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Marine Small-Scale Fisheries of Tamil Nadu: A General Description



Bay of Bengal Programme



MARINE SMALL-SCALE FISHERIES
OF TAMIL NADU :
A GENERAL DESCRIPTION

Executing Agency :
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of the United Nations

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PREFACE

This document attempts a brief and factual presentation of data and baseline information on the main features of the small-scale marine fisheries of the Indian state of Tamil Nadu.

It could serve as an introduction to the problems and prospects of this sector leading to deeper studies of particular aspects, as a source of general information, or more particularly, as a background document for use in discussions on the planning and programming of development assistance.

This is a revised and updated edition of a General Description of Marine Small-Scale Fisheries, Tamil Nadu, originally prepared in 1977 jointly by the Tamil Nadu Directorate of Fisheries and the FAO/UNDP Project for Development of Small-Scale Fisheries in South-West Asia RAS/74/031. This revision was carried out in cooperation with the Directorate of Fisheries, Tamil Nadu. Two officers of the Directorate, Mr. V. Ramamoorthy, Asst. Director (Information & Statistics) and Mr. S. Somasundaram, Fisheries Inspector (Statistics) were actively associated with the work.

This paper is an activity of the Project for Small-Scale Fisheries Development of the Bay of Bengal Programme. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Swedish International Development Authority (SIDA). It covers five countries bordering the Bay of Bengal Region: Bangladesh, India, Malaysia, Thailand and Sri Lanka. Its main aims are to develop, demonstrate and promote appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk and the supply of fish from the small-scale sector in the five countries.

The document is a working paper and has not been officially cleared by the Government or the FAO.

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1. INTRODUCTION

Situated between 8° 5' and 13° 35' north and 76° 15' and 80° 20' east, Tamil Nadu is the southernmost maritime state of India bordering the Bay of Bengal. The state is bordered by Andhra Pradesh in the north, the Bay of Bengal and the Palk Bay in the east, the Gulf of Mannar in the south-east, the Indian Ocean in the South, the Arabian Sea in the south-west, Kerala state in the west and Karnataka state in the north-east. Administratively, there are 16 districts of which eight are coastal. Appendix 1.1 is an administrative map of the state. Some socio-economic indicators are given in Appendix 1.2.

With a 1,000 km coastline and 41,400 km² continental shelf, the state accounts for 13% and 9% of India's coastline and continental shelf respectively. The width of the continental shelf varies from 40 to 60 km. More than 55% of the continental shelf is no deeper than 50 m. There are nearly 80,000 ha of brackishwaters close to the coast, out of which an area of 20,000-27,000 ha is generally regarded to have fish culture potential.

Marine fish production increased steadily up to 1968/69 (212,005 tonne). During the subsequent years the catches fluctuated between 192,000 tonne and 224,000 tonne. The state's 216,000 tonne of marine landings in 1979/80 constituted about 15% of India's total marine catch and 57% of the state's total (376,000 tonne) fish landings from both inland and marine sources. The proportions of pelagic and demersal fish in the marine landings are nearly equal. About 396,000 people earn their livelihood directly from fisheries. Fish is the principal source of animal protein. Tamil Nadu is India's third largest fish exporting state. Foreign exchange earnings in 1979-80 were nearly Rs. 300 million representing 11% of the nation's total foreign exchange earnings from fisheries.

The fishing fleet consists of about 46,000 craft of which 94% are traditional and non-mechanised. These craft are responsible for at least 70% of the marine landings. The majority of the traditional craft are kattumarams. The history of mechanisation dates back to the mid-fifties when the state government collaborated with the FAO in designing a motorised craft. Since then, up to 1980, nearly 3,000 mechanised fishing boats have been locally constructed and put into operation. Synthetic twine, first introduced in the late fifties, has now almost totally replaced cotton twine for making fish nets. At present, fishing hardly extends beyond the 40 m depth line.

Since the marine resource potential is believed to offer scope for increased production, the state government of Tamil Nadu plans to expand both the fishing fleet and its operational zone by improving and diversifying the fleet. The Sixth Plan target is an additional 80,000 tonne of marine fish, of which more than 70-75% will be the share of the small-scale sector.

The state is collaborating with the FAO/SIDA Bay of Bengal Programme for the Development of Small-Scale Fisheries in technological improvement which includes development of beachcraft and high-opening bottom trawling, kattumaram improvement, etc.

New landing terminals and harbours or expansion and improvement of the existing ones are planned. Coastal aquaculture, particularly for culture of mussels, shrimp, fish, etc. is receiving increased attention. To uplift the socio-economic status of the fishermen, various welfare programmes and subsidies for fishing boats and accessories are planned.

2. FISHERY RESOURCES

Being situated in the equatorial belt, Tamil Nadu has a warm climate with a prolonged summer. Summer temperatures may go up to 43°C (May) while during the brief winter (January) the temperature may come down to about 13°C at night. The state is affected by two distinct monsoons. The north-east monsoon (October-December) contributes about 60% and the south-west monsoon (June-September) 28% to the total annual rainfall which averages about 946 mm. The wind velocity during the monsoon months may reach 15-20 knots per hour and go up to 60 knots or more per hour during cyclones which are not infrequent on the Tamil Nadu coast.

The coastline is about 1,000 km long. The continental shelf covers about 41,400 km². The width of the continental shelf varies from 40 to 60 km, the average being 43 km. The gradient is high on the Coromandel coast and in the Gulf of Mannar and is low in the Palk Bay area where the depth does not exceed 16 m. The configuration of the continental shelf is shown in Appendix 2.1. The area under various depth ranges is given in Table 2.1.

Table 2.1

Continental shelf areas under various depth ranges

Depth ranges	Areas of continental shelf (km ²)
0-20 m	16,058
20-50 m	7,197
50-200 m	18,157
Total	41,412

On the east coast of India as a whole, the surface drift has a north-easterly direction during February-July. This changes to south-westerly in the northern part and to southerly in the southern part (i.e. Tamil Nadu) by September-December. In the Bay of Bengal, the usual range of surface temperature is between 27°C and 29°C. The thermocline level is usually below 50-55 m. During the south-west monsoon, fairly strong convergences develop in the east coast. Phytoplankton production peaks during the south-west and north-east monsoons while the zooplankton population peaks generally in June and October.

