1465.81 |
| 280 - 289 | 407.08 | 470 - 479 | 1549.72 |
| 290 - 299 | 445.54 | 480 - 489 | 1636.53 |
| 300 - 309 | 486.16 | | |

# A NOTE ON THE RARE SNAGGLE TOOTH SHARK, *HEMIPRISTIS ELONGATUS**

The snaggle tooth shark also known as fossil shark, *Hemipristis elongatus* is a very rare species found along the continental shelf of Indian coasts at a depth of upto 30 m. At present it appears to be the only living species under the genus *Hemipristis*. The shark attains a length of 218 cm in Indian waters. The shark is caught in gill net fisheries along our coasts. The meat is used fresh for human consumption and fins for export.

Fourteen sharks including six males and eight females were collected from gill net catches off Madras coast over a period of one year (Table 1). Two female sharks were found to be pregnant and three with full stomach. The sizes of sharks ranged from 130 to 220 cm.

*H. elongatus* is a live-bearing species, the embryos being nourished by yolk-sac placenta. In the present case the embryos were in advanced stage of development and exactly similar to the adult except in the development of teeth. A litter of five embryos was taken from one female shark and six embryos were taken from one female shark and six embryos from another female shark. Particulars on the total length, sex and umbilical cord of the embryos are given in Table 2. The second dorsal is conspicuously black tipped, a character which becomes fainter and ultimately disappears as the shark grows to adult. The umbilical cord is provided all along its length with closely set small hair like protuberances from the point of attachment with the foetus to the placenta (Fig. 1). There is reason to believe that as the embryo grows in size, the length of umbilical cord becomes shorter (Table 2).

In the adult females, the uteri on both sides are functional. The posterior part of the oviduct is dilated and contains the embryos. Each embryo is enclosed separately in a membrane filled with embryonic fluid. The embryos are positioned with tail folded upwards in the form of U. The head of the foetus points towards the anterior side of the mother. The ventral side of the embryo is found to face the ventral side of the mother.

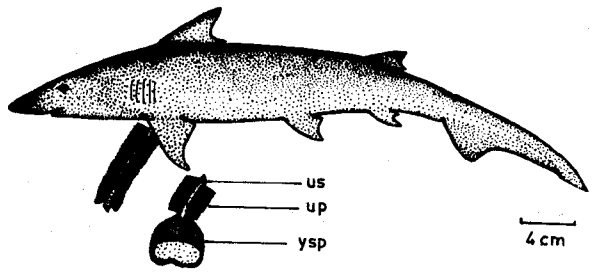



Fig. 1. Full term embryo, 495 mm in TL of *Hemipristis elongatus* us: umbilical stalk, up: umbilical pap illac and ysp: yolk sac placenta.

In most of the sharks, the stomach contained only digestive juice. Only three sharks had their stomach full. In one stomach, one small shark, *Scoliodon laticaudus* of 27.5 cm in total length was recorded. In another, two small rays, *Dasyatis imbricatus* (185 mm and 195 mm across in disc width) were observed. In the third, partly digested teleost fishes were seen.

TABLE 1. *Occurrence of* Hemipristis elongatus *along Madras Coast: Dates of capture and other details*

| Sl No. | Date | TL of sharks (cm) | Sex | Stage of maturity |
|---|---|---|---|---|
| 1 | 20-6-90 | 185 | F | Mature |
| 2 | 2-7-90 | 140 | M | Immature |
| 3 | 1-9-90 | 200 | F | Pregnant |
| 4 | 9-10-90 | 180 | F | Pregnant |
| 5 | 9-11-90 | 175 | M | Mature |
| 6 | 11-1-91 | 180 | F | Mature |
| 7 | 18-1-91 | 145 | M | Maturing |
| 8 | 8-2-91 | 200 | F | Mature |
| 9 | 19-2-91 | 195 | F | Mature |
| 10 | 5-3-91 | 155 | M | Mature |
| 11 | 16-3-91 | 160 | F | Mature |
| 12 | 19-3-91 | 175 | M | Mature |
| 13 | 3-4-91 | 145 | M | Immature |
| 14 | 10-5-91 | 220 | F | Mature |

TABLE 2. *Particulars of embryos taken from the mother sharks* H. elongatus *200 cm and 180 cm in TL on 1-9-90 & 9-10-90*

| Sl No. | Length of embryo (mm) | Sex | Length of umbilical cord (mm) |
|---|---|---|---|
| Date: 1-9-90 | | | |
| 1 | 435 | M | 290 |
| 2 | 480 | M | 280 |
| 3 | 495 | F | 280 |
| 4 | 510 | M | 230 |
| 5 | 515 | M | 230 |
| Date: 9-10-90 | | | |
| 1 | 440 | M | 290 |
| 2 | 450 | F | 290 |
| 3 | 475 | F | 280 |
| 4 | 495 | F | 280 |
| 5 | 510 | M | 235 |
| 6 | 510 | F | 230 |
| Average | 48.30 | | |

* Prepared by P. Devadoss and S. Chandrasekar, Madras Research Centre of CMFRI, Madras-600 008.

# INCIDENCE OF SHARKS WOUNDED BY PLASTIC BANDS*

Sharks with either rings or plastic belts around their necks have been reported in commercial fish landings along the east and west coasts of India. All these reports reveal that these plastic rings or belts have caused severe gaping wound around the nape of the sharks. Some have even cut into the origin of the pectoral fins. One such shark was landed at Punnakayal landing centre on 13-2-'91, caught by long line with large hooks, operated by Tuticorin type of mechanised 'vallams' (Plank built boat) at a depth of 30 m and was identified as a tiger shark *Galeocerda cuvieri* (Le Sueur) (Fig. 1). The specimen had a naked gaping wound around its neck apparently caused by a plastic tape which was missing. It was understood from the statement of the fishermen who landed the shark that it had a synthetic belt like material around its neck which was lost while hauling up the specimen onboard with the help of a hooked rod. The specimen was a male measuring 2.32 m and weighing about 70 kg. The important morphometric measurements of the specimen are given in Table 1.

TABLE 1. *Morphometric measurements (in cm) of the wounded tiger shark* Galeocerda cuvieri *caught off Punnakayal on 13-2-'91*

| | | | | |
|---|---|---|---|---|
| 1. | Total length | : | 232 | |
| 2. | Weight | : | 70 | kg |
| 3. | Sex | : | Male | |
| 4. | Snout length | : | 9.5 | |
| 5. | Head length | : | 37 | |
| 6. | Nostril opening | : | 3.5 | |
| 7. | Inter nostril distance | : | 15.5 | |
| 8. | Mouth opening | : | 24.5 | |
| 9. | Mouth arch | : | 30.5 | |
| 10. | Eye diameter (horizontal) | : | 3 | |
| 11. | Eye diameter (vertical) | : | 2.5 | |
| 12. | Number of gills | : | 5 | |
| 13. | Inter orbital distance | : | 42 | |
| 14. | Pre orbital distance | : | 12 | |
| 15. | Pre dorsal distance | : | 63 | |
| 16. | Pre pectoral length | : | 48 | |
| 17. | Pre anal length | : | 143 | |
| 18. | Pre 2nd dorsal length | : | 134 | |
| 19. | Pectoral to anal | : | 56 | |
| 20. | Origin of 1 dorsal to 2nd dorsal | : | 71 | |
| 21. | Origin of 2nd dorsal to caudal peduncle | : | 30 | |
| 22. | Origin of ventral to caudal peduncle | : | 28 | |
| 23. | a) Pectoral fin length | : | 33 | |
| | b) Pectoral base outer | : | 11 | |
| | c) Pectoral curvature | : | 31 | |
| | d) Pectoral inner curvature | : | 11 | |
| 24. | **I Dorsal fin** | | | |
| | a) Height | : | 29 | |
| | b) Base | : | 19 | |
| | c) Outer curvature | : | 25 | |
| | d) Inner curvature | : | 14.5 | |
| 25. | **2nd Dorsal** | | | |
| | a) Height | : | 12 | |
| | b) Base | : | 10 | |
| | c) Outer curvature | : | 12 | |
| | d) Lower curvature | : | 9.5 | |
| 26. | **Caudal fin** | | | |
| | a) Upper lobe | : | 70 | |
| | b) Lower lobe | : | 29 | |
| | c) Inner curvature | : | 75 | |
| 27. | **Anal fin** | | | |
| | a) Height | : | 14 | |
| | b) Breadth | : | 12.5 | |
| | c) Lower curvature | : | 6 | |
| 28. | **Claspers** | | | |
| | a) Length | : | 8 | |
| | b) Breadth | : | 2.5 | |
| 29. | **Girth of Body** | | | |
| | a) At the head region | : | 81 | |
| | b) At the I dorsal region | : | 97 | |
| | c) At the II dorsal region | : | 45.5 | |
| | d) At anal region | : | 67.5 | |
| | e) At caudal peduncle | : | 26 | |

Lipton *et al.* (*Mar. Fish. Infor. Serv., T & E Ser.*, 77, 1987) reported for the first time in India the landing of a 'Dusky shark' *Carcharhinus obscurus* on 28-3-'87 at Veraval (Gujarat) with a black ring pierced through the first dorsal fin and right pectoral fin around the girth of body without a tag on it. Subsequently, Ferozkhan and Nandakumar (*Mar. Fish. Infor. Serv., T & E Ser.*, 95, 1989) reported the landing of the 'Black tip shark' *Carcharhinus limbatus* on 12th and 19th May 1988 with a blue coloured high density polyethylene strap encircled around the girth of the body just in front of the pectoral fins. They suspected that some kind of tags present on the strap might have been lost while the fish

Fig. 1. The wounded shark with plastic band around the neck.

struggled to escape from the hook. Sam Bennet *et al.* (*Mar. Fish. Infor. Serv., T &E Ser.*, 104, 1990) also assumed that the tiger shark, *Galeocerda cuvieri* landed with a synthetic belt around the body on 24-8-1989 was a tagged shark. Reports show that the synthetic ring or straps found on these sharks are not tags or tag bearing rings but just ordinary plastic bands used to secure the cardboard containers which are deliberately or accidentally jettisoned from fishing boats and commercial cargo vessels. He further reports that these wounded sharks have become a hidden danger in the sea for bathers, swimmers and under water divers. Many have been troubled by these wounded sharks as their normal life is hampered by the wound caused by these straps.

