

---

Report of the Consultation  
on Stock Assessment  
for Small-Scale Fisheries  
in the Bay of Bengal

Volume 2 : Papers

---

Executing Agency :  
Food and Agriculture Organisation  
of the United Nations

Funding Agency :  
Swedish International  
Development Authority

INDIA

**Status Paper on Coastal Fishery Resources  
along the East Coast**

By

E. G. Silas

T. Jacob

K. C. George

M. J. George

Central Marine Fisheries Research Institute  
Post Bag 1912, Cochin 682018



## CONTENTS

	<i>Page</i>
1. Existing knowledge on the status of exploited coastal stocks and estimates of exploited yields	25
2. Methodology for collection of catch statistics and the organisational set-up for collection and processing of catch statistics	27
3. The extent of availability of catch statistics with reference to species, areas, types of vessels and gear and fishing effort in hours	28
4. Methods of stock assessment employed, if any and the results obtained. Nature of studies presently undertaken and those in the pipeline	29
5. Brief information on the fishery and biological characteristics such as age/ size, composition, growth, feeding habits, maturity and spawning and estimates, if any of population parameters of major exploited species	29
6. Yield trends over the years against fishing effort	33
7. Problems/constraints in the collection and processing of fishery statistics and in the assessment of coastal stocks	33
8. Requirements for solving/removing the above problems/constraints	33
Selected references	34
 <i>Tables</i>	
1. Percentage contribution of important varieties of fish to the total catch of the east coast	37
2. Estimated marine fish landings on the east coast of India during the years 1975 to 79, in tonnes	38
3a. Estimated marine fish landings in Tamil Nadu during the years 1975 to 1979, in tonnes	39
3b. Estimated marine fish landings in Pondicherry during the years 1975 to 1979, in tonnes	40
3c. Estimated marine fish landings in Andhra Pradesh during the years 1975 to 1979, in tonnes	41
3d. Estimated marine fish landings in Orissa during the years 1976 to 1979, in tonnes	42
3e. Estimated marine fish landings in West Bengal during the years 1975 to 1979, in tonnes	43
3f. Estimated marine fish landings in Andamans during the years 1975 to 1979, in tonnes	44

## 1. Existing knowledge on the status of exploited coastal stocks and estimates of exploited yields

The total marine fish production in India has been estimated at an average of 1.37 million tonnes a year for the two year period of 1978-79. Roughly two thirds of this is contributed by the traditional small-scale fisheries and the rest by small and medium sized mechanised 'boats using mostly bottom trawls and gill nets. Nearly 30% of the marine fish produced in India is landed along the east coast.

There has been an increase in the marine fish production of India by about 50, per cent as compared to 1969 (0.9 million). This increase is mainly due to factors such as the progressive introduction of mechanised crafts, use of synthetic fibre fishing gears and improvement in infrastructure facilities for landing, transporting and marketing. With the recent introduction of larger trawlers by private agencies, India has ventured into commercial off-shore, and deep-sea fishing. The present paper gives an appraisal of the fishery resources in the seas bordering the east coast of India comprising the coasts of West Bengal, Orissa, Andhra Pradesh, Tamil Nadu and Pondicherry and the Andaman and Nicobar Islands.

### 1.1 Coastal fisheries

Marine fishery resources in the east coast are constituted of a large variety of fin and shellfishes, typical of tropical waters. These comprise pelagic resources such as lesser sardines, ribbon fish, white baits, hilsa, horse mackerel, Indian mackerel, seer fish and flying fish; demersal resources such as silver bellies, elasmobranchs, sciaenids, catfish, threadfin, breams and other perches and pomfrets; crustacean resources such as prawns, lobsters and crabs and molluscan resources such as mussels, oysters and clams, cuttlefish and squids.

### 1.2 The coastline, shelf area and fishing grounds

The eastern seaboard of India has a coastline of about 3,000 km and the Andaman Nicobar Islands about 1,500 km. The total continental shelf covers an area of about 67,000 sq.km up to 50 m depth and 1,10,000 sq.km up to 200 m. In the Andaman Nicobar seas the continental shelf covers about 16,000 sq.km up to 200 m. The average width of the continental shelf is 43 km off the Tamil Nadu coast, 32 km off the Andhra coast and 68 km off the Orissa-West Bengal coast.

On the east coast, trawling grounds are in general less extensive. In the southern sector, the Wadge Bank south of Cape Comorin and the Pedro Bank in the Palk Bay have been traditional trawling grounds. Potentially good shark fishing grounds from Point Calimere to Cuddalore, perch grounds from Point Calimere to Pondicherry and horse mackerel from Pondicherry to Madras are indicated. Palk Bay and Gulf of Mannar abound in silver bellies. Large concentrations of white baits have been noticed in the Gulf of Mannar during the June to September months. Threadfin bream, catfish and ribbonfish have been caught in abundance off the Andhra coast. Recent exploratory surveys along Orissa-West Bengal coasts have shown several productive grounds off Sand heads, Tiger point, Baitarani, Devi and Prachi river mouths, Black Pagoda, Puri, Chilka and Gopalpur. The 'swatch of no grounds' have yielded quality fish in significant quantities.

### 1.3 Andaman and Nicobar Islands

In the Andamans commercial fishing is carried out mainly from Port Blair, Rangat, Mayabander and Diglipur. Subsistence fishing is prevalent in the narrow eastern coastal belt of Andamans and neighbouring islands.

The continental shelf is narrow and within two km of the coast line depths of 45 to 180 m depth are seen. Weather conditions are rough May to October, and calm November to April.

#### *1.4 Census of fishermen and fishing craft*

##### *1.4.1 East coast*

According to the figures obtained through an all-India census carried out in marine fishing villages by the Central Marine Fisheries Research Institute (C.M.F.R.I.) around 1975, the total marine fishermen population in the states along the east coast was about 0.6 million inhabiting 982 coastal villages. 25 per cent of them were active fishermen. Based on this census and other currently available information the number of mechanized fishing craft would be about **4,000, mostly trawlers. Non-mechanized boats number about 70,000 the most common among them being catamarans, dugout canoes and plank-built boats. The most commonly used gears were gillnet, drag net, boat-seine, bag net and hooks and lines.**

##### *1.4.2 Andaman, Nicobar Island groups*

The fishermen numbering about 1,000 are of Andhra, Tamil Nadu, Kerala, Bengal and a few of Burmese origin. The local fishing fleet consists of about 500 craft, mainly dug-out canoes. The traditional gears are cast net, hook and line, gill net, shore-seine, stake net and anchor trawl net. Mechanized trawling has not yet been established in the Andaman waters. Andamans based joint ventures with international collaboration have been in operation during the last two years, with trawling mainly along the Orissa - West Bengal coast.

#### *1.5 Annual catches*

The figures of the annual catches in the east coast for the five years 1975 to 1979 and the percentage contribution of important varieties of fish are given in Table 1. The detailed species-wise figures for the east coast area as a whole are given in Table 2 and the figures separately for each state are shown in Table 3(a) to 3(f). Broadly the total production showed a declining trend from 1975 to 1977 and thereafter an increasing trend is seen. Similar trends are also seen for the states of West Bengal, Orissa, Tamil Nadu and Pondicherry, while in Andhra region the declining trend continued till 1978. This can be partly ascribed to the series of cyclones that hit especially the Andhra coast, the most devastating being the one of November 1977.

It is seen that lesser sardines, ribbon fishes, white baits, carangids, seer fish and Hilsa form the bulk of the pelagic fishes caught on the east coast (Table 1). Silver bellies, sharks and rays, jew fishes, catfishes, perches and pomfrets constitute the major demersal groups caught. Penaeid prawns form about 5 per cent of the total catch.