The estimates of potential catch from the EEZ off Tamil Nadu vary from 400,000 to 800,000 tonne. A comprehensive survey has not been so far carried out to provide an adequate estimate of the marine resource potential. Past surveys in the region through national and international (NORAD and SIDA) efforts were fragmentary and restricted to a few areas. Critically analysing the average annual rate of increase in marine fish production, the organic productivity and the average rate of fish production per unit area during 1972-1976, George et al (1977) have estimated the potential yields for various regions of the Indian waters. The figures for the lower east coast (including Tamil Nadu, Pondicherry and Andhra Pradesh) is indicated as 674,000 tonne. Calculating from this figure, the potential yield from the continental shelf of Tamil Nadu (0-200 m) may be taken as 389,000 tonne (12 tonne/km² in waters 0-50 m and 6 tonne/km² in waters 50-200 m). 50% of this potential catch may be demersal.

The survey conducted by the FAO/UNDP Pelagic Fishery Project indicated a total stock of about 550,000 tonne around the peninsular curve including the Wadge Bank, Gulf of Mannar and Palk Bay, besides the profuse seasonal piling up of white bait resources in the Gulf of Mannar. If white bait and other similar stocks are considered, the Pelagic Fisheries Project estimates correspond with those of George et al.

According to the same analysis, of the estimated potential yield of 389,000 tonne from the Tamil Nadu continental shelf, 280,000 may come from inshore waters and about 109,000 from the offshore region. The main exploitable inshore (0-50 m) resources are white bait, ribbon fish, silver bellies and sardines and to some extent lobsters and cephalopods. For offshore (50-200 m) exploitation, the prospective areas would be the Wedge Bank and Gulf of Mannar, where the important potential resources are perches, white bait, deep-sea prawns and lobsters. Another commercially potential resource, in view of the use of the mature ovaries of these species for making fish paste, is the stock of deep sea echinoids. Some indications of the geographical distribution of the most abundant fish species are given in Table 2.2.

Table 2.2
Geographical distribution of some abundant species

			Demersal	Pelagic
Coromandel Coast	..	..	Ribbon fish Silver bellies Shrimp	Sardines Anchovies Flying fish Tuna Mackerel Seer fish
Palk Bay	..	..	Silver bellies	Sardines Seer fish
Gulf of Mannar	..	..	Perches Silver bellies	Sardines Anchovies Tuna
Wedge Bank	..	..	Shrimp Deep sea shrimp Lobster	

There is apparently some potential for shrimp and fish culture in the coastal waters. Culture potential also seems to exist for pearl oysters and certain types of **seaweeds**, particularly around the southern part of the state.

3. FISHING FLEET

3.1 Fishing craft

There are 46,000 fishing craft in Tamil Nadu as elicited by the all-India census of marine fishermen, craft and gear, 1980. Of this about 2,750 are mechanised; the rest are non-mechanised traditional craft. 73% of the traditional craft are kattumarams, the rest plank-built boats and canoes. The district of Ramanathapuram has the largest number of mechanised craft, while Kanyakumari district has the largest number of kattumarams. The district-wise distribution of the different types of fishing craft owned/shared by fishermen is shown in Appendix 3.1. For mechanised craft, 130 boats owned by others are not included in these figures.

Kattumarams and canoes are the two main types of traditional craft. Propelled by oar and sail, these are still the predominant fishing craft in the state.

The kattumaram is basically a raft of 3-5 logs fastened together with ropes, suitable for surf-ridden beaches. The length of the craft is 6-8 m. *Melia dubia* and *Albizia spp.* are the timbers most preferred for construction. The main fishing method is gillnetting with nets of mesh size

30-150 mm; a bigger mesh of 150 mm may also be used. Handlining and longlining are the other methods used. The craft has an annual output of about 5 tonne of fish. Its service life is 7-8 years and its crew complement varies from 1-5 members. Its range is generally up to 10-15 km from the shore and it is operated mainly during the day. Kattumarams are most abundant in the open Coromandel and Kanyakumari coasts with strong surfs. In these areas, however, they may go as far as 30 km from the coast for fishing. In the Kanyakumari region, kattumarams are constructed out of three specially shaped large logs, giving the craft a boat-like appearance.

Canoes, mostly plank built but in some cases dug out, are more common in the protected areas of the Palk Bay and the Gulf of Mannar. The canoes used in the Palk Bay region are a distinct type of craft with flat bottom, long and narrow shape, raised bow and long balance boards. Locally known as "Sirugu Kattai Vallam" these are fast-moving boats, using one or two triangular lateen sails. In the Kanyakumari region, there is a small percentage of flat-bottomed dug-out canoes which operate side by side with boat kattumarams. In the Tirunelveli coast, a narrow, double-ended, low draft plank-built canoe is found in large numbers. Locally known as the "Tuticorin vallam", these boats use large lug sails. Along the coasts of Ramanathapuram and Kilakarai there are small dug-out canoes with or without outriggers but generally using a squat lug sail.

A weakly built craft known as "Masula" is found, though not in large numbers, in many parts along the coast. This is a double-ended craft, made of planks, stitched together with coir and/or polyethylene twine. The joints are plugged with reeds for achieving watertightness. The craft is propelled by oars and mainly utilised for setting beach seines in calm weather. Their construction cost is Rs. 1 0,000-Rs. 15,000.

The number of traditional craft in operation in 1980 as compared with the numbers in 1959 is given below in Table 3.1.

Table 3.1
Numerical changes in non-mechanised craft

Craft type	Total no. in 1959	Total no. in 1980	Percentage increase
Plank-built, dug-out canoes	4,246	11,492	170
Kattumarams	22,217	31,851	43
Total	26,463	43,343	64

The history of fishing boat mechanisation in Tamil Nadu dates back to 1954-55 when the designing of a suitable mechanised fishing craft was undertaken in collaboration with the FAO. Since then mechanised boats have been constructed in public and private sector boatyards. The present strength of the mechanised fishing fleet is shown in Appendix 3.1.

The mechanised boats constructed by public sector boatyards are of six size groups viz. 7.6 m, 9.1 m, 9.7 m, 11 m, 11.5 m and 13.2 m. Table 3.2 gives the numbers of mechanised boats of the different sizes constructed by public sector boatyards up to 1980. Boats constructed by private sector boatyards are not included in the Table.

The 7.6 m boats were originally designed for gillnetting, but were later modified by fishermen for trawling. The construction of these boats was discontinued from 1974. Similarly, nearly 1,200 boats of the 9.1 m size originally meant for gillnetting-cum-stern trawling were used by the owners exclusively for stern trawling. Fishermen introduced the changes in their boats on their own since shrimp trawling proved more profitable than gillnetting.

About 700 mechanised boats of the size range 9.1-9.7 m have been built by the private sector.

Of the various sizes, boats of 9.1 and 9.7 m are the most popular and constitute nearly 97% of the total number of mechanised boats.