It appears that all the wounded sharks so far reported in India might have got ensnared by the synthetic straps when they were young and small in size. In course of time, when these sharks had outgrown the diameter of the synthetic straps, the constant swimming and body movements might have caused aberrations and gaping wounds by these straps. To avoid such situations it has been suggested that, as a precautionary measure, one should ensure that each plastic strap is at least cut through and discarded rather than just slipped off the boxes intact. Then, if one does go over the side it will only be a floating rubbish and not a potential danger to marine life.

* Reported by: H. Mohamad Kasim, T.S. Balasubramanian, K.M.S. Ameer Hamsa and S. Rajapackiyam, Tuticorin Research Centre of CMFRI, Tuticorin, 628 001.

# केरल की समुद्री मात्स्यिकी की वर्तमान स्थिति की एक समीक्षा

पी. एस. बी. आर. जेम्स, के. एन. कुरुप और एन. जी. के. पिल्लै
केंद्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान, कोचीन

## प्रस्तावना

प्रायद्वीपीय (Peninsular) भारत के दक्षिण में स्थित दुबला सा केरल का पश्चिम भाग लंबे समुद्र तटों से अनुग्रहीत है। पूरे संसार के मछली उत्पादन में केरल का भी एक प्रमुख स्थान है। भारत के वार्षिक मछली अवतरण का 24% यहाँ से प्रप्त होता है। यहाँ का उपतटीय समुद्र, दोनों मानसूनों से प्रभावित है, जो यहाँ की एक विशेषता है। दक्षिण पश्चिम मानसून से होनेवाले पारिस्थितिक परिवर्तनों का प्रभाव तटीय समुद्रों की संपदाओं के भौगोलिक और मौसमिक वितरण और प्रचुरता पर पडता है। मौसम में होने वाले परिवर्तन और मत्स्यन धरातल की भौतिक-रासायनिक विशेषताओं का भी हर साल की मात्स्यिकी पर प्रभाव पडता है।

कारीगरी उपस्कर (artisanal tackles) जैसे तट संपाशों (shore seine) और बोट संपाशों को उपयुक्त करके मत्स्यन करना एक पुरानी रीति है। फिर भी केरल में 3-4 दशवर्ष पहले ही मत्स्यन नावों के यंत्रीकरण द्वारा ट्रालिंग जैसे बेहत्तर मत्स्यन तकनोलजियों का उपयोग करने लगा। 1960 से शुरू होने वाले दशक में भी मत्स्यन तकनोलजी में कई विकास हुये। ये नाइलॉन जालों का उपयोग, तटीय समुद्रों में ट्रॉल मात्स्यिकी का विकास आदि थे। इसके बाद वाणिज्यिक कोष संपाशों का उपयोग और परंपरागत यानों का यंत्रीकरण आदि परिवर्तन भी आ गए।

देश की आज़ादी के समय में समुद्री मछली उत्पादन 2 लाख टन था और अब यह 6 लाख टन हो गया है।

# केरल की समुद्री मात्स्यिकी की वर्तमान स्थिति की एक समीक्षा

पी. एस. बी. आर. जेम्स, के. एन. कुरुप और एन. जी. के. पिल्लै
केंद्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान, कोचीन

**प्रस्तावना**

प्रायद्वीपीय (Peninsular) भारत के दक्षिण में स्थित दुबला सा केरल का पश्चिम भाग लंबे समुद्र तटों से अनुग्रहीत है। पूरे संसार के मछली उत्पादन में केरल का भी एक प्रमुख स्थान है। भारत के वार्षिक मछली अवतरण का 24% यहाँ से प्रप्त होता है। यहाँ का उपतटीय समुद्र, दोनों मानसूनों से प्रभावित है, जो यहाँ की एक विशेषता है। दक्षिण पश्चिम मानसून से होनेवाले पारिस्थितिक परिवर्तनों का प्रभाव तटीय समुद्रों की संपदाओं के भौगोलिक और मौसमिक वितरण और प्रचुरता पर पडता है। मौसम में होने वाले परिवर्तन और मत्स्यन धरातल की भौतिक-रासायनिक विशेषताओं का भी हर साल की मात्स्यिकी पर प्रभाव पडता है।

कारीगरी उपस्कर (artisanal tackles) जैसे तट संपाशों (shore seine) और बोट संपाशों को उपयुक्त करके मत्स्यन करना एक पुरानी रीति है। फिर भी केरल में 3-4 दशवर्ष पहले ही मत्स्यन नावों के यंत्रीकरण द्वारा ट्रालिंग जैसे बेहत्तर मत्स्यन तकनोलजियों का उपयोग करने लगा। 1960 से शुरू होने वाले दशक में भी मत्स्यन तकनोलजी में कई विकास हुये। ये नाइलॉन जालों का उपयोग, तटीय समुद्रों में ट्रॉल मात्स्यिकी का विकास आदि थे। इसके बाद वाणिज्यिक कोष संपाशों का उपयोग और परंपरागत यानों का यंत्रीकरण आदि परिवर्तन भी आ गए।

देश की आज़ादी के समय में समुद्री मछली उत्पादन 2 लाख टन था और अब यह 6 लाख टन हो गया है।

बीच के समय में राज्य के मत्स्यन तकनोलजी में आश्चर्यजनक परिवर्तन भी हुये हैं। चालू लेखाओं के अनुसार राज्य से समुद्री उत्पादों के निर्यात से राष्ट्र को 240 करोड रुपए की विदेशी मुद्रा प्राप्त हो रही है। केरल की समुद्री मात्स्यिकी की वर्तमान प्रवणता और स्थिति की एक रूपरेखा इस लेख में व्यक्त की गई है।

**मछुओं की जनसंख्या**

राज्य मात्स्यिकी विभाग की एक रिपोर्ट के अनुसार केरल के मछुओं की जनसंख्या वर्ष 1985 में 650143 है। इस विभाग के अध्ययनों द्वारा व्यक्त हुआ कि इसमें 18-59 आयु होने वाले मछुए 53.7% है और कार्यरत मछुए 22.74% है। वर्तमान आकलन के अनुसार सक्रिय रूप से मत्स्यनकार्य में लगे हुए मछुओं की संख्या 93,000 है। प्रतिवर्ष मछलियों का प्रतिशीर्ष उत्पादन 4.58 टन है।

**समुद्री मछली उत्पादन**

केंद्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान के प्रारंभ काल का एक मुख्य कार्य भारत के समुद्री मछली उत्पादन की सांख्यिकी का संग्रहण था। इस पर प्रामाणिक सांख्यिकी वर्ष 1950 से लेकर संस्थान में है। इसके आकलन के लिए संस्थान ने मछली अवतरण पर राष्ट्र व्यापी सर्वेक्षण का तरीका अपनाया था। बाद में संस्थान ने समुद्री मछली उत्पादन का आकलन करने के लिए नमूना सर्वेक्षण की रीति विकसित की गई।

वर्ष 1950 में मछली उत्पादन 2 लाख टन था और वर्ष 1957 में यह 301,000 टन हो गया। इसके पश्चात वर्ष 1964 तक आते आते उत्पादन में वृद्धि होती हुई वर्ष 1965 में उत्पादन 3,40,000 टन हो गया। बाद के दो दशवर्षों में उत्पादन 290,000 और 450,000 टन के बीच में रह गया और वर्ष 1984 के बाद उत्पादन में फिर से वृद्धि हुई। इस समय वार्षिक उत्पादन 4,26,000 टन था जो 5.1% की वृद्धि दिखाता है।

परंपरागत रूप से राज्य के समुद्री मछली उत्पादन की प्रवणता का निर्धारण वेलापवर्ती संपदाएँ जैसे तारली *(सारडिनेला लौंगिसेप्स)* और बांगडा *(रैस्ट्रेलिगर कानागुटा)* की उपलब्धता पर होता है। केरल के वाणिज्य प्रमुख मछलियों में तारलियों (19.3%) का प्रथम स्थान है और इसके बाद चिंगट (11.2%) कैरंजिड (9.6%), पर्चस (8.8%), बांगडा (8.4%) और *स्टोलिफोरस* जातियाँ (8.0%) आती हैं।