Latest landing figures (1978) available for the Island group of Andamans show an estimate of 1579 t (Table 3) of which about 500 t can be classified as demersal consisting of perches, elasmobranchs, silver bellies and catfish. The pelagic group consisting of carangids, seer fish mackerel, lesser sardines, tunas, barracudas, mullets, white baits etc. contribute nearly 1,000 t and the Penaeid prawns 38 t.

A catch of about 5,500 t of fish including 227 t of prawns is landed by the joint venture deep sea operations from the east coast in 1978.

#### *1.6 Effort*

Data on catch and effort are being collected at the national level by the Central Marine Fisheries Research Institute through its scientifically planned sample surveys, and state-wise and species-wise catch are estimated and published periodically. While overall effort is estimated at CMFRI gear-wise estimates pose a major problem as the fishery is one of multi-species operated by multigears.

## 1.7 Resources survey

The C.M.F.R.I. carries out continuous monitoring of the resources of all important exploited fisheries in the seas around India. Along the east coast, fisheries such as those of lesser sardines, silver bellies, ribbon fishes, sciaenids, white baits, catfish, perches, seer fish and penaeid prawns are monitored for the fishery and biological characteristics. Trawling data collected by the Exploratory Fisheries Project vessels operating off Tuticorin, Madras, Kakinada, Waltair, Paradeep and Calcutta form additional sources for studying the resources position in the area. Catch rate and depth-wise and region-wise catches are calculated for both pelagic and demersal resources. The erstwhile FAO/UNDP-sponsored Pelagic Fisheries Project had carried out extensive surveys on pelagic resources from Ratnagiri to Tuticorin. The data collected resulted in a better understanding of the stock abundance and distribution of the major fish resources of the area.

## 1.8 Organic productivity

Studies on primary productivity have been made by C.M.F.R.I. in the inshore waters of Gulf of Mannar and Palk Bay. The reports of the 'Galathea' Expedition and the International Indian Ocean Expedition also dealt with primary productivity in the Bay of Bengal. The production rate in the Bay of Bengal region was found to be on the average  $0.19 \text{ gC/m}^2/\text{day}$  in the deeper part while the shelf area showed a higher productivity rate of  $0.63 \text{ gC/m}^2/\text{day}$ . In the inshore regions of Gulf of Mannar and Palk Bay the value was much higher. Taking the average to be  $0.63 \text{ gC/m}^2/\text{day}$ , the net organic productivity for the east coast shelf was estimated at 15 million tonnes of carbon and the potential fish yield over 6 lakh tonnes.

## 1.9 Statistical models

Data on biological, physiological and nutritional aspects such as growth, mortality, reproduction, migration and feeding habits, chemical and physical properties of the inshore and off-shore waters and the interaction and dynamics of population are essential to study the behaviour of the marine system, the knowledge of which is a pre-requisite for reliable prediction and efficient management of the fisheries. Due to the inherent complexities of the fisheries and lack of suitable data some of the fishery problems cannot be directly investigated. In such situations one may resort to simulation techniques involving use of mathematical and statistical models. System analysis techniques have been suggested to fisheries problems only recently. While no advances have been made in this direction in the country, the C.M.F.R.I. proposes to initiate such studies for the marine systems in the Indian seas.

## 2. Methodology for collection of catch statistics and the organisational set-up for collection and processing of catch statistics

### 2.1 Methodology

The C.M.F.R.I. is the nodal organisation engaged in the task of collection of marine fish catch statistics and data on biological characteristics on a nation-wide basis. The Institute has played a pioneering role in developing a suitable sampling design for the collection of catch data. The procedures have been undergoing modifications to accommodate the innovations introduced in the fishing industry from time to time.

At present the Institute is following a stratified multistage probability sampling design for estimation of marine fish landings in the country. The design involves a space-time stratification. Each maritime state is divided into zones based on criteria such as intensity of fishing, type of fishing and geographical conditions. A zone consists of about 20 to 30 landing centres. A ten day period in a month forms the time-stratum. From the first five days of the month a day is selected randomly which together with the next 5 consecutive days form the first cluster. The next 6 days from the other two groups of ten days are so selected that a ten day gap falls between the starting day of two consecutive clusters. Three centres are randomly selected for observations over 6 days and each selected centre is observed for two days, first day in the afternoon and second day in the morning for a six-hour duration each day. On the day of

observation, based on the landings of a sample number of boats (units) selected in a systematic way, detailed recordings are made on items such as species-wise composition of catch, type of crafts and gears used and effort. The total number of boats landed during the observation period is also recorded. A sub-sample of commercially important fishes is collected for biological observation. Landings made at night which are generally of a much smaller magnitude are recorded through careful enquiry.

In zones where considerable variation is observed in the landing pattern, sub-stratification is made based mostly on the intensity of landings and sampling is done from within the substratum. In fact the stratification procedure often undergoes continuous change depending on the intensity of landings. Work programmes are prepared according to the random procedure every month afresh for implementation at the field level.

From the landings of selected boats (units) the landings for all the boats (units) during the observation period are estimated first. By adding the estimated quantities landed during the two six-hour periods and during the night (12 hrs.) the quantity landed for one day (24 hrs.) at a centre is calculated. By using appropriate raising factors the monthly zonal landings are estimated. By pooling the zonal estimates for all the months the figures of annual landings are obtained. The standard errors of the estimates are also computed for the annual estimates of catch.

## **2.2 Organization**

The Institute maintains a well-trained field staff in 42 research/field centres located along the coastline to monitor the catch. They are specially trained to identify the various species and to collect the needed biological statistics. The scientific and senior technical personnel posted at headquarters and different research centres to implement the research programmes of the Institute carry out supervision of the work of the collection of statistics at the field level.

The data collected for a month are sent within the first ten days of the succeeding month to the Data Centre maintained at the headquarters of the Institute. Scrutiny and processing of data are done by a team of qualified computing staff using partly calculators and partly programmable computers. The processed results are examined and interpreted and the information is disseminated periodically through the Institute's publications.

Some of the states like Maharashtra, Gujarat and Tamil Nadu are also collecting catch statistics from the landing centres located within the respective states employing random sampling procedures. Frequent dialogues are arranged between the scientists of the Institute and the officials of the State Fisheries Departments to examine the figures obtained by the two agencies. As per the recommendation of the National Commission on Agriculture, an integrated methodology is being evolved so that the C.M.F.R.I. and the State Departments may be able to combine their efforts to arrive at more precise estimates. In case of states where no system of collection of catch statistics exists, the C.M.F.R.I. is giving the necessary technical support.

## **3. The extent of availability of catch statistics with reference to species, areas, types of vessels and gear and fishing effort in hours**

The Central Marine Fisheries Research Institute publishes state-wise and species-wise estimates of fish catch and supplies the details to national and international agencies. The species are combined to form 27 groups as shown in Table 2 mentioned earlier. Proposals to record species in more detail are already on. Thus pomfrets will be grouped into 3 namely the white, grey and black pomfrets. Similarly for all the commercially important varieties more detailed species-wise identification and recording will be made. District and season-wise estimates are also under preparation.

The types of craft used, both mechanized and non-mechanized, with further details are recorded during the observation period. Information on total man-hours of fishing is also collected. However, gear-wise estimates of effort for any particular species pose a major problem as the fishery is one of multiple species operated by multigears. Efforts are under way to standardise

the effort for selected commercially important species with reference to the most important gear prevalent in an area.