Table 3.2

Mechanised boats constructed in public sector boatyards (up to 1980)

	7.6 m	9.1 & 9.7 m	11 m	13.2 m	9.7 m F.C.	11.5 m F.C.	Total
Total	52	2,302	6	7	1	6	2,374

F.C. — ferrocement boats

The fish hold capacity of the 9.1 m boat is 2 tonne while that of the 9.7 and 13.2 m boats are respectively 4 and 7 tonne. The holds are generally not insulated. The engine horse-power for the 9.1-9.7 m boats generally ranges between 45 and 67 while the 13.2 m boat is powered by an 83 hp engine. The majority of these boats are built in wood with an aluminium alloy underwater sheathing as a protection against marine borer attack.

The 9.1-9.7 m boat has a crew of five to seven members. Its operational range is up to 40 m depth.

The economics of operation of the most popular mechanised boats are indicated in Appendices 3.2 and 3.3.

3.2 Fishing gear

The mechanised boats mainly use bottom trawls for shrimp. A high-opening bottom trawl introduced recently in collaboration with the Bay of Bengal Programme is being increasingly used in trawling for food fish, particularly in Palk Bay.

The fishing gears operated from non-mechanised traditional craft include :

- Gillnets operated both by kattumarams and canoes. The main seasons are February-May in the north and September-January in the south. The different types of gillnet are bottom set nets, drift nets, and wall nets. The last is a surface drift net extending in the air to catch flying fish. Most of the nets are operated at depths up to 25 m but the wallnet may be operated at depths up to 70 m.
- Hook and line. The season is July-October. Some traditional craft go out as far as 60 km to reach the rocky bottom patches with potential for this type of fishing.
- Shore seines. These are operated mainly along the Coromandel coast and make use of masula boats for setting the net.
- Boat seines. One form of this gear is the Pindaivalai which is operated by four kattumarams towed by a mechanised boat. The net is set around a shoal and then lifted by the four kattumarams. The season for this gear is February-May. A smaller boat seine 'Thoorivalai' is operated by two kattumarams and is now more widely used than the Pindaivalai. The season for the former is generally from June to October.

Appendix 3.4 shows the districtwise distribution of the different types of fishing gears.

4. INFRASTRUCTURE AND SERVICE FACILITIES

There are 375 marine fish landing centres distributed in 422 coastal fishing villages. At eight of these centres, landing and berthing facilities in the form of harbours and jetties already exist or are being established. These include two major harbours at Madras and Tuticorin. Proposals for the establishment of major harbours at Chinamuttom (Kanyakumari district) and Valinokkam (Ramanathapuram district) are under consideration. Appendix 4.1 gives some details of landing facilities already established or under construction.

The districtwise distribution and capacities of ice plants, cold storages, freezing plants and frozen fish storages are shown in Appendix 4.2.

There are 13 established boat building yards run by the public, cooperatives and private sectors for constructing mechanised boats. Information regarding these yards is set out in Appendix 4.3. In addition, at many places along the coast traditional crafts are constructed by village artisans without any established boatyard facilities.

A net-making plant with an annual capacity of 145 tonne is operated by a government agency, the Tamil Nadu Agro Industries Corporation Ltd. The private sector operates 10 small net-making plants with an annual capacity of 3-13 tonne : two in Chingleput, two in Madras, one in North Arcot, one in Thanjavur, two in Tirunelveli and two in Kanyakumari districts with a total annual capacity of 71 tonne. The present policy of the state government is not to permit any new industrial units for net making so as to safeguard employment opportunities for fisherwomen and children.

As for marine diesel engines, of the eight makes in the country, one (Ashok Leyland) is manufactured in Tamil Nadu.

Other infrastructure facilities already established or being established by the government include approach roads, fish curing yards, service stations and workshops, insulated trailer services, community halls, cyclone shelters and guide lights in selected fishing villages.

5. PRODUCTION

Marine fish production in Tamil Nadu (Appendix 5.1) increased from 45,000 tonne in 1951/52 to 212,000 tonne in 1968/69 — a 400% increase in 17 years. The upward trend was steady and continuous. But since then -for the past 12 years — production has been fluctuating between 192,000 and 224,000 tonne. The figure of 216,000 tonne of marine fish catch in 1979/80 meant 15% of the nation's marine landings; it also represented 57% of the state's total fish landing (376,000) from inland and marine waters.

The main fish species of the state quantitatively, are sardines, ribbon fish, silver bellies, anchovies, half-beak and gar fish, skates and rays, polynemids, seer and other mackerel, perches, carangids and catfish. These species constituted 66% of the total marine landings in 1979/80. The species composition of the marine landings for the period 1974/75-1979/80 is given in Appendix 5.3. A districtwise breakup of the fish landings in 1978/79 is given in Table 5.1.

Table 5.1
Marine fish landings in the maritime districts 1978/79

District	Quantity landed (tonne)	Percentage of the state's total
Madras	13,980	6.65
Chingleput	14,148	6.73
South Arcot	7,385	3.51
Thanjavur	62,665	29.80
Pudukottai	4,587	2.16
Ramanathapuram	29,281	13.92
Tirunelveli	23,628	11.23
Kanyakumari	54,672	26.00
Total	210,346	100.00

The non-mechanised craft of the small-scale fisheries sector accounted for 70% of the total landings in 1978/79, the rest from the mechanised sector. As against this general trend, in Madras and Ramanathapuram districts the mechanised sector clearly contributed more than the non-mechanised craft while in Thanjavur district the contributions of the two types of craft were almost equal (Appendix 5.4).

The fishing seasons for some of the commercially important species are given in Appendix 5.5.

6. HANDLING AND PROCESSING

All fishing craft, including the mechanised boats, make daily trips. They do not generally carry ice to preserve fish on board. Shrimp, being in great demand, is sold out as soon as it is landed, and finds its way quickly to processing factories. Lobsters, squids and cuttlefish are also collected quickly and transported to the factories by agents. After landing, the finfish are sorted on the shore and auctioned. Fish is carried un-iced from the landing centre to nearby markets — usually in palm-leaf baskets — by means of cycles, rickshaws, hand carts and tongas or by headload. Stronger baskets and boxes of ice are used while transporting fish to distant markets. Lorry, bus, and van transport are used for long-distance trips.

About 65% of the total marine fish landing is consumed in fresh form, 28% is salted and dried and the remaining 7% is either frozen or reduced to fish meal. Generally, only surplus or deteriorated fish is subject to sun-drying and curing.

Fish drying and curing is done all along the coast mainly on a cottage industry scale, but also on a larger scale in the districts of Kanyakumari and Ramanathapuram. Small varieties of fish such as anchovies, silver bellies and white sardines are sun-dried directly on the beach, generally without the addition of salt. In the case of small seer, jew fish, catfish and small perches, the fish is gutted, washed and salted. Large-sized fish like shark, rock cod, skates, rays and perches are eviscerated, dressed and salted at a salt: fish ratio of 1 : 3 for about 24 hours. The salted fish is then rinsed with fresh or sea water and sun-dried on cement platforms, on mats or on sand in the open beaches.