**यंत्रीकरण की प्रवणताएं**

केरल में उन्नीस सौ पचास से शुरु होनेवाले दशक के मध्य में इंडो-नोर्वीजियन परियोजना के दौरान यंत्रीकृत मत्स्यन का आरंभ हुआ। उन्नीस सौ साठ से शुरु होनेवाले दशक में कई निजी उद्यमी राज्य की ट्राल मात्स्यिकी के द्रुत विकास करते हुये आगे आए। इंडो-नोर्वीजियन परियोजना के दौरान देशज यानों के यंत्रीकरण पर किए गए परीक्षण सफल नहीं हुये। वर्ष 1970 में इंडो-बेल्जियम मात्स्यिकी परियोजना के अंदर कन्याकुमारी जिले के 100 बोटों में बाहरी इंजन लगाए गए। बाद के कुछ वर्षों में इस पर हुए परीक्षण भी सफल नहीं हुये। वर्ष 1979-80 के दौरान एरनाकुलम जिला के कण्णमाली मत्सयन गाँव में किया गया परीक्षण सफल हो गया और इसके बाद केरल में नावों के यंत्रीकरण में उल्लेखनीय प्रगति होने लगी।

केरल के अपतट जल में उन्नीस सौ सत्तर से शुरु होनेवाले दशक में बडे पैमाने में वाणिज्यिक ट्रालिंग होने से समुद्री मछली उत्पादन में वृद्धि हुई। इसके फलस्वरूप वर्ष 1971-75 का औसत मछली उत्पादन 406,000 टन हो गया। बाद के कुछ वर्षों में भी यह स्थिर रह गया। झींगों की पकड में बढ़ोतरी और बाज़ार में इसकी बडी माँग के कारण इस उद्योग में भी उल्लेखनीय प्रगति हुई। झींगों का और भी अधिक उत्पादन और निर्यात राष्ट्र की आय बढ़ाने के लिए सहायक बन गया। कुल समुद्री मछली उत्पादन में कहने लायक वृद्धि न होने पर भी चिंगट मात्स्यिकी में महत्वपूर्ण प्रगति दिखाई पडी।

केरल में वर्ष 1979 के अंत से तटीय जल में कोष संपाशों (purse seine) का प्रयोग शुरू हुआ लेकिन कर्नाटक के समान, जहाँ यह मत्स्यन की प्रमुख रीति है, केरल में इसका अनुकूल प्रभाव नहीं दिखाया पडा। यंत्रीकृत यानों का दो प्रकार वर्गीकरण किया जा सकता है (क) मत्स्यन के लिए मशीन का उपयोग करनेवाला यान (ख) नोदन (propulsion) के लिए मशीन का उपयोग करनेवाला यान। उक्त दशक में दूसरे तरीके के यान का योगदान पहले की अपेक्षा अधिक दिखाया पड़ा। यंत्रीकृत एककों द्वारा उत्पादन में एकदम वृद्धि हुई लेकिन परंपरागत एककों द्वारा अवतरण में घटती भी हुई।

हाल ही में देशज यानों के यंत्रीकरण से केरल के परंपरागत मत्स्यन उद्योग की तकनो-सामाजिक व्यवस्था में काफी परिवर्तन हुआ है। अब यंत्रीकृत यानों की संख्या में गण्यात्मक वृद्धि हुई है। परंपरागत यानों के यंत्रीकरण से अनेक लाभ होते हैं। कम श्रम शक्ति का उपयोग, समय लाभ, अधिक क्षेत्रों में परिचालन आदि ऐसे लाभ है। सबसे प्रमुख लाभ यह है कि पकड को ताज़ा स्थिति में ही तट पर ला सकते है जिससे अधिक मूल्य भी मिल पाता है। इन सारे घटकों द्वारा मछुआ परिवारों की सामाजिक-आर्थिक स्थिति में भी सर्वतोमुख परिवर्तन और प्रगति हुई है।

देशज यानों के यंत्रीकरण के बाद बोट और गिअरों के आकार में भी परिवर्तन हुआ है। कुछ बोटों में इंजन लगाने की सुविधा केलिए आकार चपटा कर दिया है। कुछ स्थानों में प्लाइवुड बोटों का उपयोग प्रचार में है और हाल ही में तिरुवनंतपुरम के कुछ स्थानों में बाहरी इंजन लगाए गए कटामरीन और फाइबर ग्लास के बोट भी लोकप्रिय हो रहे हैं।

**कृत्रिम भित्तियों का निर्माण**

समुद्री संपदाओं का उत्पादन बढ़ाने के लिए मानव-निर्मित ढ़ाँचों का निर्माण समुद्री तकनोलजी की एक विशेष शाखा है जिसे कृत्रिम भित्ति विकास कहा जाता है। कृत्रिम भित्तियाँ कई प्रकार की मछलियों को निवास स्थान प्रदान करती हैं। आहार की उपलब्धता और परभक्षियों से सुरक्षा मिलने के कारण कृत्रिम भित्तियों की ओर मछलियों का आकर्षण अधिक होता है। वलियतुरा तट के ब्रदरहुड सोसाइटी द्वारा कृत्रिम भित्तियाँ का निर्माण किया गया है और सी एम एफ आर आइ के वैज्ञानिकों द्वारा इनका मॉनीटरन किया जा रहा है। 33 मी की गहराई में छाँटे गए टायर, कंकरीट वलय, ग्रनाइट के पत्थर, बर्तनों के टुकडे, तेजपत्ता पेड की शाखाएँ और नारियल पेड उपयुक्त करके कृत्रिम भित्तियों का निर्माण किया जा सकता है। वर्ष 1989 के दौरान यहाँ से 5.8 टन कैरजिड्स, पर्चस और किलिमीन की पकड हुई।

**"करिक्काडी" मात्स्यिकी और मानसून के दौरान ट्रालिंग पर रोक**

केरल में, शक्तिकुलंगरा और कोचीन में मानसून के दौरान आम तौर पर "करिक्काडी" कहलाए जानेवाले झींगा *पैरापेनिओप्सिस स्टाइलिफेरा* की अच्छी पकड होती रहती है। मानसून के अवसर पर ट्रालर परिचालकों तथा परंपरागत मछुओं के बीच पकड के संबंध में विवाद होता है। इसलिए एक परीक्षण के रूप में केरल सरकार द्वारा मानसून ट्रालिंग पर रोक लगाया गया। संस्थान द्वारा किए गए अध्ययन से यह व्यक्त हो जाता है कि केरल तट के 60 मी की गहराई में झींगे की यह जाति अधिकतम मात्रा में दिखाई पडती है। दक्षिण पश्चिम मानसून के आरंभ में ये गहरे समुद्र की ओर प्रवास करते हैं। राज्य में ट्रालरों द्वारा लगभग 95% "करिक्काडी" का अवतरण होता है।

पिछले तीन वर्षों के दौरान केरल सरकार द्वारा मानसून मौसम के ट्रालिंग पर भागिक रूप से रोक लगाया था। लेकिन तलमज्जी मछलियों जैसे किलिमीन, मुल्लन, तुम्बिल आदि पर रोक का असर नहीं पडा है। लेकिन शक्तिकुलंगरा और कोच्चि में झींगों का अवतरण कम था और मानसूनोत्तर अवधि में भी इस संपदा का पूर्ण रूप से विदोहन नहीं हुआ था।

**केरल मराइन फिशरीस रेगुलेशन ऐक्ट 1980**

केरल के तटीय जल में यंत्रीकृत यानों द्वारा होने वाले मत्स्यन पर हुए सामाजिक विरोध के संदर्भ में केरल सरकार ने केरल मराइन फिशरीस रेगुलेशन ऐक्ट, 1980 का प्रख्यापन किया। इसके अनुसार केरल के समुद्रतट को दो क्षेत्रों में विभाजित किया गया है। पहला दक्षिण क्षेत्र-78 की मी कोल्लंगोड से एडवा तक और दूसरा, उत्तर क्षेत्र - 512 कि मी परवूर से मंजेश्वरम तक। दक्षिण क्षेत्र में तट से 16 फैथम की गहराई और उत्तर क्षेत्र में तट से 8 फैथम की गहराई तक का मत्स्यन परंपरागत यानों के लिए आरक्षित है।

दूसरे गहराई वर्गीकरण में दक्षिण में 20 फैथम तक और उत्तर क्षेत्र में 10 फैथम तक यंत्रीकृत देशज यानों के अतिरिक्त सभी प्रकार के यंत्रीकृत बोटों के मत्स्यन पर रोक लगाया है।

तीसरे वर्गीकरण में दक्षिण क्षेत्र में 35 फैथम और उत्तर क्षेत्र में 20 फैथम तक मत्स्यन पर रोक लगाया गया है। वर्ष 1983 अक्तूबर तक सरकार ने बोटम ट्रालों में 35 मि मी से कम आकारवाले जालों के उपयोग पर रोक लगाया था।

विभिन्न प्रकार के मत्स्यन यानों के मत्स्यन क्षेत्र का सीमांकन परंपरागत मछुओं की इच्छानुसार किया गया है और

ट्राल जालों की जालाक्षियों के आकार का नियमन ट्रालरों द्वारा छोटे आकारवाली मछलियों को अवतरण से बचाने के लिए है।

हमारे देश में, मछुओं के लिए आरक्षित क्षेत्र का स्वैच्छिक रूप से निर्धारण करने में और सरकार द्वारा इन नियमावली का कडाई से लागू करने में व्यावहारिक कठिनाई होती है। दक्षिण-पश्चिम तट में तटीय वेलापवर्ती मछलियों जैसे तारलियों के वितरण का क्षेत्र जानने पर यह मालूम पडता है कि अपतट जल में भी इनकी भारी उपस्थिति होती है। लेकिन 22 कि मी से बाहर कोष संपाश का परिचालन करने से कोई फायदा नहीं। इसलिए इस अधिनियम का समय समय पर संशोधन करना आवश्यक माना जाता है।