#### 4. Methods of stock assessment employed, if any, and the results obtained. Nature of studies presently undertaken and those in the pipeline

##### 4.1 Methods

While several procedures are followed by research workers, a commonly used method based on landed catches is summarised here. On the basis of length and weight measurements made on a representative sample of fish catch, express the total catch in numbers and segregate the length data into different year classes by using a method like 'length frequency plot'. The instantaneous total mortality ( $Z$ ) is estimated by comparing the abundance of fish at successive years. An estimate of natural mortality ( $M$ ) is obtained as the intercept of the line of regression of  $Z$  on fishing effort. The instantaneous rate of fishing mortality ( $F$ ) can then be directly computed. From known values of  $F$  and  $M$  the rate of exploitation and consequently the stock can be estimated.

Some estimates of the magnitude of potential stocks in the Arabian Sea and the Bay of Bengal have been published based on primary productivity figures and the average rates of fish production per unit area. (Prasad et al., 1970, Cushing, 1971, Jones and Banerji, 1973, Nair et al., 1973 and George et al., 1977). Systematic acoustic surveys in Indian waters have been conducted only along the SW coast of India and the segment of the SE coast (Gulf of Mannar) covered during the studies gave assessment figures of the migrant white bait stocks in the Gulf of Mannar during the June-September period (Anon 1976b). Jones and Banerji (1973) estimated a potential yield of 815,000t of fish from the shelf of the east coast split into 143,000 t of demersal fish based on records of average catches and 672,000 t of pelagic fish based on primary productivity rates. Nair et al. (1973) estimated on the basis of primary productivity studies, a potential of little over 600,000 t of fish for the east coast shelf. George et al. (1977) computed figures of potential yield for the east coast shelf on the basis of primary productivity as well as rate of fish production per sq.km and has arrived at 1.2 and 1.4 million tonne respectively as the magnitude of the potential yield. The acoustic surveys of the Pelagic Fishery Project revealed that almost the whole stock of white baits migrated from the SW coast to the Gulf of Mannar on the SE coast during the June-September period. The highest concentration of this stock observed in August-September 1974, was estimated at about 800,000 t.

#### 5. Brief information on the fishery and biological characteristics such as age/size, composition, growth, feeding habits, maturity and spawning and estimates, if any, of population parameters of major exploited species

A few species of comparative importance from the point of view of production, namely, lesser sardines, ribbon fishes, white baits, silver bellies, jew fishes, pomfrets and shrimps are briefly dealt with here.

##### 5.1 Fishes

###### 5.1.1 Lesser sardines

Among lesser sardines the commercially important species are *Sardinella gibbosa*, *S. fimbriata*, *Sualbella* and *S. sirm*. The fishery is restricted to the inshore waters within 25 km from the shore and mainly supported by 0-year class fish. They mature and breed at the end of first year of life and their life span is about 2 years. The first three species mentioned above have more or less the same rate of growth reaching about 120-130 mm total length at the end of the first year when they attain maturity. *S. sirm* attains 170-180 mm length at the end of first year. The lesser sardines have similar food preferences, zooplankton being the most dominant food item.



### 5.1.2 Ribbon fishes

Ribbon fishes form fishery of considerable magnitude along the east coast, particularly along Tamil Nadu and Andhra coasts. A limited fishery exists in the Hooghly-Matlah estuaries. The most dominant species caught is *Trichiurus lepturus* which grows up to 1.5 m. Average commercial size is 75 cm. The other species *Lepturacanthus savala*, *Eupleurogrammus intermedius* and *E. muticus* are smaller in size. Large shoals of *T. lepturus* are caught from the inshore waters of peninsular India during August and October. Ribbon fishes breed more than once in a year. *L. savala* is the predominant species in Hooghly Matlah estuaries. Commercial size of this species is 15-50 cm *E. intermedius* is abundant in Palk Bay and *E. muticus* along Orissa coast. Commercial size of *E. intermedius* is 14-35 cm and the life span about 4 years. Commercial size of *E. muticus* is 35-50 cm. Ribbon fishes are carnivorous, the food consisting of crustaceans and fishes. Spawning of ribbon fishes appear to be in offshore waters.

### 5.1.3 Seer fishes

The fishery is constituted by 3 species, *Scomberomorus commersoni*, *S. guttatus* and *S. lineolatus*. Seer fishes are caught from the inshore waters by gill nets, drift nets and hook and lines. The fishing season extends from October to March. The spawners have been met with during May to July period. The size at maturity is about 50 cm. The fishery is dominated by this size group assigned to the third year class.

### 5.1.4 White baits

White baits (*Stolephorous* spp.) occur mostly in areas with bottom depths between 20 and 50 m. *S. heterolobus*, *S. zollingeri*, *S. bataviensis*, *S. commersoni*, *S. baganensis*, *S. devisi* and *S. indicus* are the common species. The fishery seasons are from May to November along Tamil Nadu and November to April along Andhra coast. Large concentrations of the fish are observed in the Gulf of Mannar during the June-September period. The fishery is contributed mainly by O-year class fish, the mean age being about 6 months when they first spawn. Spawning is noticed throughout the year in white baits. White baits mainly feed on zoo-plankton. Life span of the whitebaits is estimated to be about 2 years.

### 5.1.5 Silver bellies

*Leiognathus*, *Secutor* and *Gazza* spp. are landed in large quantities along the Tamil Nadu and Andhra coasts. *Leiognathus splendens* is the most abundant species, which grows up to a length of 15 cm. *L. equulus* attains the largest size up to 24 cm. The catches of silver bellies comprise mostly of fish less than one year old. Their life span is considered to be less than 2 years. *L. splendens* caught in November to June along SW coast are found in spawning condition. Peak catches are obtained in Madras during October to December and in Andhra, Orissa and West Bengal from January to June.

### 5.1.6 Jew fishes

Several species of jew fishes mainly *Pseudosciaena*, *Johnius*, *Otolithoides* and *Otolithus* spp. contribute to the fishery along the east coast. *P. diacanthus* the largest of the jew fishes found on SE coast grows up to 120 cm in length. This fish attains sexual maturity at 70-80 cm. Smaller species are caught by trawlers in large quantities from coastal waters. Along the NE coast some species enter the river systems and are fished from the estuaries. The average length of the Ganges Jew fish (*Pseudosciaena coibar*) from the commercial catches is about 92 cm.

### 5.1.7 Pomfrets

There are three species of pomfrets fished along the Indian coasts, the black pomfret (*Formio niger*), the white or silver pomfret (*Pampus argenteus*), and the Chinese or grey pomfret (*P.*

Chinensis). The black pomfret is fished off the coasts of Orissa and W. Bengal, mostly from June to September.

#### 5.1.8 Threadfin breams

Exploratory trawling off Andhra and Orissa coasts has indicated good resources of threadfin bream *Nemipterus Japonicus* in the area during the January-April period.

#### 5.1.9 Catfish

*Tachysurus thalassinus* and *T. tenuispinis* are the major catfishes caught along the east coast. *T. jella* and *T. dissumieri* are two other species caught. Exploratory trawling up to 100 m depth along the Andhra-W. Bengal coast showed about 28% of catfishes in the catch. *T. thalassinus* of 6-80 cm and *T. tenuispinis* of 6-60 cm size ranges are landed commercially.

#### 5.1 .10 Mackerel

Of the total mackerel landings of India roughly 10 per cent only is caught from the east coast. In addition to the major species *Rastrelliger kanagurta* two others *R. brachysoma* and *R. faughni* occur in the east coast. Most of the landings on the east coast are along Tamil Nadu and Andhra coasts. The size of *R. kanagurta* in the commercial catch ranges from 12-23 cm which belong to 0 and 1 year class. In the Andamans in addition to *R. kanagurta*, *R. brachysoma* is also caught. In 1978 only 106 tonnes of mackerel were caught in Andamans. The fish are known to breed all the year round.

### 5.2 Prawns

Considerable information on biological characteristics of different species of prawns contributing to the fishery is available. Both penaeid prawns and non-penaeid prawns occur in the fishery. Features of some of the important species are summarised.