Shark fins are collected at the landing centres and are sun-dried with or without application of a little lime and salt on the cut portions where the flesh is exposed.

Fish maws are collected from the swim-bladders of jewfish, catfish and eels. Washed well with freshwater, the swim-bladders are sun-dried. They are exported for culinary use or for preparation of isinglass.

Three fish canning plants came up in the state over the years, one in the public sector and two in the private sector, at Tuticorin, Adirampattinam and Nagercoil. The public sector plant at Tuticorin with an installed capacity of 0.5 tonne/day and the private sector plants at Nagercoil with an installed capacity of 5 tonne/day had to be closed down ; the operations were unprofitable because of high canning cost and low product demand. The private sector plant at Adirampattinam with an installed capacity of 1 tonne/day is continuing its efforts to run on commercial lines.

Freezing is the processing technology most widely adopted for shrimp, lobster, squid, cuttle fish and other high value export produce. There are fish processing plants with a total freezing capacity of 175 tonne per day and frozen fish storage capacity of 4,102 tonne (Appendix 4.2).

Five fish meal plants exist at present for reduction of surplus or non-edible fish into fish meal. The locations and capacities of these plants are given in Table 6.1.

Table 6.1
Fish meal plants

Location	Ownership	Plant capacity for handling raw material (tonne)
Mandapam	Tamil Nadu Fisheries Development Corporation	50.0
Tuticorin	Fisheries Department	0.5
Tuticorin	Private	4.0
Tuticorin	Private	0.5
Tiruchirapalli	Private	2.0
	Total	57.0

7. DISTRIBUTION AND MARKETING

About 80% of the population in the state consume fish. The annual per capita consumption of fish works out to 7.5 kg. The demand for fish and fishery products in Tamil Nadu is steadily on the increase. The fish-eating people of the coastal areas prefer marine fish, but those residing in the interior mainland generally prefer freshwater fish.

Marine fish is landed at 375 landing centres along the coast. Formerly, most of the surplus marine fish caught in the state was sun-dried or cured and disposed of partly in the interior markets and partly through export to Sri Lanka. Modern methods of preservation and processing like icing, freezing and canning as also improved transport and communication have changed the pattern of disposal of the catch. The percentage of fish marketed in fresh condition (with or without ice) has increased from 43% in 1955 to 68% in 1979 while the quantity used for curing has fallen correspondingly from 51% to 28%. Freezing, accounting for about 7% is resorted to mainly for export packing of prawns, lobsters, cuttle fish, etc. Fish canning, however, has failed to make any impact because of production and marketing problems.

Fish is generally auctioned on the beaches by traditional auctioneers on a commission basis. They also take the responsibility for realising the sale proceeds from traders.

The auctioneers are also often moneylenders who advance funds to fishermen and thus have some control over them. In some villages an annual auction is held for the right of purchasing fish for which the successful traders pay a premium. In these cases, prices are more or less dictated by the trader.

Many important towns have fish markets operated by local authorities. Where such markets do not exist, fish is sold in the general marketplace or at roadside stalls. In some places, cycle vendors sell the fish door-to-door.

About 25% of the marine fish production is marketed directly through local retailers near the landing centres. The major part, however, is taken to private stalls or fish markets situated in the cities and towns run by the corporations or municipalities. In the wholesale markets, retailers buy fish at auctions.

Formerly the state fisheries department advanced loans to municipalities and other local bodies for construction of hygienic fish markets. These loans carried a subsidy of 50%. Standard plans for such markets were provided by the state fisheries department. This scheme was in operation from 1957-58 and 64 markets were either constructed or renovated. The system has been discontinued.

With a view to encouraging cooperative marketing, 10 cooperative fish marketing unions were organised. Since most of the unions did not function satisfactorily, three production-cum-marketing societies have been registered at Alathalai and Ovari (Tirunelveli district) and Kanyakumari (Kanyakumari district) for which the government has contributed Rs. 218,000 as share capital assistance and managerial subsidy.

The TNFDC runs 34 fish stalls in Madras, Madurai, Coimbatore and Tirunelveli to sell quality fish at reasonable prices to the public. The Corporation buys fish from important landing centres like Royapuram, Arambakkam, Nagapattinam, Mallipattinam, Arcotthurai, Valinokkam, Tuticorin, Tiruchendur, Kanyakumari and Colachel for feeding the fish stalls. In addition to the catch from corporation reservoirs, it also procures freshwater fish from Madurai.

The average retail prices of some marine fish species at selected centres are shown in Appendix 7.1.

8. EXPORTS AND IMPORTS

Tamil Nadu is India's third largest fish exporting state, accounting for about 11% of India's total value of fishery exports in 1979. Table 8.1 gives details of Tamil Nadu's exports of marine products.

Table 8.1
Exports of marine products (1971-79)

Year	Quantity (tonnes)	Percentage share of India's export	Value (Rs. million)	Percentage share of India's export
1971	5633	15	16.6	4
1972	3429	9	17.2	3
1973	4947	6	58.7	7
1974	4520	10	88.9	12
1975	5865	11	133.3	13
1976	7965	12	241.4	13
1977	7319	11	236.3	13
1978	10430	13	317.7	15
1979	8294	9	298.3	11

A breakdown of the categories of marine products exported is given in Table 8.2.

Table 8.2
Product composition of marine product exports from Tamil Nadu

Items	%	% of total quantity	%	% of total value
Frozen shrimp	..	49	..	84
Frozen froglegs	..	7.7	..	5
Frozen lobster	..	L1	..	L1
Frozen cuttlefish	..	2.6	..	2
Dried fish	..	37.7	..	4.5
Shark fins	..	1	..	2.7
Fish maws	..	L1	..	L1
Beche-de-mer	..	L1	..	L1
Others	..	L1	..	L1

L 1: Less than 1%

Japan, USA, UK, France, Spain, Sri Lanka, Singapore, Hong Kong and West Germany are some of the importers of fish from Tamil Nadu, the first two being the most important.

Within India, about 1,500 tonne of fish are sent annually to Calcutta, while the state receives some fish from Andhra Pradesh, Kerala and Karnataka.

Tamil Nadu's imports in fisheries are confined to equipment and spare parts for freezing and processing plants, net-making machines, outboard motors, etc.

9. COASTAL AQUACULTURE

Due to such factors as the increased demand for fish for export and internal consumption and the need to generate rural employment, the government is presently according some priority to the development of coastal aquaculture.