### पंक-तट (mud-bank) मात्स्यिकी

दक्षिण-पश्चिम मानसून की अवधि में केरल तट के आलप्पी क्षेत्र में पंक-तट दिखाई पडता है। भारी वर्षा के समय में तट पर कीचड के जमाव से ये बन जाते हैं। ये पंक-तट देशज यानों को लंगर करने की सहायता प्रदान करते हैं। फेनिल तरंग वाले तटों में परंपरागत यानों को लंगर करने में ये तट सहायक बन जाते हैं। इन पंक-तटों के शांत जल से परंपरागत मछुए लोग झींगा, तारली और विविध प्रकार की मछलियों को पकडते हैं।

### समुद्री संवर्धन

केरल में मछली उत्पादन को बढ़ावा देने के लिए समुद्री संवर्धन के विकास की संभाव्यताएं ज़्यादा है। यह आकलन किया है कि केरल में लगभग 2.43 लाख है. पश्चजल और 590 कि मी क्षेत्र का उथला तटीय समुद्र वाणिज्यिक तौर पर फिन फिश और कवच प्राणियों के संवर्धन के लिए उपलब्ध है। इस दृष्टि से सी. एम. एफ. आर. आइ ने पिछले डेढ़ दशक से लेकर प्रयोगशाला और खेत में तकनोलजी के आधार पर कई गहन अनुसंधान कार्यक्रम शुरु किए हैं जिनके द्वारा वाणिज्य प्रमुख समुद्री जातियों का संवर्धन किया जा रहा है। संस्थान द्वारा विकसित तकनोलजी के अनुसार "मत्स्यफेड" के लिए कण्णूर के मोप्ला उपसागर में एक झींगा स्फुटनशाला की स्थापना भी की गई है।

वर्ष 1976 में सी. एम. एफ. आर. आइ कोचीन, के अधीन नारक्कल में स्थापित के वी के द्वारा भी कृषकों, भूमि रहित श्रमिकों, बेरोजगार युवकों के लिए सी. एम. एफ. आर. आइ तकनोलजी के आधार पर झींगा और मछली कृषि में गहन प्रशिक्षण दिया जा रहा है।

### तटीय क्षेत्रों में जल का प्रदूषण और मात्स्यिकी पर इसका प्रभाव

आज बढनेवाले नगरीकरण और औद्योगीकरण के फलस्वरूप फैक्टरियों से निकालने वाले असंसाधित और भागिक रूप से संसाधित उत्सर्ज्य पदार्थ और कीटनाशक सीधे समुद्र में पहुँचते है जो समुद्री वातावरण को प्रदूषित करते हैं। चालियार नदी और पेरियार ज्वारनदमुखी में मछलियों की बडी संख्या में मृत्यु इस प्रकार हुई थी। हाल ही में तिरुवनंतपुरम तट में तटीय प्रदूषण अधिक मात्रा में रिपोर्ट की गई है। समुद्री संपदा की सुरक्षा केलिए इसके विरुद्ध उचित कदम उठाना आवश्यक है। इसके उपाय के मार्ग निर्धारित करने के लिए सी. एम. एफ. आर. आइ द्वारा तटीय प्रदूषण और जीव संपदा पर इसके प्रभाव का मॉनीटरन किया जा रहा है।

### हाल के विकास

आलप्पी क्षेत्र में वर्ष 1985 में परिचालन करने लगे छोटे कोष संपाश इस दिशा में हुआ एक मुख्य विकास है। इनका परिचालन कोष संपाशों के परिचालन के समान ही है। इनके जाल बोट संपाश जालों के समान होने पर भी छोटे कोष सांपाशों की पकड दर इनसे भी अधिक है। रिंग संपाशों के योगदान का प्रतिशत बोट संपाशों की अपेक्षा कम है। पिछले मानसून के दौरान यह मालूम पड़ा कि राज्य में रिंग संपाशों के परिचालन से किशोर तारलियों की भारी मृत्यु हुई। इसका कारण जालाक्षियों का कम आकार है।

### केरल में समुद्री मात्स्यिकी के विकास की गुंजाइश और योजना

केरल में अवतरण की जाने वाली मछलियों का 70% वेलापवर्ती जाति की होती है और बाकी झींगा और तलमज्जी भी हैं। परंपरागत मत्स्यन अधिक रूप से 50 मी. के गहराई क्षेत्र से किया जाता है। यह सुझाव है कि मत्स्यन क्षेत्र की सीमा बढ़ाने से पकड में कुछ हद तक वृद्धि हो जाएगी। पिछले तीन दशकों से दक्षिण-पशिचम तट में हुआ चिंगट ट्रालिंग इसका उदाहरण है।

केरल में पोतों द्वारा महासमुद्री वेलापवर्ती जातियाँ जैसे येलोफिन और बिग आइ, बिल फिशस और सुराओं का विदोहन किया जा सकता है। अतिरिक्त संपदाओं का मत्स्यन विकसित करने के लिए पकड के अनुरक्षण, विपणन, आदि सुविधाओं को भी विकसित किया जाना ज़रूरी है।

अन्य राज्यों की अपेक्षा केरल में यह देखा गया है कि हाल के वर्षों में कारीगरी क्षेत्र से मछली उत्पादन कम

हो गया है। इसका कारण कारीगरी क्षेत्र और यंत्रीकृत क्षेत्र में होनेवाला विरोध है। इसलिए अयंत्रीकृत परंपरागत यानों के लिए एक मेखला परिधि निर्धारित करना आवश्यक है।

**इस तौर पर होने वाले विकास के लिए निम्नलिखित विकल्प दिए जा सकते है :**

प्रथम कदम के रूप में परंपरागत मत्स्य संपदाओं का अवतरण बढ़ाने के लिए देशज यानों का यंत्रीकरण और भी बढ़ाना है और जाल के आकार में आवश्यक परिवर्तन लाना है। चुने गए क्षेत्रों में तटीय ट्यूना, सीर फिश, पॉम्फ्रेट आदि का संवर्धन बढ़ाने के लिए यंत्रीकृत गिल नेट मात्स्यिकी का विकास करना भी आवश्यक है।

दूसरा विकल्प परंपरागत वेलापवर्ती और कोलम्नार (columnar) संपदाएं, जैसे होर्स माकरल, स्काड, लाइट बेट और फीतामीन का विदोहन किया जाना है।

तीसरा विकल्प, केरल तट से विभिन्न तलमज्जी, कोलम्नार, मध्य (meso) और गभीर (bathy) वेलापवर्ती मछलियों, कवच प्राणी ओर शीर्षपादों का विदोहन किया जाना है। इन में सूत्रपक्ष ब्रीम, "बुल्स आई, "ग्रीन आई", इंडियन ड्रिफ्ट फिश, बोर फिश, रोक कोड, पेनिआइड और नॉन-पेनिआइड झींगों की विविध जातियाँ और गभीर सागर महाचिंगट प्यूरुलस सीवेली मुख्य मछलियाँ हैं।

वर्तमान में केरल तट के 0-50 मी की गहराई मेखला से अधिकांश विदोहन किया जाता है। केरल के अपतट जल में समुद्री ट्यूना, कैरंजिड, पर्चस, स्क्विड, गभीर सागरी झींगा और महाचिंगटों के विदोहन की साध्यताएं अधिक है।

हाल ही में केरल का मत्स्यन उद्योग उलझन में पड गया है। यहाँ होने वाले अव्यवस्थित विदोहन संपदाओं के स्वस्थ रहन के लिए दोषकारी है। किशोरों का विदोहन रोकने के लिए मत्स्यन क्षेत्र में और भी प्रतिबंध लगाना, जालाक्षियों का आकार कम करना आदि बातों को कार्यान्वित किया जाना है। इन विषयों में सरकार को परामर्श देने केलिए एक सांविधिक निकाय की स्थापना की जानी है।

# महाराष्ट्र में ट्रालिंग की आर्थिक साध्यताएं

**डी. बी. एस. सेहरा, जे. पी. करभारी और**
**के. पी. शालिनी, केंद्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान, कोचीन - 682 031**

**प्रस्तावना**

महाराष्ट्र के 5 समुद्रवर्ती जिलाओं का वार्षिक समुद्री मछली अवतरण 3-4 लाख टन है। कुल पकड का 90% यंत्रीकृत एककों द्वारा मिलता है। मत्स्यन जालों में ट्राल नेट और गिल नेट प्रमुख हैं। ट्राल परिचालन से प्राप्त प्रमुख जातियाँ झींगा, क्रोकेर्स, फीतामीन और उपास्थिमीन हैं। महाराष्ट्र के ग्रेटर-बंबई, रइगाड और रत्नगिरी जिलाओं में ट्रालरों का परिचालन अधिक मात्रा में दिखाया जाता है।

राज्य में मत्स्यन के लिए परंपरागत नावों के स्थान में यंत्रीकृत नावों का उपयोग अधिक होता है। लाभकारिता का स्तर जानने केलिए ट्रालर द्वारा पकडी गई मछली का मूल्य निर्णय अवश्य किया जाना है। इसी प्रकार ट्रालिंग की अर्थिक व्यवहार्यता का अध्ययन करने के लिए पकड की उपलब्धता और इसका मूल्य तथा ट्रालर का परिचालन और नियत लागत दो प्रमुख घटक हैं। सिर्फ पकड की मात्रा के अनुसार नहीं, बल्कि गुण के अनुसार एकक की वास्तविक कमाई निर्धारित करता है। इसके अतिरिक्त विपणन के आंतारिक और बाहरी घटक भी पकड के मूल्य को प्रभावित करते हैं। महाराष्ट्र के ट्रालर परिचालन की लाभकारिता की साध्यताएं जानने के लिए वहाँ के चुने गए परिचालन केंद्रों में वर्ष 1987-88 के दौरान केंद्रीय समुद्री मात्स्यिकी अनुसंधान केंद्र, कोचीन द्वारा एक अध्ययन आयोजित किया था।