#### 5.2.1 *Penaeus indicus*

Distributed along the entire coast of India up to the 50 m depth zone, juveniles occurring in estuaries and backwaters. Rao (1968) estimated the size of the female at first maturity at 130.2 mm. Fecundity ranges from 68,000 to 7,31,000 ova in females measuring 140 mm and 200 mm respectively. At Madras peak spawning activity was observed from May to September. Feeds on both vegetable and animal matter, consisting of mainly crustaceans. Juveniles grow at an average monthly rate of 10 mm in Chilka lake, 14.4 mm in Ennur estuary, 16.0 at Adyar estuary and 24.0 mm in Covelong backwaters. The adults show a growth of 5.6/7.0 mm in males and females at Madras. Males and females attain a length of 156/138 mm at the end of first year and 189/181 mm at the end of the second year of life. Fishing is supported by the 0-year old in the estuaries and by 0-year (80-120 mm) and 1-year olds (95-175 mm) in the marine region. Within the size range the modal sizes vary from place to place and season to season. The estimated annual total mortality in the fishery at one centre in SW coast is 3.1 in males and 2.1 in females.

#### 5.2.2 *Penaeus monodon*

These are commonly distributed in the north east coast. Number of eggs varies from 3 to 7 lakhs. Breeds in the same grounds as *P. indicus*. Food consists of large crustaceans, vegetable matter, polychaetes, molluscs and fish. Largest recorded size is 337 mm. In the Chilka lake the juveniles grow at a rapid rate of 25 mm per month and at Madras it reaches 160-170 mm size in 6 months in brackish water. Commercial catches are formed by 0-year and 1-year class. Attains about 250 mm in one year.

### 5.2.3 *Penaeus semisulcatus*

More common on the east coast. The size of female at first maturity is 23 mm carapace length. Fecundity ranges from 67,900 to 660,900 eggs in different sizes, June to September and January, February are peak spawning season in Gulf of Mannar and Palk Bay. Maximum size attained is about 250 mm. It consumes large quantities of animal matter as well as diatoms and algal filaments. In the estuary it grows to about 150 mm forming the 0-year class. The marine fishery is contributed by sizes ranging from 120 to 230 mm, consisting of both 0-year and 1-year classes.

### 5.2.4 *Metapenaeus monoceros*

Distributed in both estuarine and marine regions. Maturity attained in the sea after 120 mm size. Fecundity ranges from 155,000 to 338,000 eggs. Peak spawning in July-August and November-December. It grows to maximum size of 190 mm. Feeds mostly on small crustaceans. In Godvay estuary migration out of the estuary was mostly nocturnal and immigration mostly at dawn. The estuarine fishery is contributed by 0-year class. Marine fishery mostly contributed by sizes 125 mm to 150 mm of the 1-year class.

### 5.2.5 *Metapenaeus dobsoni*

Distributed up to a depth of about 40 m, with large quantities in the brackish water areas. The size at first maturity is 64 mm. Fecundity ranges from 34,500 eggs in 70 mm prawn and 160,000 eggs in 120 mm size. Maximum size attained is 130 mm. Breeds in the inshore waters inside the 25 m depth region. The species is a detritus feeder. Juveniles grow in the estuarine environment at an average monthly rate of about 10 mm. Bulk of the fishery in the backwaters and the sea is supported by 3-12 month old prawns. The total annual instantaneous mortality rate on the west coast ranges from 3.1 to 3.8.

### 5.2.6 *Metapenaeus brevicornis*

Distributed in the northern region of the coast. Attains maximum size of 135 mm and maturity at about 75 mm. In the Hooghly estuarine system there are two spawning seasons, in March, April and July, August. Major food items are vegetable matter and crustacean remains. Growth rate varies with salinity and temperature of the environment. In the estuary the sizes range from 15 to 115 mm constituted by 0 to 2 year groups.

There are several other species of penaeid prawns which occur in small quantities in the fishery of different areas and different seasons. The important non-penaeid species which contribute to the fishery of mostly Andhra coast and in the northern region are *Acetes indicus*, *Palaemon tenoipes*, *Palaemon styliferus* and *Hippolytina ensirostris*.

## 5.3 *Lobsters*

Spiny lobsters are distributed along the SE coast and forms good fishery at Tuticorin, Mandapam areas and Madras. The important species are *Panulirus homarus*, *P. ornatus* and *P. versicolor*. The first two species are equally abundant. The peak seasons are January to March and July to September. Along the Bengal coast *P. polyphagus* is the dominant species. In the south east coast the sizes of lobsters in the fishery ranges from 110 mm to 370 mm. In Mandapam area population estimates of the lobsters for the period 1965-67 were made by George (1973) using the Petersen method. An estimated population of 2.6 tonnes was obtained with a rate of exploitation of 22.7%.

## 5.4 *Crabs*

Crab fishery also is gaining importance in several centres along the east coast. The important species which are exploited from the marine sector are *Portunus pelagicus* and *Portunus sangu*

*inolentus*. In the brackishwater environments *Scylla serrata* is dominant. The size ranges in carapace width of the three species in the fishery are 30-185 mm, 20-94 mm and 30-126 mm respectively.

#### 6. Yield trends over the years against fishing effort

Yield trends in the fishery of certain individual groups and species of fishes and shellfishes have been studied from specified regions along the west coast of India. Similar studies from the east coast on particular groups are envisaged in the project oriented research programmes of the CMFRI. This would require standardised effort data pertaining to each fishery. These data are available with the Institute but remain to be processed. For example in the case of the shrimp fishery of SW coast of India, relation between catch per unit effort as well as total catch and total effort for the period 1957 to 1970 for the different constituent species of Cochin area were studied (Anon 1971). From the yield curves drawn from the data it was concluded that in the case of the shrimps additional yield from further increase in fishing will be only marginal. Similar studies on the yield trends over the last 10 years against fishing effort in the case of shrimps at different centres along the east coast of India are in progress.

#### 7. Problems/constraints in the collection and processing of fishery statistics and in the assessment of coastal stocks

- (a) A number of fishing harbours are coming up, many of them requiring exclusive coverage for fish landings. This combined with the changing patterns of fishing, necessitates more intensive monitoring.
- (b) Data acquisition, processing and dissemination need strengthening. This would help in formulating suitable policies for efficient management of fisheries.
- (c) Development of a proper catch monitoring system in the estuaries and backwaters of coastal areas requires attention.
- (d) Another problem which has been already mentioned is that the fishery dealt with is one of multispecies operated by multigears. There is an urgent necessity for standardising the effort in relation to gears for the major commercial species and fishing crafts of different types.
- (e) Improvements in the handling, preservation, transport and marketing systems are necessary.
- (f) The process of modernisation of the traditional fisheries has its own impact on the socio-economic conditions of the fisherfolk. There is need for making socio-economic surveys at a number of centres so as to assess any adverse impact and arrive at timely remedial measures. Studies are also required to be undertaken to get an insight into the economic structure governing various activities directly and indirectly related to fisheries.

#### 8. Requirements for solving/removing the above problems/constraints

- (a) Programmes for increasing the frequency of collection of data from landing centres; round the clock collection of data from fishing harbours and other centres of concentration of boats; evolving special designs for collection of data from operation of gears such as purse-seines are already under way. In the country's 6th Five Year Plan it is proposed to make these systems more efficient and effective.
- (b) The fishery data centre at CMFRI headquarters is being computerised and the efforts for acquisition, processing and dissemination of information are being strengthened to enable short term forecasts and implementation of extension programmes for the benefit of the small scale sector.
- (c) A suitable statistical design for covering the landings of estuarine and brackishwater areas is being formulated.