Preliminary observations and surveys during the 1970s by the Directorate of Fisheries indicate that there are 56,000 ha of brackishwater spreads consisting of estuaries, lagoons, backwaters, mangrove swamps, etc., and another 15,000 ha of low-lying state-owned coastal land that could be utilised for pond construction. Distribution of these waters and land by district is indicated in Table 9.1. The land is owned by the Department of Revenue, Salt, Forests and Railways. No data was elicited in the surveys regarding private land.

Table 9.1
Distribution of brackishwaters by district

District	Total brackishwaters	Total low-lying lands fringing brackishwaters
	ha	
Chingleput	14,841	2,663
South Arcot	8,072	2,704
Thanjavur	31,426	7,297
Pudukottai	—	247
Ramanathapuram	874	1,385
Tirunelveli	401	566
Kanyakumari	265	18
Total	55,879	14,880

The Pulicat lake, Killai and Ennore backwaters, Adyar, Marakkanam, Vellar and Coleroon estuaries and Muthupet swamp are important brackishwater spreads in the state.

The coast of Tamil Nadu is characterised by low tidal amplitudes, rarely exceeding a metre : the average daily fluctuation in most places is in the order of 0.5 m only. Due to the low tidal range, coastal pond culture operations would require the use of pumps.

Furthermore, although the coast has a few isolated clayey and sandy clay areas, there is a preponderance of sandy soils which make pond construction and maintenance problematical and costly.

Some surveys have been made of the occurrence and seasonality of the culturable shrimp and fish seed resources in the major estuaries and backwaters. The seed supply appears to be plentiful particularly in the low saline estuaries rich in mangrove vegetation. The entry of seed from the open sea into the inland waters occurs or substantially increases when the sand bars at the entrances to estuaries and backwaters are breached during the monsoons. Some seed incursion also takes place over the bars during very high tide cycles. The seasons of **seed** availability in various brackishwaters elicited by these surveys are given in Appendix 9.1.

Only preliminary studies have been carried out on quantitative assessments of the availability of seed. Some work has been done at the Centre for Advanced Studies in Marine Biology, Annamalai University, and at the Santhome brackishwater fish farm of the Directorate of Fisheries on the composition of seed available at Porto Novo and Adyar respectively. Their findings are summarised in Table 9.2.

Table 9.2
Percentage composition of shrimp and fish seed

Species	Adyar Estuary (1979)	Porto Novo Estuary (1977)	Porto Novo Mangrove (1977)
<i>Shrimp</i>			
Penaeus indicus	58	22	45
P. monodon	3	6	6
P. semisulcatus		47	2
Metapenaeus dobsoni		13	33
Metapenaeus monoceros	39	6	9
Other species		6	5
	100	100	100
<i>Finfish</i>			
Mullet	89		
Milkfish	11		
	100		

The Santhome Brackishwater Fish Farm has estimated that 3,000-9,000 seeds of 20-40 mm size of p. indicus per man hour could be collected from the Adyar estuary by using shooting nets and cast nets, depending on the monsoon and the consequent opening of the river mouth. Some data on the seed collection rate achieved in the Adyar estuary are given in Appendix 9.2.

Messrs Hindustan Lever Ltd., a private company, have set up an experimental shrimp hatchery at Muthukadu on the banks of the Kovalam backwaters. Details of the performance of this hatchery are not yet available.

The first attempt at brackishwater fish culture was made in the 1940s when Chanos fry were successfully reared to marketable size in Kurusadi island near Mandapam in Ramanathapuram district and some sporadic attempts were made thereafter to culture other brackishwater species. The real thrust in coastal aquaculture started in 1977. The Directorate of Fisheries now operates five shrimp research centres at Pulicat, Adyar, Marakkanam, Porto Novo, and Manakudi. Ten demonstration farms are also in various stages of development at Pulicat, Vaniyanchavadi (Kovalam), TVS Pettai, Thandiakadu (Tranquebar), Eripurakarai (Adirampattinam), Kattumavadi, Kannamunai, Keelavaipar, Punnakayal, and Arockiapuram.

In the public sector, the highest shrimp production achieved so far through pond culture is 516 kg/ha of *P. monodon* in 80 days. This result was obtained in a 1.14 ha pond in 1977-78 at the Brackishwater Fish Culture Experimental Centre at Santhome in Madras. Production achieved through polyculture of Chanos and *P. indicus* in a 0.1 ha pond works out at 2,200 kg/ha/annum.

Pen culture of shrimp is being tried at the Kilalai (Porto Novo) backwaters, while shrimp culture in cages is under experimentation in the Kovalam backwaters. The results of these experiments have not yet been evaluated. The problems encountered in regard to pen culture are: lack of a cheap and effective netting material for pen construction; damage to netting by crab and eel action; problems in excluding predators and competitors from the pen; lack of cheap, effective and easily available artificially compounded feed; difficulty of complete recovery of the cultured shrimp from the pen; and poaching.

Experimental culture of crab, lobster, chanos, mussel, turtle and seaweed is being carried out at the Mandapam and Tuticorin research stations of the Central Marine Fisheries Research Institute.

Shrimp culture activities in the private sector started in the late 1970s. About 50 farms covering 70 ha of water area came up mainly in the districts of Chingleput and Thanjavur, and a few in South Arcot. Most of them had a water spread of 0.1-1.13 ha while a few ranged in size from 2 to 10 ha. The owners were either marginal farmers who constructed ponds in their own lands or in lands leased from the state, local bodies, etc., or entrepreneurs who were attracted by the increasing prices of shrimp in the international market and research at some of the experimental farms in India and abroad.

These farmers encountered several problems. In many cases, pond construction proved to be complicated and expensive, owing to the sandy nature of the soil. There was continuous loss of water due to seepage. Filling, draining, and maintaining appropriate water levels in ponds by means of water pumps was an expensive and cumbersome process. There were difficulties in identifying and procuring shrimp seed, and wrong species were often introduced into the ponds. The quality of the response of fertilisers to sandy soil and water pollution due to unscientific feeding led to high mortality, slow growth, and low biomass production. After the first few attempts, therefore, many farms were abandoned and fewer than ten farmers are presently operating shrimp farms.

The present policy of the state government with regard to coastal aquaculture in state-owned waters/land is to channelise its efforts and inputs only through government departments to fishermen cooperatives. Potential areas for such action have been identified by the Directorate of Fisheries at Adirampattinam (Thanjavur district) and at Karangadu (Ramanathapuram district).

10. SOCIO-ECONOMICS

Tamil Nadu has a total marine fisherfolk population of about 396,000 living in 422 fishing villages. The total number actually engaged in fishing is estimated at 96,500. The districtwise distribution of the marine fishing villages and the fisherfolk population is given in Appendix 10.1.