**डाटा बेस**

महाराष्ट्र के ग्रेटर बंबई और रत्नगिरी नामक दो जिलाओं से ट्राल अवतरण केंद्रों से संबंधित प्राथमिक सूचना संग्रहित की गई। ट्रालरों से डाटा संग्रहित करने के लिए दो गणनाकारों को चुनकर उन्हें प्रशिक्षण दिया। नाव, इंजन, परिचालन क्षेत्र, ट्रालर का स्वामित्व, श्रम, विपणन आदि के डाटा पत्तन प्राधिकारियों और मछुआ सहकारी संघ द्वारा संग्रहित किया। पकड, मूल्य और मत्स्यन लागत की सूचना मिलने के लिए प्रश्नावली भी तैयार की गई। प्रशिक्षित गणनाकारों ने वर्ष 1987-88 के 9 महीनों की अवधि के आंकडे संग्रहित किए।

डाटा के सारणीकरण की सुविधा के लिए पकड को प्रमुख 12 वर्गों, यानी; झींगा, महाचिंगट, शीर्षपाद, उपास्थिमीन, क्रोकेर्स, फीतामीन, ईल, शिंगटी पर्चस, तुम्बिल, पाम्फेट और क्लूपिओइड्स में बाँटा गया। अन्य सभी मछलियों को फुटकर वर्ग में रखा और सभी का कुल मूल्य लेकर राजस्व आंका गया।

**अवसंरचना का विकास**

न्यू फेरी वार्फ अवतरण केंद्र में सभी प्रकार की मात्स्यिकी अवसंरचनात्मक सुविधाएं उपलब्ध होती हैं। लगभग 3 कि मी के अंदर ही यातायात और विपणन की सुविधाएं हैं और बोट के इंजन के मरम्मत, शीतीकरण, डीज़ल आदि की सुविधाएं भी मौजूद हैं। पकड मछली व्यापारियों को दी जाती है और बंपर पकड के अवसर पर नीलाम करके थोक व्यपारियों को दी जाती है।

मिरकरवाडा भी उपर्युक्त सारी सुविधाएं होनेवाला अवतरण केंद्र है। इस केंद्र में एक मछुआ सहकारिता समिति भी है। मछुआ स्त्रियों ने एक संघ आयोजित किया था लेकिन इसमें कम मूल्य वाली मछलियों का विपणन होता है। वाणिज्य प्रधान मछलियों को रत्नगिरी के मछली संसाधन कंपनियाँ लेती हैं।

**ट्रालर परिचालन**

न्यू फेरी वार्फ में 11-14 मी के लगभग 800 ट्रालरों का परिचालन होता है। अधिकांश ट्रालरों में इंजन भी लगाये हैं। एक एकक में चार-सात ट्राल जाल होते हैं। साधारणतया मत्स्यन सितंबर में शुरु होकर मई में समाप्त होता है। मत्स्यन परिचालन, मानसूनोत्तर अवधि में 40 फैथम की गहराई तक, ग्रीष्म में 50 फैथम तक और पूर्व-मानसून अवधि में 60 फैथम तक किया जाता है। मानसून के दौरान सिर्फ चुने गए दिनों में सीमित ट्रालरों का परिचालन होता है। एक मत्स्यन यात्रा 4-5 दिनों में समाप्त होती है।

मिरकरवाड केंद्र में लगभग 150 ट्रालर मत्स्यन करते हैं और अधिकांश ट्रालरों में आंतरिक इंजन भी लगाये जाते हैं। ट्राल जाल की संख्या 3 से 6 है। मौसम के आरंभ में 20 फैथम की गहराई से मत्स्यन किया जाता है और ग्रीष्म तथा पूर्व मानसून मौसम में 60 फैथम की गहराई से मत्स्यन कार्य होता है।

**ट्राल मत्स्यन के लिए आवश्यक लागत**

**क. निक्षेप लागत**

ट्राल मात्स्यिकी की नियत लागत मुख्य रूप से प्रारंभिक पूँजी निवेश यानी उत्पादन, पूँजी राशी और बीमा के ब्याज पर आश्रित है।

न्यू फेरी वार्फ में एक ट्रालर का औसत पूँजीनिवेश हल (hull), इंजन, जाल और अन्य उपकरणों को मिलाकर 4.7 लाख रू. आकलित किया है। इनमें से, इंजन के टूट-फूट से अवमूल्यन, जाल, उपकरण और विविध सामग्रियों के एक वर्ष का अवमूल्यन 66,430 रु. आकलित किया है। एक ट्रालर के लिए एक वर्ष का अवमूल्यन,ब्याज और बीमा की कुल लगत 1,50,534 रु. आकलित किया है।

मिरकरवाड अवतरण केंद्र में एक ट्रालर का कुल पूँजी निवेश 5,21,250 रु. और इसमें से विभिन्न कारणों से वार्षिक अवमूल्यन 67,450 रु. भी आकलित किया है।

**ख. परिचालन व्यय**

ट्रालर परिचालन के व्यय में ईंधन का मूल्य, श्रम, आहार तथा बाटा, बर्फ, मरम्मत और अनुरक्षण सम्मिलित हैं। न्यू फेरी वार्फ में नौ महीने के मत्स्यन काल में ट्रालर का परिचालन व्यय 1,34,190 रु. है, श्रमिक दल का वेतन 64,800 रू. बर्फ का मूल्य 38,250 रु. और आहार तथा बाटा के लिए 48,150 रु. की लागत है। ट्रालर के दो प्रकार के मरम्मत यानी दैनिक और आकस्मिक मरम्मत के लिए वर्ष में 36,675 रु. लग जाते है और विविध प्रकार के व्यय के लिए 19,800 रु. भी लग जाते है। इस प्रकार वर्ष में एक ट्रालर एकक के लिए 3,41,865 रु. का व्यय आकलित किया जाता है। इसी प्राकर मिरकरवाड केंद्र में होने वाला वार्षिक परिचालन व्यय 2,76,200 रु. आकलित किया है।

**ग. पकड और राजस्व**

ट्रालरों द्वारा मुख्य रूप से झींगों का मत्स्यन किया जाता है और इसके लिए अनुकूल रीति से जालाक्षियों के आकार का रूपांकन किया है। न्यू फेरी वार्फ में वार्षिक पकड का 15% झींगे होते हैं और अन्य प्रमुख जातियाँ उपास्थिमीन (12%), क्राकेर्स (12%), फीतामीन (10%) और शिंगटी (11%) हैं। 17% विविध जातियाँ होती है। एक मत्स्यन मौसम में ट्रालर की कुल पकड 56,800 कि. ग्रा है।

न्यू फेरी वार्फ के राजस्व का 51% मात्र झींगों की बिक्री से मिलता है। अन्य प्रमुख वर्गों में महाचिंगट (11%), शीर्षपाद (4%), क्रोकेर्स (10%), फीतामीन (4%), और उपास्थिमीन (4%), हैं। एक ट्रालर का वार्षिक राजस्व 5,23,950 रु. आकालित किया है जिसका 43% मत्स्यन मौसस की प्रथम तिमाही याने सितंबर-नवंबर से ही मिल जाता है।

वर्ष 1987-88 के दौरान मिरकरवाड की वार्षिक पकड 55.3 टन आकलित किया है। कुल अवतरण का 16% विभिन्न आकार वाले झींगे हैं। मत्स्यन मौसम के पहले तीन महीनों की पकड का 26% झींगे हैं और इनके अतिरिक्त अन्य प्रमुख वर्ग क्राकेर्स (13%), फीतामीन (15%), ईल (6%), शिंगटी (9%), क्लूपिओइड्स (8%) और पर्चस (4%) हैं।

अध्ययन अवधि के दौरान मिरकरवाड के ट्राल एकक का राजस्व 4.56 आकलित किया जिसका 66% झींगों की बिक्री से और 9% क्राकेर्स की बिक्री से होता है।

**ट्राल मत्स्यन के लाभ का स्तर और अन्य दक्षता अनुपात**

न्यू फेरी वार्फ में मत्स्यन मौसम के 208 दिन मत्स्यन होता है और मिरकरवाड में 217 दिन भी। इन केंद्रों की प्रतिदिन पकड क्रमशः 273 कि. ग्रा. और 255 कि. ग्रा हैं। इन केंद्रों में ईंधन की वार्षिक लागत 1.22 से 1.34 लाख है। वर्ष के दौरान ट्राल मत्स्यन का व्यय मिरकरवाड में 2.76 लाख और न्यू फेरी वार्फ में 3.42 लाख है। ट्रॉल एकक की वार्षिक आय 3.42 लाख रु. और मिरकरवाड में 19,096 आकलित किया। पकड की उपलब्धता और कुल वार्षिक परिचालन व्यय के आधार पर दोनों केंद्रों के मत्स्यन परिचालन का अंतर समझ सकते हैं।