- (d) Methods for standardisation of effort in relation to gears and major commercial species are being worked out.
- (e) The difficulties in handling, preservation and marketing have been identified as the primary areas for improvement. With the introduction of quality control in products going for export, development programmes involving states, central organisations including the funding agencies and co-operatives are being evolved.
- (f) A major thrust during the 6th Five Year Plan period will be for integrated rural development of the coastal sector. This will involve considerable amount of base line studies to understand the gaps and deficiencies, to formulate remedial measures for improving the socio-economic conditions. This would also help monetary benefits and other advantages from the developmental programmes to reach the large number of traditional fishermen operating non-mechanised craft.

### Selected References

- Anon. 1971 Report of the working group for the assessment of prawn fisheries with special reference to Cochin area, CMFRI (Mimeo).
- Anon. 1972 25 years of marine fisheries research — Handbook-Silver Jubilee, CMFRI, 72 pp.
- Anon. 1972 Symposium on the pelagic fisheries resources of the seas around India, 11-13 December 1972, *Abstracts*.
- Anon. 1973 Proceedings of the symposium on the living resources of the seas around India (1967), 1-748.
- Anon. 1976a *Report of the National Commission on Agriculture* Part VIII. Fisheries : 270 pp.
- Anon. 19766 Progress Report No. 13: Survey results 1974/75 UNDP/FAO-Pelagic Fishery Project (Ind 69/593).
- Anon. 1977 *Indian Fisheries — 1947-77*. Published by M. PEDDA, Cochin — Ed. E. G. Silas.
- Borisow, N. I. 1962 Report to the Government of India on experimental and exploratory fishing in the Bay of Bengal. *Report No. 7466, F.A.O. of the United Nations, Rome, I-29*.
- George, M. J. 1970a Synopsis of biological data on penaeid prawn, *Metapenaeus dobsoni* (Miers). 1878. *FAO Fisheries Report (57)* Vol. 4, 1335-1 357.
- George, M. J. 1970b Synopsis of biological data on penaeid prawn, *Metapenaeus affinis* (H. Milne Edwards) 1837. *FAO Fisheries Report (57)* Vol. 4, 1359-1375.
- George, M. J. 1970c Synopsis of biological data on penaeid prawn, *Metapenaeus monoceros* (Fabricius) 1798. *FAO Fisheries Report (57)* Vol. 4, 1539-1557.
- George, M. J. 1970d Synopsis of biological data on penaeid prawns *Metapenaeus brevicornis* (H. Milne Edwards) 1837. *FAO Fisheries Report (57)* Vol. 4, 1559-1573.

- George, M. J. 1972 On the zoogeographic distribution of Indian penaeidae. Indian Journal of Marine Sciences, 1 (1), 89-92.
- George, M. J. 1973 Lobster fishery resources of India. Proceedings of the symposium on living resources of the seas around India, Special Publication CMFRI(1967) 570-580
- George, M. J. and K. H. Mohamed 1966 An assessment of marine prawn fishery resources of Kanyakumari District -south west coast of India. Proceedings of the Indo-Pacific Fisheries Council: 12(2), 210-219.
- George, P. C., B. T. Antony Raja and K. C. George 1977 Fishery resources of the Indian economic zone : Souvenir, Integrated Fisheries Project, Cochin, 79-120.
- Hida, T. S. and W. T. Pereyra 1966 Results of bottom trawling in Indian seas, R. V. Anton Bruun in 1963. Proceedings of the Indo-Pacific Fisheries Council, 11(11) , 156- 171.
- James, P. S. B. R. 1973 Sharks, rays and skates as potential fishery resources off the east coast of India. Proceedings of the symposium on living resources of the seas around India, CMFRI. 481-494.
- Jones, S. and S. K. Banerji 1973 A review of the living resources of the Central Indian Ocean. Ibid., 1-17.
- Joseph, K. M. 1971 Crustacean fisheries of the west coast of India. *IOFC/DEV/71/21*. F.A.O. of the United Nations. Rome.
- Joseph, K. M. 1974 Demersal fisheries resources off the north west coast of India. Bulletin of the Exploratory Fisheries Project, No. 1,1-45.
- Joseph, K. M. 1976 Results of Demersal Fisheries Resources survey along the east coast of India 1959-74. **Bulletin of the Exploratory Fisheries Project, No. 5.**
- Krishnamoorthy, B. 1973 An assessment of Memipterus fishery off Andhra-Orissa coasts based on exploratory fishing. **Proceedings of the symposium on living resources of the seas around India, CMFRI, 493-516.**
- Kumaran, M. 1973 The fishery potential of Andaman and Nicobar Islands. **Proceedings of the symposium on living resources of the seas around India, 387-389.**
- Menon, P. M. G. 1977 The economic development of Andaman and Nicobar islands by increased fisheries developmental activities. **Seafood Export Journal, 9(9), 9-15.**
- Mitra, G. N. 1968 Fisheries Development in Andaman Group of islands **Project Report** No. 3, Ministry of Food and Agriculture, New Delhi, 47 pp.
- Mohamed, K. H. 1970a Synopsis of biological data on the jumbo tiger prawns **Penaeus monodon** Fabricius, **1798 FAO Fisheries Report (57)**, Vol. 4,1251-1 256.
- Mohamed, K. H. 1970b Synopsis of biological data on the Indian prawn **Penaeus indicus** H. Milne Edwards, 1837. **FAO Fisheries Report (57)**, Vol. 4, 1267-1288.

- Mohamed, K. H. 1973                      Penaeid prawn resources of India. *Proceedings of the symposium on living resources of the seas around India. Special Publication.* CMFRI 1967, 548-556.
- Naumov, K. V. 1961                        A survey of the fisheries resources of the Bay of Bengal. *Report No. 1393. F.A.O. of the U.N., Rome, I-60.*
- Pai, M. V. and  
Mahadevan Pillai 1973                      Trawl fishery potential of the south east coast of India. *Proceedings of the symposium on living resources of the seas around India, CMFRI, 261-279.*
- Poliakov, M. P. 1961                        Interim Report to the Govt. of India on experimental and exploratory trawling in the Bay of Bengal in 1960-61. *F.A.O. (Mimeo), 1-23.*
- Prasad, R. R., S. K. Banerji and  
P. V. Ramachandran Nair 1970              A quantitative assessment of the potential fishery resources of the Indian Ocean and adjoining seas. *Indian Journal of Animal Sciences 40( 1 ), 73-98.*
- Prasad, R. R. and  
P. V. Ramachandran Nair 1973              India and Indian Ocean fisheries, *Journal of the Marine Biological Association of India. 15( 1 ) , 1-19.*
- Rao, K. Virabhadra 1969                      Distribution pattern of the major exploited marine fishery resources of India. *Bulletin of the Central Marine Fisheries Research Institute No. 6,1-69.*
- Rao, P. Vedavyasa 1968                      Maturation and spawning of the penaeid prawns of the south west coast of India. *FAO Fisheries Report 57(2), 285-302.*
- Rao, P. V. and S. Choudhury 1979            Ganjam coast in Orissa can support good trawl fishery. *Seafood Export Journal, 9(3), 15-17.*
- Sekharan, K. V. 1973                        On the catfish resources of the coasts of Andhra Pradesh, Orissa and West Bengal. *Proceedings of the symposium on living resources of the seas around India, CMFRI, 517-536.*
- Shariff, A. T. 1961                            Survey of the offshore demersal fisheries of the Andaman and Orissa coasts 1960. *Souvenir, Fisheries of Gujarat, 46-54.*
- Shomura, R. S. 1970                        Indian Ocean coastal waters- *Fish Resources of the Oceans* ed. J. A. Gulland, 115-119.
- Silas, E. G., S. K. Dharmaraja and  
Rengarajan 1976                            Exploited marine fisheries resources of India. *Bulletin of the Central Marine Fisheries Research Institute, 27, 1-24.*
- Sudarsan, D. and  
P. J. Joseph 1978                            Indian fisheries- the role of the east coast, eastern states, and the Bay of Bengal. *Seafood Export Journal, 10(9) 11-23.*
- West, W. Q. B. 1973                        Fishery resources of the Upper Bay of Bengal. IOFC/DEV/73/28: *F.A.O. of the United Nations, Rome, I-39.*