Of the total fisherfolk population, Hindus constitute 54%, Christians 40% and Muslims 6%. The Christian fisherfolk are concentrated in Kanyakumari and Tirunelveli districts, where over 95% of the fishermen are Christians, while the Muslims are concentrated in the districts of Pudukottai and Ramanathapuram.

The fisherfolk have a very low status in the social hierarchy. They belong to many castes: Chettiar, Naicker, Reddiar, Mudaliar, Nattar, Goundar, Padayachi, Santhaipettiyar, Panicker, Pillai, Kallar, Thevar, Irungaliyar, Vandaiyar, Ambalakaran, Vannier, Maniyagar, Labbai, Rowther, Samban, Karayar, Paravan, Valayan, Nadar, Pattamkittian, Kadayar, Mukkuwa, Nulaya. Of these, Rowther and Labbai are Muslim castes while Mukkuwa, Nulaya and Paravan are Christian castes.

Besides fishing, these people engage themselves actively in fish curing, drying, net-making and marketing.

The number of fisherfolk families is about 76,000. The size of an average family is 5.2 and adult males and females are 32% each, the rest being children.

It has been estimated that about 40,000 fishermen do not own either boats or gear but true quantitative information regarding ownership is not available. In cases where there is no ownership by the crew, 60% of the earnings goes to the owners of the craft and gear and 40% to the crew.

The income from fishing is seasonal and the bulk of the earnings is often realised during a few months in the year. The margin for savings or for even distribution of expenditures is small, and fishermen often get indebted to traders or moneylenders to survive during the off-season. The major part of the income is spent on food and related items and on clothing.

Information on the pattern of spending among fisherfolk, elicited in a survey of three selected villages in Thanjavur and South Arcot districts, is given in Table 10.1.

Table 10.1
Pattern of spending among the fisherfolk at three selected centres, 1980

Items of expenditure	% of total expenditure		
	Adirampattinam	Mallipattinam	Cuddalore
1. Food	60	60	60
2. Clothing	10	10	5
3. Education	3	1	—
4. Health	5	5	4
5. Refreshments	10	10	15
6. Fuel	—	—	—
7. Tobacco	—	2	—
8. Drink	—	1	5
9. Religious ceremonies	2	1	1
10. Entertainment	5	6	4
11. Savings	—	—	2
12. Maintenance of boats and gears	5	4	4
Total	100	100	100

The lack of proper housing is a major problem for the fisherfolk. Till the end of June 1980, the Government had provided 9,934 houses for them. Prior to 1975, the fishermen were given loans and subsidies for the construction of their own houses, but from 1975 onwards, the Government has been providing free houses to coastal fishermen.

Most of the fishing villages do not have enough supply of potable water. The Fisheries Department has identified the villages that need better water supply and the Tamil Nadu Water Supply and Drainage Board has taken up this work.

11. FISHERIES ADMINISTRATION AND INSTITUTIONS

11.1 Fisheries administration

At the state level, a cabinet minister is responsible for the sector. He is assisted by a Secretary to Government who is the administrative head of the Department of Forestry and Fisheries. The administrative set-up of fisheries at the national and state levels is shown in Appendix 11.1.1.

The Director of Fisheries is the administrative head of the Directorate of Fisheries. The organisation of the directorate is shown in Appendix 11.1.2.

The Directorate is manned by 11 professional officers at headquarters: five technical officers, one engineering officer and three officers from the ministerial cadre for planning administration and accounts. In addition, there is a Deputy Registrar of Cooperative Societies, and a Senior Accounts Officer. The regional and district level offices have 37 technical, 10 research, two engineering and two refrigeration and four ministerial cadre officers.

The main functions of the directorate are:

- increasing marine and inland fish production in Tamil Nadu ;
- creation of the required infrastructural facilities through state and central plan schemes;
- improvement of the socio-economic conditions of small-scale fishermen by cooperative effort and financial assistance;
- providing relief for fishermen at time of natural calamities;
- arranging the flow of institutional funds into the fishing industry, to accelerate development activities with scope for raising production;
- diversification of fishing methods;
- training of fishermen;
- improvement of preservation, marketing and transport facilities for fish;
- survey and conservation of fishery resources;
- development of freshwater and brackishwater fisheries;
- development of pearl and chank fisheries;
- research ;
- extension

The annual budget of the directorate for 1980/81 was Rs. 34.27 million of which the capital expenditure component was Rs. 9.48 million.

11.2 Research and development institutions

The Central Marine Fisheries Research Institute (CMFRI) which has its headquarters at Cochin has three of its nine sub-stations at Madras, Mandapam, and Tuticorin in Tamil Nadu.

The Central Inland Fisheries Research Institute (CIFRI), which has its headquarters at Barrackpore, has sub-stations at Madras and Bhavanisagar in Tamil Nadu.

The Exploratory Fisheries Project (EFP) with its headquarters in Bombay has two units based at Madras and Tuticorin which operate four 17.5 m vessels and one 16.5 m vessel.

The Marine Products Export Development Authority (MPEDA) located at Cochin has a regional office in Madras. Funds are provided **by** MPEDA to the Tamil Nadu Government for improving fish landing facilities at selected centres. It also organises dry fish storage at Tuticorin.

The state Fisheries Directorate operates the following eight research stations:

- The Hydrobiological Research Station at Ooty (Nilgiris district) is responsible for highland fisheries research including trout culture.
- The Freshwater Fisheries Biological Research Station located at Bhavanisagar (Coimbatore district) conducts research on the conservation and culture of Torkhudre, Puntius; cage culture of *Mystus Oar*; culture of *Macrobrachium*: breeding of major carps and nursery management. The research station has two field units, one at Mettur and the other at Thanjavur.
- The Hydrobiological Research Station in Madras carries out research on ecology and fishery management of reservoirs and irrigation tanks, fertilisation of fish ponds and reservoirs, water pollution studies, fish diseases and fish toxicants.
- The Marine Biological Station located in Madras has five units, one each at Ennore (Chingleput), Porto Novo (South Arcot district), Marakkanam (South Arcot district), Muthupet, (Thanjavur) and Mandapam (Ramanathapuram district). The station, with its field units, is responsible for the survey of prawn and fish resources in estuaries and backwaters and the culture of edible molluscs, seaweeds and shrimp.
- The Pearl Culture Station with two centres at Tuticorin and Cape Comorin pursues research on the ecology of **chank** beds and the ecology and culture of the pearl oyster.
- The Mariculture Research Station with two sub-stations, one at Pulicat (Chingleput) and the other at Kovalam (Madras), is responsible for coastal aquaculture in ponds and cages.
- The Fisheries Technological Station at Tuticorin conducts research on fish processing, product development, quality control, drafting of standards, etc.
- The ICAR project for brackishwater fish farming investigates the culture possibilities of penaeid shrimp and euryhaline fish in the Porto Novo area.