**निष्कर्ष और टिप्पणी**

महाराष्ट्र में वर्ष 1987-88 के दौरान औसत आकार वाले ट्रालर का निवेश लगभग 5 लाख रु. आकलित किया। अधिकांश ट्रालरों में आंतरिक इंजन लगाए जाते है और सितंबर में मत्स्यन शुरु होकर मई में समाप्त होता है। महाराष्ट्र में ट्रालर परिचालन से प्राप्त होनेवाली झींगे, मछलियाँ, महाचिंगट, शीर्षपाद, उपास्थिमीन, क्राकेर्स, फीतामीन, ईल, शिंगट, तुम्बिल, पाम्फ्रेट और क्लूपिओइड्स हैं। पकड का 15-16 प्रतिशत झींगे ही हैं और वार्षिक राजस्व का 51-66% इनसे ही मिलता है। अध्ययन वर्ष के दौरान एक ट्रालर की कमाई 5 लाख रु. है।

अवमूल्यन, प्रारंभिक पूँजी निवेश का ब्याज और बीमा की नियत लागत 1.5-1.6 लाख और विविध व्यय 2.8-3.4 लाख आकलित किया है। विविध व्यय में सबसे पहले ईंधन का व्यय आता है और इसके बाद श्रम, वेतन, आहार, वार्षिक मरम्मत और अनुरक्षण, बर्फ का मूल्य आदि आते हैं। इनके अतिरिक्त बाज़ार व्यय, पानी का चार्ज आदि छोटे छोटे व्यय भी वार्षिक व्यय में सम्मिलित हैं।

वार्षिक लाभ आकलित करते समय यह मालूम पडता है कि प्रति एकक की पकड के मूल्य से वार्षिक लाभ में अधिक अंतर आता है। दो केंद्रों में प्रति ट्रालर के राजस्व में 50 हज़ार रुपए का अंतर व्यक्त हो गया है। एक ट्रालर का वार्षिक लाभ मिरकरवाड में 19 हज़ार रु. और न्यू फेरी वार्फ में 32 हज़ार रु. होता है और 5-6 वर्ष की अवधि से ट्रालर मालिक अपना पूँजी निवेश वापस ले सकता है।

महाराष्ट्र में प्रतिवर्ष ट्रालरों की संख्या बढ़ने के कारण प्रति ट्रालर की पकड दर कम हो रहा है। इन केंद्रों में ट्राल नेट के परिचालन से आर्थिक लाभ न होने के कारण कुछ ट्रालर, कोष संपाश या गिल जाल परिचालन में लगे हुए हैं। राज्य में अब भी अवसंरचनात्मक और बाज़ार की सुविधाएं उपलब्ध होने पर भी अधिकांश मछुए लोगों को कर्ज के लिए निजी व्यक्तियों या व्यापारियों का आश्रय लेना पडता है। कुछ केंद्रों में मछुओं को वित्तीय और विपणन सहायता देने के लिए मछुआ सहकारी संघ आगे आए हैं। अध्ययन के दोनों केंद्रों में ट्रालरों के लिए रियायती दर में मिलने वाला डीज़ल पर्याप्त नहीं होता और उन्हें आवश्यकता की पूर्ति के लिए बाज़ार से अधिक दर देकर खरीदना पडता है। बढ़ने वाला यंत्रीकरण और ईंधन की अधिक आवश्यकता को मानकर सरकार को सहायक दर पर डीज़ल का कोटा बढ़ाना चाहिए और इससे मछली निर्यात में ट्राल मात्स्यिकी का योगदान और भी बढ़ जाएगा।

# तमिलनाडू तट के समुद्री और नुनखरे जल की मात्स्यिकी संपदाओं के विदोहन के लिए उपयुक्त किए जाने वाले मत्स्यन जाल*

तमिलनाडू तट के समुद्री और नुनखरे जल की मात्स्यिकी संपदाओं का विदोहन परंपरागत रूप से देशज जालों द्वारा किया जाता है। यंत्रीकृत नावों की क्रमिक वृद्धि के कारण तमिलनाडू और पोंडिच्चेरी में वर्ष 1985-89 के दौरान मछली उत्पादन 2.5 लाख टन तक बढ़ गया। इन स्थानों में नियमित मत्स्यन क्षेत्रों के अतिरिक्त तटीय क्षेत्र के 16,058 कि मी$^2$ और उपतटीय क्षेत्र के 7,197 कि मी$^2$ की दूरी में 40 फैथम की गहराई में विदोहन किया जाता है। भारत की अनन्य

आर्थिक मेखला का 16% यहाँ स्थित है जिसमें कोरोमंडल तट, पाक उपसागर क्षेत्र और मान्नार खाडी क्षेत्र शामिल हैं।

इस तट में स्थित 430 मत्स्यन गाँवों में अधिकांश चंगलपट और रामनाट जिले में हैं और यहाँ देशज नावों द्वारा परंपरागत मत्स्यन हो रहा है। यंत्रीकृत नावों द्वारा किए जानेवाले अवतरण में तमिलनाडू का योगदान पूरे भारत के मछली उत्पादन का 17% है।

हाल के वर्षों में और भी अधिक पकड केलिए तमिलनाडू में देशज नावों में कुछ परिवर्तन लाए है। पिछले तीन दशकों के दौरान विभिन्न प्रकार के जालों के निर्माण केलिए कृत्रिम सामग्रियाँ, नाइलॉन और पॉलिप्रोपिलिन (एच डी पी) का अधिक उपयोग हो रहा है।

इस तट में परिचालित नावों के वर्गीकरण और विस्तृत ब्योरा का व्यक्त रिकार्ड नहीं है। फिर भी देशज नावों को उनकी परिचालन रीति के अनुसार बैग नेट, इनशोर ड्राग नेट, एनसरक्लिंग नेट, गिल नेट आदि नाम से वर्गीकृत किया जा सकता है। इनके अतिरिक्त नुनखरे जल में परिचालन होने वाले जाले जालों का वर्गीकरण भी किया गया है।

---

*सी. एम. एफ. आर. आइ के मद्रास अनुसंधान केन्द्र के श्री. पी. तिरुमिलू, पी. के. महादेवन पिल्लै, के. एस. कृष्णन और पी. पूवण्णन द्वारा तैयार किया लेख।

# बुल्स आई - दक्षिण कन्नड तट की एक नाशोन्मुख ट्राल मात्स्यिकी संपदा*

**प्रस्तावना**

हाल के वर्षों में देश की समुद्री मछली का उत्पादन बढ़ाने के उद्देश्य से मत्स्यन कार्य में परिवर्तन लाने के बारे में विचार किये जा रहे है। चिंगट को प्रमुखता देनेवाले निर्यात उद्योग ने अपतटीय मात्स्यिकी संपदाओं (inshore fishery resources) पर प्रतिकूल प्रभाव डाला है। इसलिए समुद्री मछलियों की पकड और भी बढ़ाने के लिए मत्स्यन गतिविधियों का गहरे जल तक विस्तार करना अनिवार्य है।

प्रियाकांतिड्स या "बुल्स आई" इस प्रकार विदोहन करने योग्य एक तलमज्जी (demersal) संपदा है। फिशरी सर्वे ऑफ इंडिया द्वारा आयोजित अन्वेषणात्मक सर्वेक्षणों से यह व्यक्त होता है कि भारत की अनन्य आर्थिक मेखला (EEZ) में 40,000 टन विदोहन करने योग्य यह संपदा मौजूद है। 30 से 500 मीटर की गहराई में ये मौजूद है फिर भी पश्चिम तट के 100 से 200 मीटर की गहराई में इसकी अधिक प्रचुरता रिपोर्ट की गई है।

अभी तक पशिचम तट से प्रियाकांतिड्स के उल्लेखनीय मत्स्यन के बारे में रिपोर्ट नहीं है। फिर भी विशाखपट्टणम से औद्योगिक चिंगट ट्रालर परिचालन द्वारा 236 टन प्रियाकांतस जातियों का वार्षिक अवतरण हुआ है। वर्ष 1979 से लेकर मांगलूर में परिचालित होनेवाले छोटे ट्राल एकक गहरे जल में विदोहन करने का प्रयास करने लगे और उन्हें कुछ नयी मछलियों, जिन में प्रियाकांतिड्स भी थी, मिलने लगी। इस संपदा की मात्स्यिकी के बारे में और भी अधिक जानकरी मिलने के उद्देश्य से इस लेख में दक्षिण कन्नड तट की इस नई संपदा का जीव विज्ञान, मौसमिक प्रचुरता, प्रवास रीति आदि पर 1986-91 के दौरान प्राप्त डाटाओं के आधार पर विवरण प्रस्तुत किया गया है।

**मात्स्यिकी**

वर्ष 1990-91 में मांगलूर और माल्प के ट्राल अवतरण का 3% प्रियाकांतिड्स था। यहाँ का ट्रालर परिचालन नवंबर से लेकर मई तक है। इन ट्रालरों में साधारण रूप से दो प्रकार के जाल होते हैं, चिंगट ट्राल जाल और मछली ट्राल जाल। इन बोटों में 3-5 दिनों के लिए पकड को परिरक्षित रखने की सुविधा भी मौजूद है ताकि एक ही ट्रिप में अधिक मत्स्यन किया जा सकता है। परिचालन कासरगोड से माल्प के 30-60 मी की गहराई के क्षेत्र में किया जाता है।

**मात्स्यिकी की प्रवणता**

वर्ष 1986-87 से 1990-91 की अवधि के साधारण ट्रालरों की पकड का 1.5% प्रियाकांतिड्स थे। वार्षिक पकड वर्ष 1990-91 में 603 टन थी जो वर्ष 1989-90 में 59 टन थी। वर्ष 1990-1991 के दौरान 23.5 कि ग्रा/एकक की अधिकतम पकड दर अंकित की गई। अधिकतम पकड 30 और 40 मी के गहराई क्षेत्र से पूर्व मानसून काल में मिल जाती है।