Table 1

**Percentage contribution of important varieties  
of fish to the total catch of the East Coast**

Name of fish	Year					Average over the years
	1975	1976	1977	1978	1979	
Lesser Sardines	16.36	12.26	11.80	9.14	11.32	12.18
Ribbon fish	7.19	7.72	4.09	9.93	7.25	7.24
Anchoviella	4.31	4.67	6.98	4.80	4.59	5.07
Caranx	2.47	2.57	3.22	1.55	2.87	2.54
Seer fish	2.33	2.02	3.13	2.41	3.51	2.68
Hilsa	1.27	1.55	1.02	2.27	2.75	1.77
Leiognathus	7.54	8.19	7.24	9.41	12.47	8.97
Elasmobranchs	7.46	6.94	8.01	7.76	6.09	7.25
Sciaenids	6.13	6.20	7.53	7.64	7.59	7.02
Catfishes	4.80	3.31	6.60	3.00	2.65	4.07
Perches	3.19	1.90	3.35	3.40	2.64	2.90
Pomfrets	2.21	3.84	1.31	2.62	3.59	2.71
Penaeid prawns	5.01	4.87	4.76	6.98	5.30	5.38
Crabs & other Crustaceans	3.42	4.08	3.58	2.82	1.85	3.15
Total per cent accounted for	73.69	70.12	72.62	73.73	74.47	72.93
<b>Total fish production in tonnes</b>	431,868	424,090	336,557	355,846	388,130	—



Table 2  
Estimated marine fish landings on the East Coast  
of India during 1975-1979, in tonnes

Sl. No.	Name of fish	1975	1976	1977	1978	1979
1.	Elasmobranchs	32,218	29,431	26,950	27,624	23,629
2.	Eels	1,955	834	676	1,410	453
3.	Catfishes	20,746	14,022	22,201	10,679	10,266
4.	<i>Cyprinocentrus</i>	5,503	4,759	4,652	4,439	4,357
5.	(a) Oil sardine	131	112	714	36	1,011
	(b) Lesser Sardine	70,673	51,983	39,700	32,534	43,925
	(c) <i>Hilsa ilisha</i>	5,476	6,578	3,428	8,093	10,663
	(d) Other <i>Hilsa</i>	2,559	4,424	7,998	6,530	4,230
	(e) <i>Anchoviella</i>	18,608	19,819	23,476	17,063	17,811
	(f) <i>Thrissoctes</i>	6,848	12,193	5,373	7,750	9,929
	(g) Other clupeids	16,437	26,824	6,509	7,640	9,247
6.	(a) <i>Harpodon nehereus</i>	3,403	2,554	2,120	2,778	2,126
	(b) <i>Saurida &amp; Saurus</i>	1,318	1,095	1,555	2,294	3,189
7.	<i>Hemirhamphus &amp; Belone</i>	1,582	769	1,766	904	758
8.	Flying fish	1,800	1,397	613	1,641	2,528
9.	Perches	13,788	8,035	11,287	12,080	10,253
10.	Red mullets	2,401	1,259	1,184	2,409	2,078
11.	Polynemids	3,413	4,096	2,726	3,182	2,784
12.	Sciæni ds	26,464	26,291	25,327	27,180	29,463
13.	Ribbon fish	31,049	32,756	13,763	35,326	28,156
14.	(a) <i>Caranx</i>	10,678	10,902	10,850	5,525	11,122
	(b) <i>Chorinemus</i>	3,045	2,742	2,398	2,522	2,093
	(c) <i>Trachynotus</i>	6	29	73	84	182
	(d) Other carangids	16	912	100	258	79
	(e) <i>Coryphaena</i>	316	203	198	45	47
	(f) <i>Elacate</i>	113	231	247	295	535
15.	(a) <i>L. eiognathus</i>	32,553	34,736	24,349	33,469	48,396
	(b) <i>Gazza</i>	130	55	61	104	197
16.	<i>L. actarius</i>	4,371	2,615	2,066	1,536	2,281
17.	Pomfrets	9,528	16,269	4,401	9,305	13,915
18.	Mackerel	9,909	14,672	7,418	4,454	6,847
19.	Seer fish	10,039	8,544	10,542	8,581	13,622
20.	Tunnies	2,474	3,355	3,761	2,166	3,679
21.	<i>Sphyraena</i>	1,680	1,806	1,898	2,299	1,551
22.	<i>Mugil</i>	2,679	1,289	1,237	1,226	437
23.	<i>Bregmaceros</i>	—	—	—	—	—
24.	<i>Soles</i>	1,245	1,225	1,738	2,163	3,135
25.	(a) Penaeid prawns	21,622	20,656	16,015	24,845	20,561
	(b) Non-penaeid prawns	6,885	5,252	5,556	2,863	4,279
	(c) Lobsters	592	561	308	271	448
	(d) Crabs & other crustaceans	14,769	17,281	12,039	10,022	7,169
26.	Cephalopods	3,164	1,931	1,845	1,409	2,488
27.	Miscellaneous	29,682	29,593	27,439	30,812	27,611
	<b>Total</b>	<b>4,31,868</b>	<b>4,24,090</b>	<b>3,36,557</b>	<b>3,55,846</b>	<b>3,88,130</b>

Table 3a

Estimated marine fish landings in Tamil Nadu during the years 1975 to 1979, in tonnes

Sl. No.	Name of fish	1975	1976	1977	1978	1979
1.	Elasmobranchs	20,614	19,039	18,327	15,121	12,358
2.	Eels	110	620	232	325	119
3.	Catfishes	7,469	5,033	15,205	5,252	5,615
4.	Chirocentrus	1,811	2,058	2,475	1,736	1,839
5:	(a) Oil sardine	---	---	714	36	1,011
	(b) Lesser Sardines	35,610	25,169	26,259	21,050	33,289
	(c) Hilsa ilisha	121	22	343	161	41
	(d) Other Hilsa	1,158	2,331	5,784	4,166	2,761
	(e) Anchoviella	10,873	7,869	13,388	7,447	11,061
	(f) Thrissocles	3,127	8,362	3,008	4,719	5,542
	(g) Other clupeids	5,406	15,851	2,652	3,043	3,564
6.	(a) Harpodon nehereus	1	--	14	--	1
	(b) Saurida & Saurus	1,026	823	572	1,100	1,498
7.	Hemirhamphus & Belone	1,482	717	1,574	759	624
8.	Flying fish	1,657	1,232	526	1,092	1,599
9.	Perches	8,153	5,341	7,918	9,241	5,865
10.	Red mullets	1,566	626	832	1,963	1,448
11.	Polynemids	1,339	1,944	1,592	706	353
12.	Sciaenids	10,096	10,562	13,756	14,239	18,944
13.	Ribbon fish	17,782	19,054	4,594	28,664	21,040
14.	(a) <i>Caranx</i>	6,225	7,082	6,120	3,104	7,015
	(b) <i>Chorinemus</i>	1,090	646	1,465	971	844
	(c) <i>Trachynotus</i>	--	28	73	84	182
	(d) Other carangids	8	907	22	171	23
	(e) <i>Coryphaena</i>	65	105	58	18	37
	(f) Elacate	87	217	230	239	535
15.	(a) <i>L. eiognathus</i>	20,142	29,664	17,783	30,281	42,872
	(b) <i>Gazza</i>	29	6	54	104	197
16.	<i>Lactarius</i>	1,822	775	740	840	1,323
17.	Pomfrets	1,303	822	628	789	877
18.	Mackerel	5,826	10,488	5,674	1,453	3,521
19.	Seer fish	4,100	3,784	6,424	4,700	5,228
20.	Tunnies	1,785	2,923	3,238	1,169	3,211
21.	<i>Syphraena</i>	1,506	1,554	1,702	2,147	1,463
22.	Mugil	1,566	285	923	829	229
23.	Bregmaceros					
24.	Soles	785	909	908	1,580	2,337
25:	(a) Penaeid prawns	11,460	8,864	8,197	13,327	10,222
	(b) Non-penaeid prawns	573	169	159	585	897
	(c) Lobsters	465	525	286	249	340
	(d) Crabs & other Crustaceans	13,896	16,413	11,018	9,290	5,883
26.	Cephalopods	2,953	1,451	1,375	1,042	1,902
27.	Miscellaneous	16,128	11,808	19,204	19,107	17,106
	<b>Total</b>	<b>2,21,215</b>	<b>2,26,078</b>	<b>2,06,046</b>	<b>2,12,899</b>	<b>2,34,816</b>