The Directorate has five survey stations along the coast at Madras Cuddalore, Mallipatnam, Rameswaram and Kanyakumari. The inshore areas up to 40 m depth are surveyed by these stations with small mechanised boats to provide information to fishermen with regard to

- fishing grounds and types of suitable fishing gear;
- region-wise distribution of commercially important fish ;
- area-wise quantitative abundance of the potential fishable stock;
- season-wise fluctuations in abundance of stocks;
- ecological factors determining quantitative abundance; and
- migration, if any, of commercially important species.

11.3 Training institutions

The Central Institute of Fisheries, Nautical and Engineering Training (CIFNET), with its headquarters at Cochin, has been operating a unit in Madras since 1968. This unit is headed by a Deputy Director and has a technical staff of 20. It trains skippers, engineers, fishing second hands and engine drivers for large and medium deep-sea fishing vessels and shore-based staff such as radio telephone operators, shore mechanics and gear technicians.

Details of the training courses conducted are given in Table 11.3.1.

Table 11.3.1
CIFNET training courses at Madras

S.No.	Name of the course	Training capacity	Duration (months)
1.	Fishing second hands	40	15
2.	Engine drivers	40	15
3.	Shore mechanics	20	12
4.	Radio telephone operators	15	99
5.	Gear technicians	20	9

650 persons have been trained by this unit up to 1979/80.

The Central Polytechnic Institute conducts a three-year diploma course in fisheries technology and navigation.

The state Fisheries Directorate runs a Fisheries Staff Training Institute in Madras. Department personnel undergo one-year theoretical and practical training in oceanography, navigation, marine fisheries, inland fisheries and cooperation. It also conducts three-week refresher courses for in-service personnel.

In addition, training in inland fish culture is also given to fish farmers.

The Directorate operates six training centres for training young literate fishermen in the 18-35 age group. A 10-month training is given in the operation of mechanised fishing boats, modern fishing methods, elementary navigation, use of modern fishing gear, etc. By December 1979, 4,500 persons had completed this course.

Fishermen who have undergone the training courses are eligible to handle mechanised fishing boats allotted under the hire-purchase system. The banks which finance these mechanised fishing boats require that at least one member of the owner-crew has been trained at one of the centres.

A junior mechanics course was also started at the Tuticorin Fishermen Training Centre in 1963. This 10-month course trains fishermen intensively in the handling, maintenance and repair of marine diesel engines. Fishermen in the age group 18 to 35, who have passed the eighth standard and have five years' experience, are eligible for the course.

11.4 Other institutions

The Centre of Advanced Study in Marine Biology is part of the Marine Biology Department of the Annamalai University in South Arcot district. Courses offered include oceanography, marine biology and marine ecology with reference to fisheries.

The Fisheries College at Tuticorin under the Agricultural University of Madras has recently started a degree course in Fisheries Science (B.F.Sc.).

12. INDUSTRY ORGANISATIONS

12.1 Fisheries corporations

The Tamil Nadu Fisheries Development Corporation Ltd. (TNFDC) was set up in April 1974 as a commercial organisation. It took over from the Fisheries Directorate all industrial activities, assets and functions for which the department was earlier responsible. These consisted of: four boat-building yards, two at Madras, one at Nagapattinam and another at Mandapam (all four closed down in 1983) ; freezing plants at Ennore, Mandapam and Tuticorin ; a fish meal plant at Mandapam; a canning factory at Tuticorin ; distribution of boats to fishermen ; procurement, operation and maintenance of deep-sea fishing trawlers; Ice plants and cold storages; the organization and marketing of fish and fishery products; and fishing rights in the reservoirs at Sathanur, Bhavanisagar, Amaravathi, Aliyur and Thirumoorthy.

The processing centres at Ennore and Mandapam have been temporarily leased to private enterprises. The Tuticorin unit has a corporation staff of 21 persons; TNFDC has plans to put up additional processing facilities at Tuticorin and at the Madras fishery harbour.

The corporation operates two 23 m Gulf of Mexico type steel hulled trawlers from the fishing harbour in Visakhapatnam (Andhra Pradesh). It also operates two 17.2 m trawlers from the Madras commercial port for supplying fish to the corporations' 34 fish retail stalls located at important urban centres. Other important activities include the operation of diesel supply points at Madras, Mallipattinam and Tuticorin.

TNFDC has a headquarters staff of about 70. The Director of Fisheries is also the Managing Director of TNFDC. The budget for 1980/81 is Rs. 19.6 million of which the proposed capital expenditure is Rs. 6.55 million.

12.2 Fisheries cooperative societies

The fisheries cooperative societies of Tamil Nadu are under the administrative control of the Director of Fisheries and provide financial assistance and relief to member fishermen. There are cooperatives in nearly all of the 400 fishing villages along the Tamil Nadu coast.

The societies receive only limited institutional finance and, therefore, depend largely on the modest financial support provided by the state government. An amendment to the Reserve Bank of India Act, which places the fishermen's cooperative societies on par with agricultural cooperative institutions is likely to increase the availability of credit from banks and institutions such as National Cooperative Development Corporation and the Agricultural Refinance Development Corporation.

Some details of the number, membership and share capital of fishermen cooperative societies in the state are given in Table 12.2.1.

There are 278 primary societies in the marine sector. These are at the village or kuppam level. A member must live in the area covered by the society, be connected with the fishing industry and be above 18 years. The individual share capital contribution is **Rs. 5**.

The main function of the societies is to channel government loans to their members. The loans fall into four categories :

- long-term loans for the purchase of craft and equipment and for discharge of prior debts. The maximum amount is Rs. 400 per member, repayable in 10 years at the current rate of interest;
- medium-term loans for the same purpose as the long-term loans, but repayable in five years. In the inland fishermen cooperative societies, the maximum amount is Rs. 300 per member;

- short-term loans to meet urgent needs during the off season. The maximum amount is Rs. 400 (marine) and Rs. 200 (inland) and is repayable within one year;
- working capital loans up to a maximum of Rs. 5,000 per society to run fair-price shops. Such loans are repayable in 10 years.

Table 12.2.1
Fishermen cooperative societies (1980)

Name of Society	Number	Membership	Share capital (million Rs.)
Primary Fishermen Cooperative Societies ..	483	—	—
Primary Fishermen Cooperative Marketing Societies	5	81,362	2.32
Fishermen Cooperative Societies organised under "half a million jobs programme" and employment promotion programme ..	16	496	0.02
Cooperativa fish marketing unions	10	702	0.80
Total	514	82,560	3.23

The loans schemes for fishermen cooperative societies were started in 1956/57. Details of the amount lent up to 1978/79 are given in Table 12.2.2. Recoveries up to 1975/76 amounted to Rs. 4.7 million.