**जीवविज्ञान**

पकड का मुख्य अंश *प्रियाकांतस हामरर* था और *पी. कुएन्टाटस* भी मौजूद था। *पी. हामरर* का आकार 145 से 265 मि मी था और पकड में स्त्री जाति की मछली अधिक थी। मई महीने के दौरान 35% स्त्री जाति दिखाई पडी और इस समय इनका निरीक्षण करने पर करीब 42% के पेट शून्य दिखाये पडे। आहार नली का विश्लेषण करने पर यह भी व्यक्त हो गया कि ये मांसाहारी (carnivorus) हैं।

**टिप्पणी**

गभीर सागरीय मत्स्यन, मछली उत्पादन बढ़ाने का एक माध्यम होने पर भी ऐसे परिचालन की आर्थिक व्यवहारिता सुस्थापित की जानी है। वर्तमान उपतटीय ट्राल रीति में उचित परिवर्तन लाने से विदोहन न किए गए क्षेत्रों में परिचालन किया जा सकता है। चिंगट और मछली ट्राल जाल लगाए गए ये बोट चिंगट पर आधारित मात्स्यिकी की अपेक्षा चिंगट-फिनफिश पर आधारित मात्स्यिकी पर ज़ोर देने लगे। यह, मत्स्यन प्रयास में हुए परिवर्तन की एक अच्छी प्रवणता है।

फिशरीस सर्वे ऑफ इंडिया द्वारा आयोजित सर्वेक्षणों से यह दिखाया पडा कि पश्चिम तट के 30-50 मी से प्राप्त कुल ट्राल पकड का 7% प्रियाकांतिड्स है। यह बात उल्लेखनीय है कि इस क्षेत्र में किया गया विदोहन परंपरागत अपतटीय ट्राल मात्स्यिकी से भी अधिक है। इसका मुख्य कारण बोटों तथा अन्वेषणात्मक पोतों द्वारा भिन्न प्रकार के गिअरों का प्रयोग है। साधारण आकार वाले एकक वर्ष 1986-91 के दौरान मांगलूर के 60 मी की गहराई जल में परिचालन करने पर लगभग 1.5% प्रियाकांतिड्स को प्राप्त हुआ। इस क्षेत्र की प्रियाकांतस संपदा के अधिकाधिक विदोहन के लिए गिअरों में और भी परिवर्तन लाना आवश्यक समझा गया है।

अध्ययन की अवधि के दौरान वर्ष 1986-87 और 1990-91 में अधिकतम पकड प्राप्त हुई और बीच के समय में प्रियाकांतस का कम अवतरण हुआ। इस पर यह रिपोर्ट किया गया है कि प्रियाकांतिड्स की इस कम प्रचुरता का कारण अनन्य आर्थिक मेखला में अधिकार प्राप्त पोतों द्वारा किया गया विदोहन होगा।

उत्तर केरल-कर्नाटक तट में जुलाई महीने में 200-500 मी की गहराई के जल में और सितंबर-नवंबर के दौरान 100-200 मी की गहराई के जल में प्रियाकांतस की प्रचुरता दिखाई पडी है। वर्तमान अध्ययन यह व्यक्त करता है कि अपतट क्षेत्र में फरवरी-मार्च (पूर्व मानसून) के दौरान इस जाति की अधिकतम प्रचुरता है और इस अवधि में अधिकांश स्त्री जाति परिपक्व अवस्था में होती है। अध्ययनों द्वारा यह भी व्यक्त हो गया कि प्रियाकांतिड्स मानसून में प्रजनन के लिए गहरे जल से अभितट (on shore) तक और पूर्व मानसून में उथले जल (shallow water) तक और मानसूनोत्तर समय में गहरे जल तक प्रवास करते हैं। इस प्रकार यह भी देखा गया है कि ये आहार के लिए गहरे जल तक भी प्रवास करते हैं।

दक्षिण पूर्व एशियाई देशों में बुल्स आई के निर्यात की संभाव्यता बहुत अधिक है। भोजन के रूप में इस का मूल्य भी ज्यादा है। केरल में भी इसका अच्छा विपणन होता रहता है। प्राप्त लेखाओं के अनुसार इस जाति के विदोहन की अच्छी साध्यताएँ हैं। उचित योजना और कार्यान्वयन से ही समुद्री मछली का उत्पादन और देश में समुद्री मछलियों का निर्यात और भी बढ़ाया जा सकता है।

---

*मांगलूर अनुसंधान केंद्र के पी. यू. सकरिया, के. सुनिलकुमार मोहमद, पी. पी. पिल्लै और सी. पुरंधरा द्वारा तैयार किया लेख।

# झींगा खेतों में बडी सीपियों के आक्रमण का असर*

भारत के पश्चिम तट में गोवा से लेकर केरल तक काली बडी सीपी *विल्लोरिटा सैप्रिनोइडे* बडी मात्रा में मौजूद है। यह जाति शुद्ध जल के समान की लवणीयता में जीनेवाली पृथुलवणी (euryhaline) जीवी है। केरल के वेम्बनाड झील में इनकी बहुलता है।

केरल के वैपीन द्वीप परंपरागत झींगा खेती के लिए मशहूर है। यहाँ झींगों का मौसमी और बहुमाही खेती होती है। इन दिनों यहाँ के खेतों में सीपियों का आक्रमण हुआ है। इसलिए झींगा खेती, जो पट्टे पर किया करते थे, का दाम बहुत गिर गया है।

सीपियाँ निस्यंदक भोजी (filter-feeders) हैं। पानी के पादप्लवकों (phytoplankton) को वे निस्यंदन से खाती हैं इसलिए पानी की उत्पादकता में भेद हो जाती है। इसी प्रकार बडी सीपियाँ अवसादन, विलीन पौष्टिकता और शुद्ध वायु पर भी प्रभाव डालती हैं।

परंपरागत झींगा खेती करनेवाले वैपीन द्वीप के मछुओं को ध्यान में रखते हुये सी एम एफ आर आइ ने वर्ष 1986-87 के दौरान इस विषय पर एक अध्ययन चलाया। निरीक्षण ने व्यक्त किया कि झींगों की बढ़ती में बडी सीपियों ने उल्टा प्रभाव डाला है। उदाहरणार्थ सीपीहीन खेत की तुलना में सीपी युक्त खेत के झींगों ने मंद बढ़ती दिखाई। इसके अलावा सीपीयुक्त खेत में विलीन ऑक्सिजन, लवणीयता, कैल्सियम और प्राथमिक उत्पादन कम था।

उपर्युक्त अध्ययन वर्तमान परंपरागत खेतों में दोनों की खेती से झींगों की बढ़ती में होनेवाले विपरीत असर पर प्रकाश डालने के साथ साथ यह भी साबित करना चाहता है कि वैज्ञानिक तरीके से एक ही खेत में सीपियों और झींगों का लाभदायक संवर्धन किया जा सकता है। सापियाँ आहार के लिए झींगों से नहीं लडते क्यों कि ये निस्यंदक भोजी हैं। आहार श्रृंखला में ये प्राथमिक उपभोक्ता हैं। पादपप्लवकों की अधिक जीव संख्या पानी की सुपोषिणी स्थिति का लक्षण है और प्रभात में यह विलीन ऑक्सिजन का अंश कम होने का संबंध भी दिखाती है। ऐसी स्थिति में पादपप्लवकों और बैक्टीरिया की उच्च सान्द्रता का नियंत्रण करते हुए पानी के विलीन ऑक्सिजन का उतार-चढाव सुधारने की सहायता सीपियों से होती है। "बयोटरबेशन" और रीमिनेरलैज़ेशन के ज़रिए इस तंत्र की पौष्टिकता बढ़ाने के लिए भी ये जीव उपयोगी है। इस प्रकार निरीक्षण इस बात की ओर इशारा करता है कि उचित प्रबंधन प्रणाली से सीपियों और झींगों का बहुसंवर्धन किया जा सकता है।

*केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान कोचीन - 31 के. सजी चाक्को और एम. एम. तोमस, द्वारा तैयार किया लेख।

# कारवार तट के निकट से ट्राल नेट द्वारा "करिक्काडी" झींगों *पैरापेनिओप्सिस स्टाइलिफेरा* की बडी मात्रा में पकड*

कर्नाटक तट में पूरे वर्ष में बडी मात्रा में झींगा मत्स्यन होने वाले केंद्र हैं मांगलूर, माल्प, ताद्री और कारवार। यह आकलित किया जाता है कि इस राज्य में झींगों का वार्षिक अवतरण 4 से 5 हज़ार टन है। इस क्षेत्र की एक वाणिज्य प्रमुख जाति है *पैरापेनिओप्सिस स्टाइलिफेरा* जिसे आम रूप से "करिक्काडी" कहलाते है। सितंबर के प्रथम पक्ष में दक्षिण पश्चिम मानसून की समाप्ति के बाद कारवार तट में "करिक्काडी" का असाधारम अवतरण हुआ।

कारवार में 1991, सितंबर 5 वीं से 21 वीं. तक 227.0 कि. ग्रा/ एकक के पकड दर में 379.998 टन झींगों का अवतरण हुआ। यह भारी अवतरण 1674 ट्रालर एककों द्वारा किया गया। अधिकतम अवतरण सितंबर 5 वीं और 9 वीं के बीच में हुआ। मांगलूर, माल्प, ताद्री और गोआ से भी इस क्षेत्र में मत्स्यन के लिए ट्रालर आने के कारण यहाँ ट्रालरों की संख्या बहुत बढ गई है। फिर भी स्थानीय त्योहार और बोट यूनियन के अनुरोध के कारण सितंबर 11, 12, 17 और 18 वीं को मत्स्यन नहीं हुआ था।