Table 3b

Estimated marine fish landings in Pondicherry during the  
years 1975 to 1979, in tonnes

Sl. No.	Name of fish	1975	1976	1977	1978	1979
1.	Elasmobranchs	129	165	352	199	222
2.	Eels	4	6	5	--	88
3.	Catfishes	55	66	137	168	51
4.	<i>Chirocentrus</i>	50	63	63	111	167
5.	(a) Oil sardine					
	(b) Lesser Sardines	1,046	1,839	1,156	1,184	1,998
	(c) <i>Hilsa ilisha</i>	31	---	---	---	---
	(d) Other <i>Hilsa</i>	277	121	43	108	12
	(e) <i>Anchoviella</i>	412	178	548	521	346
	(f) <i>Thrissocles</i>	337	565	405	258	429
	(g) Other clupeids	50	1	---	281	345
6.	(a) <i>Harpodon nehereus</i>					
	(b) <i>Saurida &amp; Saurus</i>	4	105	103	132	622
	<i>Hemirhamphus &amp; Belone</i>	55	2	4		6
8.	Flying fish	142	165	3	480	854
9.	Perches	389	769	391	487	1,004
10.	Red mullets	100	77	32	109	203
11.	Polynemids	14	26	5	27	14
12.	Sciaenids	212	434	258	374	306
13.	Ribbon fish	314	428	143	139	129
14.	(a) <i>Caranx</i>	610	501	490	218	537
	(b) <i>Chorinemus</i>	---	2	5	33	27
	(c) <i>Trachynotus</i>	---	---	---	---	---
	(d) Other carangids	---	---	---	---	---
	(e) <i>Coryphaena</i>	---	7	2	3	2
	(f) <i>Elacate</i>	---	---	1		
15.	(a) <i>Leiognathus</i>	511	482	318	372	746
	(b) <i>Gazza</i>				---	---
16.	<i>Lactarius</i>	30	121	175	---	11
17.	Pomfrets	13	44	53	50	35
18.	Mackerel	2,259	1,598	398	178	424
19.	Seer fish	23	28	34	41	105
20.	Tunnies	---	1		3	1
21.	<i>Sphyraena</i>	27	15	9	25	22
	<i>Mugil</i>	31	4	14	26	27
23.	<i>Bregmaceros</i>					
24.	<i>Soles</i>	125	254	78	109	162
25.	(a) Penaeid prawns	62	93	103	245	532
	(b) Non-penaeid prawns	2			71	72
	(c) Lobsters	25	33	20	2	5
	(d) Crabs & other Crustaceans	260	516	296	251	242
26.	Cephalopods	58	211	62	36	50
27.	Miscellaneous	453	1,203	747	586	632
Total		8,150	10,123	6,462	6,828	10,068

Table 3c

Estimated marine fish landings in Andhra Pradesh during the years 1975 to 1979, in tonnes

Sl. No.	Name of fish	1975	1976	1977	1978	1979
1.	Elasmobranchs	9,977	6,688	6,450	8,704	6,985
2.	Eels	1,837	205	438	1,082	245
3.	Cat fishes	9,824	6,131	5,662	3,281	3,770
4.	<i>Chirocentrus</i>	2,920	1,837	1,217	1,262	976
5.	(a) Oil sardine	131	112		---	--
	(b) Lesser Sardines	32,994	23,220	10,972	7,685	6,180
	(c) <i>Hilsa ilisha</i>	70	280	41	2	78
	(d) Other <i>Hilsa</i>	930	1,815	1,654	1,349	1,092
	(e) <i>Anchoviella</i>	7,037	11,309	8,947	7,810	5,888
	(f) <i>Thrissocles</i>	1,776	1,763	1,398	1,824	3,433
	(g) Other clupeids	7,536	8,410	2,363	1,794	2,518
6.	(a) <i>Harpodon nehereus</i>	359	214	960	1,099	717
	(b) <i>Saurida &amp; Saurus</i>	242	166	875	1,057	1,379
7.	<i>Hemirhamphos &amp; Belone</i>	24	14	135	60	100
8.	Flying fish	1		84	65	71
9.	Perches	4,888	1,751	2,727	1,945	3,092
10.	Red mullets	721	553	315	335	426
11.	Polynemids	1,836	1,813	698	1,075	1,412
12.	Sciaenids	11,682	10,891	10,182	5,597	8,825
13.	Ribbon fish	11,701	12,443	8,546	5,505	6,335
14.	(a) <i>Caranx</i>	3,498	3,047	4,003	2,000	3,185
	(b) <i>Chorinemus</i>	1,790	1,820	530	665	444
	(c) <i>Trachinotus</i>	6	1	—	—	—
	(d) Other carangids	6	5	78	87	56
	(e) <i>Coryphaena</i>	251	89	137	24	7
	(f) <i>Elacate</i>	25	14		53	—
15.	(a) <i>Leiognathus</i>	11,268	3,876	5,909	2,174	3,585
	(b) <i>Gazza</i>	101	48			
16.	<i>Lactarius</i>	2,513	1,718	1,132	684	945
17.	Pomfrets	5,697	4,088	2,529	2,445	2,069
18.	Mackerel	1,593	2,084	1,040	2,520	2,621
19.	Seer fish	5,277	3,412	3,261	2,600	5,547
20.	Tunnies	664	334	449	328	437
21.	<i>Sphyræna</i>	119	187	108	43	62
22.	Mugil	954	892	170	237	159
23.	<i>Bregmaceros</i>		—			
24.	Soles	305	56	680	347	610
25.	(a) Penaeid prawns	7,152	8,833	6,266	8,031	8,610
	(b) Non-penaeid prawns	3,523	2,275	5,109	1,532	3,117
	(c) Lobsters	102	3	2	20	103
	(d) Crabs & other Crustaceans	605	329	719	477	1,039
26.	Cephalopods	151	242	408	297	523
27.	Miscellaneous	3,552	8,353	4,561	6,021	4,538
	Total	1,55,638	1,31,321	1,00,756	82,116	91,182

Table 3d

Estimated marine fish landings in Orissa during the  
years 1976 to 1979, in tonnes