ताद्री में 12 वीं से 16 वीं सितंबर के बीच में झींगों की भारी पकड हुई। भारी अवतरण के साथ साथ अनुरक्षण, यातायात और विपणन की उचित सुविधा न होने के कारण 17 वीं से 21 वीं सितंबर तक मत्स्यन पर रोक लगाया। केरल तथा गोवा में झींगों का मत्स्यन तेज़ी से होने पर कारवार और ताद्री में झींगे की मत्स्यन प्रवणता मंद दिखाई पडी। कारवार में पकड/एकक 891 से 65 कि. ग्रा. तक और ताद्री में 393 से 46 कि. ग्रा तक कम हो गया।

मुख्यत : झींगों की पकड बोटम ट्राल जाल द्वारा होने पर भी कोष संपाशों के द्वारा इस अवधि के दौरान 2 टन के दर में झींगों का अवतरण किया जा सका।

झींगों का आकार रेंज 84 से 121 मि मी था (पुरुष 84-101 मि मी आकार वाले और स्त्री 92-121 मि मी आकार वाली।) लिंग अनुपाल देखने पर पुरुष जाति (28%) की अपेक्षा स्त्री जाति (72%) अधिक थी। स्त्री जातियों के 32% में परिपक्वता की विभिन्न अवस्थाओं की जनन ग्रंथि दिखाई पडी। बाकी सब भुक्तशेष अवस्था (spent condition) में थी।

*सी. एम. एफ. आर. आई के कारवार अनुसंधान केन्द्र के श्री. वी. एस. काकती और सी. के. दिनेश द्वारा तैयार किया लेख।

# दक्षिण कन्नड तट से कोष संपाश के ज़रिए काला पॉम्फ्रेट *फोर्मिओ नाइगर* की असाधारण पकड*

कन्नडा में "मानजी" नाम से जानेवाले *फोर्मिओ नाइगर, पाम्पस अर्जेनटियूस* और पाम्पस *चैनेनसिस* को कोष संपाशों, गिल जालों और ट्राल जालों से पकडे जाते हैं। यहाँ के कुल समुद्री मछली उत्पादन के 0.5-1.0% इसका योदान है। पकड का ज्यादा भाग माने 80% *एफ. नाइगर* है। पॉम्प्रेटों के मत्स्यन के लिए अनुकूल महीने सितंबर से दिसंबर तक और फरवरी से मार्च तक होते हैं। सब से अनुकूल महीने अक्तूबर/नवंबर हैं। *एफ. नाइगर* की भारी पकड यहाँ की सविशेषता है वैसे अक्तूबर 1986, सितंबर 1987 और अक्तूबर 1990 में क्रमशः 207, 161 और 377 टन और अक्तूबर 1990 में मँगलूर से 855.5 टन *एफ. नाइगर* प्राप्त हुआ। लेकिन पकड स्थिर नहीं थी, ऐसी भारी पकड छोटी अवधि के लिए ही प्राप्त होती थी।

**भाव का स्वभाव**

अक्तूबर, 1990 के पहले हफ्ते में भारी पकड के कारण मँगलूर में *एफ. नाइगर* का भाव प्रति कि.. ग्रा 10 रुपये और 7.5 रुपये के बीच में था। यहाँ पहले हफ्ते में कुल मूल्य 63.5 लाख आकलित किया गया। दूसरे हफ्ते में पकड में घटती होने पर भी मूल्य पहले हफ्ते के समान ही रहा और कुल 7.8 लाख रुपये की मछली बिकी गई माल्प में 7-11-1990 को पकडी गई मछली की मात्रा के आधार पर प्रति नाव की पकड का नीलाम दर 14,000 रुपये से 40,000 रुपये तक परिवर्तित रही। इससे मछली का प्रति कि. ग्रा. का मूल्य 15-17 रुपये तक आया और केवल 7-11-1990 का कुल मूल्य 11.0 लाख रु. आकलित किया।

**एफ. *नाइगर* का लंबाई-चौडाई संबन्ध**

माल्प से 7-11-1990 को कोष संपाश के ज़रिए पकडे गये *एफ. नाइगर* का आकार 270 से 480 मि. मी. के बीच दिखाया पडा। इनमें 21.6% 360 मि मी के आकार वर्ग के थे बाकी 9.8% 330 मी मि, 5.8% 390 मि मी और 3.9% 420 मि. मी. के आकार वर्ग के थे। प्रति मछली का भार 385 से, 1,600 ग्रा के बीच दिखाया पडा।

*जी. एम. कुलकरनी, एस. केम्पराज, मधुमोहन, उमा भट और सी. पुरन्धरा सी. एम. एफ. आर. आई का मँगलूर अनुसंधान केन्द्र, मँगलूर

# स्नागल टूथ शार्क, होमोप्रिस्टिस इलोंगाटस (क्लूसिंगर, 1871) के संबंध में एक छोटा सा विवरण*

स्नागल टूथ शार्क, जो फोसिल शार्क नाम से भी जाना जाता है, भारत के समुद्रवर्ती तटों की एक विरल जाति है। इसलिए इस जाति पर विशद अध्ययन करना मुशिकल हो गया है। फिर भी पता चला है कि भारत के समुद्रों में देखे जानेवाली यह जाति 218 से मी तक लंबा हो जाती है और गिल नेट के ज़रिए पकडा जा सकती है। इसका ताजा माँस बहुत स्वदिष्ट है।

पिछले एक वर्ष के दौरान मद्रास के समुद्र तट से इस जाति के 14 सुराओं को पकडा। इन में 6 पुरुष और 8 स्त्री जाति के थे। स्त्री जातियों में 5 गर्भावस्था में थी। पाँचों के भ्रूण विकास की अंतिम दशा तक पहुँच गये थे। सिर्फ दाँत के विकास को छोडकर वयस्क भ्रूणों और साधारण सुराओं में कोई अंतर नहीं देखा था।

इनमें अधिकांश सुराओं के पेट शून्य था फिर भी एक के पेट में एक छोटा सा सुरा व दूसरे दो के पेट में छोटी-छोटी रे मछली दिखाई पडी।

*पी. देवदोस और एस. चन्द्रशेखर, सी, एम. एफ. आर. आई का मद्रास अनुसंधान केंद्र।

# प्लास्टिक पट्टियों के ज़रिए सुराओं में होनेवाली चोट-एक रिपोर्ट*

भारत के पूर्वी और पशिचमी तटों से वाणिज्यक मछली का अवतरण होते वक्त गर्दन में प्लास्टिक वलयों से धेरे हुये सुराओं को मिलते हुये देखा है। इस पर प्राप्त सारी रिपोर्टों ने व्यक्त किया है कि सुराओंकी गुद्दी के चारों और इससे गहरी चोट हुई है। इस प्रकार के एक सुरा को बडे काँटेवाले लंबी डोर से 17-2-91 को पुन्नक्कयल अवतरण केन्द्र में पकडा था। यह पुलिसुरा *गालोसिरेडा क्युवेरि,* था। यह गहरी चोट से पीडित था और घाव गर्दन के चारों और देखा था। सुरा को पकडे मछुओं ने कहा था कि इसके गर्दन में पकडते वक्त सिन्थेटित वस्तु से बनाई गई एक पट्टी थी लेकिन तट पर पहूँचाने पर यह कहीं नष्ट हो गया था।

भारत में पहली बार 28-3-87 को वेरावल से शरीर में पट्टी से वलयित हुआ "डस्की शार्क" *कारकारिनस अबसक्यूरस* को पकडा था। इसके बाद फरोजखान और नन्दकुमार ने 1988 मई के बारहवीं और उन्नीसवीं तारीख को नीले रंग की *पोलिथिलीन* पट्टी से वलयित "ब्लाक टिप शार्क" *कारकारिनस लिंबाटस* के बारे में रिपोर्ट की थी। साम बेनेट आदि 24-8-89 को सिंथटिक बेल्ट के साथ अवतरित पुली सुरा, *गालोसिरेडा क्युवेरि* को इस प्रकार टैगन किया हुआ सुरा मानता है। लेकिन फिटज़पाट्रिक (1989) के अनुसार इन सुराओं में देखा गया टैग असला टैग या टैगन केलिए उपयोग करनेवाली वलयाकार पट्टी नहीं है बल्कि समुद्र में अलक्ष्य रूप से छोडी गई सिंथेट्टिक पट्टिया है। इन सिंथेट्टिक पट्टियों में सुरायें अपनी बाल्यावस्था में ही फँस जाते हैं। इसलिये ही इनके बडे हो जाने पर इस प्रकार की वलयाकार चोट होती है। समुद्री मछली संपदा की सुरक्षा के लिये अनावश्यक सिंथेटिक पट्टियों को समुद्र में बहाना फिटज़पाट्रिक की दृष्टि से उचित नहीं है।

*सी एम एफ आर आइ टूटिकोरिन अनुसंधान केन्द्र के एच. मोहम्मद कासिं, टी. एस. बालसुब्रहण्यन, के. एम. एस. अमीर हंसा और एस. राजपाक्कियम की 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.

Edited by Dr. K. J. Mathew with assistance from Mr. K. Soloman. Published by Dr. K. J. Mathew on behalf of the Director, Central Marine Fisheries Research Institute, P. B. No. 2704, Dr. Salim Ali Road, Cochin - 682 031, Kerala India. Printed at Modern Graphics, Azad Road, Cochin - 682 017.