St. No.	Name of fish	1976	1977	1978	1979
1.	Elasmobranchs	2,974	1,658	3,386	3,837
2.	Eels	1	-	3	1
3.	Catfishes	1,988	1,035	1,784	694
4.	<i>Chirocentrus</i>	517	752	1,073	1,568
5.	(a) Oil sardine	--	--	--	--
	(b) Lesser sardines	1,657	1,227	2,514	2,458
	(c) <i>Hilsa ilisha</i>	5,477	2,948	71737	9,884
	(d) Other <i>Hilsa</i>	129	492	348	327
	(e) <i>Anchoviella</i>	339	486	1,169	502
	(f) <i>Thrissocles</i>	106	197	175	255
	(g) Other clupeids	772	778	1,330	1,303
6.	(a) <i>Harpodon nehereus</i>	87	86	314	197
	(b) <i>Saurida &amp; Saurus</i>	1	5	5	50
7.	<i>Hemirhamphus &amp; Belone</i>	1	-	13	23
8.	Flying fish			4	4
9.	Perches	31	55	173	66
10.	Red mullets	1	1	2	1
11.	Polynemids	244	406	1,287	833
12.	Sciæni ds	333	312	5,198	474
13.	Ribbon fish	130	174	336	361
14.	(a) <i>Cafanx</i>	147	103	68	315
	(b) <i>Chorinemus</i>	237	386	815	711
	(c) <i>Trachynotus</i>	-	-	-	-
	(d) Other carangids	--	-	-	-
	(e) <i>Coryphaena</i>	2	1	3	1
	(f) <i>Elacate</i>				
15.	(a) <i>Leiognathus</i>	378	233	256	1,097
	(b) <i>Gazza</i>	1	-	-	-
16.	<i>Lactarius</i>	1	18	12	2
17.	Pomfrets	10,699	1,018	5,714	10,012
18.	Mackerel	425	195	196	281
19.	Seer fish	940	672	1,059	2,411
20.	Tunnies	84	37	609	30
21.	<i>Sphyraena</i>	1	3	4	4
22.	Mugil	5		3	22
23.	<i>Bregmaceros</i>		-		-
24.	Soles	6	72	103	26
25.	(a) Penaeid prawns	688	802	2,599	787
	(b) Non-penaeid prawns	100	17	12	32
	(c) Other crustaceans	23	6	4	5
26.	Cephalopods	27			13
27.	Miscellaneous	1,271	888	848	2,778
	Total	29,823	15,072	39,670	41,370

Table 3e

Estimated marine fish landings in West Bengal during the  
years 1975 to 1979, in tonnes

Sl. No.	Name of fish	1975*	1976	1977	1978	1979
1.	Elasmobranchs	1,450	493	73	125	227
2.	Eels	4	1	1	—	—
3.	Catfishes	3,383	785	134	151	136
4.	<i>Chirocentrus</i>	687	251	107	217	407
5:	(a) Oil Sardine	—	—	—	—	—
	(b) Lesser Sardines	957	12	—	4	—
	(c) <i>Hilsa ilisha</i>	5,254	799	96	193	660
	(d) Other <i>Hilsa</i>	181	—	—	28	38
	(e) <i>Anchoviella</i>	207	6	4	24	14
	(f) <i>Thrissocles</i>	1,608	1,397	365	774	270
	(g) Other clupeids	3,436	1,790	705	1,174	1,517
6.	(a) <i>Harpodon nehereus</i>	3,043	2,253	1,060	1,365	1,211
	(b) <i>Saurida &amp; Saurus</i>	6	—	—	—	—
7.	<i>Hemirhamphus &amp; Belone</i>	5	—	—	11	—
8.	Flying fish	—	—	—	—	—
9.	Perches	201	1	—	—	223
10.	Red mullets	14	—	—	—	—
11.	Polynemids	224	69	25	87	172
12.	Sciaenids	4,474	4,066	819	1,772	914
13.	Ribbon fish	1,252	701	306	681	291
14.	(a) <i>Caranx</i>	237	—	—	2	70
	(b) <i>Chorinemus</i>	165	37	12	38	67
	(c) <i>Trachinotus</i>	—	—	—	—	—
	(d) Other carangids	2	—	—	—	—
	(e) <i>Coryphaena</i>	—	—	—	—	—
	(f) <i>Elacate</i>	1	—	—	—	—
15.	(a) <i>Leiognathus</i>	552	219	15	297	96
	(b) <i>Gazza</i>	—	—	—	—	—
16.	<i>Lactarius</i>	6	—	1	—	—
17.	Pomfrets	2,501	586	143	282	922
18.	Mackerel	116	—	—	—	—
19.	Seer fish	554	287	32	54	331
20.	Tunnies	16	—	—	—	—
21.	<i>Sphyræna</i>	3	—	—	—	—
23.	Mugil	44	2	—	—	—
	<i>Bregmaceros</i>	—	—	—	—	—
24:	Soles	30	—	—	24	—
25.	(a) Penaeid prawns	2,920	2,139	602	605	410
	(b) Non-penaeid prawns	2,787	2,708	269	663	161
	(c) Other crustaceans	8	—	—	—	—
26.	Cephalopods	2	—	—	30	—
27.	Miscellaneous	9,431	6,809	1,920	4,153	2,556
<b>Total</b>		<b>45,761</b>	<b>25,411</b>	<b>6,689</b>	<b>12,754</b>	<b>10,694</b>

\* West Bengal & Orissa combined estimate.

Table 3f

Estimated marine fish landings in Andamans during the  
years 1975 to 1979, in tonnes

Sl. No.	Name of fish	1975	1976	1977	1978	1979*
1.	Elasmobranchs	48	72	90	89	
2.	Eels	—	1	—	—	
3.	Cat fishes	15	19	28	33	
4.	<i>Chirocentrus</i>	35	33	38	40	
5:	(a) Oil sardine	—	—	—	—	
	(b) Lesser sardines	66	86	86	97	
	(c) <i>Hifsa ilisha</i>	—	—	—	—	
	(d) Other <i>Hilsa</i>	13	28	25	31	
	(e) <i>Anchoviella</i>	79	118	103	92	
	(f) <i>Thrissocles</i>	—	—	—	—	
	(g) Other clupeids	9	—	11	18	* Not available
6.	(a) <i>Harpodon nehereus</i>	—	—	—	—	
	(b) <i>Saurida &amp; Saurus</i>	—	—	—	—	
	<i>Hemirhamphus &amp; Belone</i>	16	35	53	61	
8.	Flying fish	—	—	—	—	
9.	Perches	157	142	196	234	
10.	Red mullets	—	—	4	—	
11.	Polynemids	—	—	—	—	
12.	Sciaenids	—	5	—	—	
13.	Ribbon fish	—	—	—	—	
14:	(a) <i>Caranx</i>	108	125	134	133	
	(b) <i>Chorinemus</i>	—	—	—	—	
	(c) <i>Trachynotus</i>	—	—	—	—	
	(d) Other carangids	—	—	—	—	
	(e) <i>Coryphaena</i>	—	—	—	—	
	(f) <i>Elacate</i>	—	—	—	—	
15.	(a) <i>Leiognathus</i>	80	117	97	89	
	(b) <i>Gazza</i>	—	—	—	—	
16.	<i>Lactarius</i>	80	7	7	—	
17.	Pomfrets	14	30	30	25	
18.	Mackerel	115	77	111	106	
19.	Seer fish	85	93	119	127	
20.	Tunnies	9	13	37	57	
21.	<i>Sphyraena</i>	25	49	76	80	
22.	Mugil	84	101	130	131	
23.	<i>Bregmaceros</i>	—	—	—	—	
24.	Soles	—	—	—	—	
	25. (a) Penaeid prawns	28	39	45	38	
	(b) Non-penaeid prawns	—	—	—	—	
	(c) Other crustaceans	—	—	—	—	
26.	Cephalopods	—	—	—	—	
27.	Miscellaneous	118	149	119	97	
Total		1,104	1,334	1,532	1,579	