Table 12.2.2
Loans issued to fishermen cooperative societies up to 1979

Type of loans	Amount (Rs.)
Long-term loans	3,624,070
Medium-term loans	1,607,833
Short-term loans	48,700
Working capital loan	764,800
Godown loan	89,450
Elimination of middlemen scheme	1,194,575
Total	7,329,428

During 1979/80 the Fisheries Directorate did not distribute any loan to fishermen's cooperatives. The National Cooperative Development Corporation (NCDC) which is now the main lending agency for fishermen's cooperatives, sanctioned Rs. 3.2 million to fishermen cooperative societies during **1979/80**.

NCDC has in fact been financing the implementation of development schemes through fishery cooperatives since 1974. It provides financial assistance to the state government for contributing to the share capital of societies. Assistance is also made available for the purchase of country craft, mechanised boats and transport vehicles, for setting up processing units of various kinds, for the construction of godowns, fish curing yards and boat-building yards, for setting up service and repair centres and technical and promotional cells, for preparing project reports for the

establishment of processing units, for undertaking feasibility studies, and for specialised training of technical and managerial personnel of fishery cooperatives.

The tentative programme for the implementation of NCDC-sponsored schemes through fishermen's cooperatives during the sixth five-year plan (1980-81 to 1984-85) will be of the order of Rs. 33.35 million. Of this Rs. 1.6 million will be **used** towards subsidy and a sum of Rs. 5.36 million towards share capital loans.

13. GOVERNMENT POLICY

The government attaches high priority to the development of the fisheries sector in the state, in view of its contribution to nutrition, employment and export earnings and also in view of its development potential for the future.

The objectives of the Sixth Five-Year plan indicate the main planks of the state government's fishery policy. They are :

- to step up fish production — marine and inland — both for export (to boost foreign exchange earnings) and for internal consumption (to raise the per capita intake of fish) :
- to develop the small-scale fisheries sector by improving the operational efficiency of kattumarams and other indigenous craft and by evolving appropriate intermediate technology, such as the introduction of suitable beachlanding craft like fibreglass boats fitted with out-board motors or inboard engines;
- to popularise diversified methods of fishing among the marine fishermen, with a view to increasing the catch of quality fish other than prawns;
- to undertake a survey of pelagic fishery resources in the deep sea off Tamil Nadu coast and take steps to tap deep-sea fishery resources;
- to provide more fishing harbours and anchorage facilities for berthing mechanised boats and trawlers ;
- to improve fish processing by using modern methods to prevent spoilage and to ensure fishermen better prices for fish and fishery products;
- to popularise and launch coastal aquaculture projects with special reference to the culture of prawns, brackishwater fish, edible oysters, mussels, seaweeds, etc. ;
- to step up the quality fish **seed** production techniques and management;
- to intensify inland fish production by organising and expanding the fish farmers development agencies ;
- to organise and expand the marketing of both marine and inland fish in all major cities and towns in the state to ensure the availability of good quality fish at fair prices to the consumers;
- to re-orient fishery research and development programmes with adequate extension facilities **for** achieving the objectives of increased fish production and its proper utilisation;
- to train the fishermen in modern and diversified methods of fishing, and the Fisheries Department personnel in various specialised areas to facilitate the speedy and effective implementation of development projects;
- to improve the socio-economic conditions of fishermen and fisherwomen;
- to revitalise fisheries cooperatives by taking advantage of institutional finance from the National Cooperative Development Corporation, the Agricultural Refinance Development Corporation, etc ;

-to promote various fish-based industries with special reference to chanks, pearls, seaweeds, trash fish, etc. ;

-to generate employment potential.

Since the First Five-Year plan (1951-56), the main emphasis in development has been on mechanisation and on building up the necessary infrastructure e.g. landing and servicing facilities. In order to promote mechanisation, boats were given to groups of fishermen under a hire-purchase system. Subsidies to the extent of 50% on the cost of engines and 25% on the cost of hulls were granted during the period 1956-69. The balance of the capital cost less an initial deposit of Rs. 500 to Rs. 5,000 paid by the fishermen as security was provided as an interest free loan. This was to be repaid in 60 monthly instalments over seven years. From 1968-69 the subsidy rate was progressively reduced and in April 1972 the scheme was abolished.

A subsidy at the rate of 20% on nylon twine was granted during the period 1956/57-1973/74.

From 1974 fishermen were required to pay 5% of the total cost of a boat. The Government granted 15% of the cost as an interest-free margin money loan and the balance of 80% was financed by the commercial banks. The Government subsidised the interest on the bank loan up to three years. This subsidy was withdrawn from 1978. From 1978 onwards the Government has subsidized 10% of the cost of boats.

14. DEVELOPMENT PLANS

The major fisheries development schemes implemented in Tamil Nadu during the period between the First Five-Year Plan (1951-56) and the Fifth Plan (1974-79) and the expenditure incurred are set out in Table 14.1.

Table 14.1
Development plans 1951-79

Plan	Expenditure (Rs. million)	Scheme
First Five-Year Plan (1951-56)	3.13	Introduction of mechanised boats, ice plants and cold storages, fish transport.
Second Five-Year Plan (1957-61)	7.53	Design and introduction of improved mechanised boats introduction of nylon twine, training fishermen in handling mechanised boats, expansion of cold storage and fish transport facilities.
Third Five-Year Plan (1962-66)	25.72	More boat-building yards, further expansion of mechanisation, harbour and landing facilities, canning and fish meal plants.
Three Annual Plans (1966-69)	39.74	Continuation and expansion of earlier activities, construction of feeder roads.
Fourth Five-Year Plan (1969-74)	107.87	Construction of more harbours, construction and supply of boats and engines for inshore and off-shore fishing, boat-building yards and workshops, supply of fishing requisites, setting up of a State Fisheries Corporation.
Fifth Five-Year Plan	142.86	Construction of mechanised fishing boats and trawlers, expansion of ice plants, cold storages, and berthing facilities.

During the Sixth Plan period (1980-85) the main development programmes to be implemented fall into the following broad categories — marine fisheries; provision of infrastructure including landing and berthing facilities; inland fisheries; brackishwater fisheries; processing and marketing; training of fishermen and fisheries staff; research and socio-economic measures to improve the living standards of fisherfolk.

Specific schemes proposed under these programmes include :

- subsidised supply of outboard motors with combination nets for kattumarams;
- supply of fibreglass boats equipped with outboard/inboard engines and combination nets on subsidised rates;
- issue of purse seiners;
- operation of deep-sea trawlers;
- establishment of new landing terminals and harbours and completion of those under construction ;
- reorganisation of fishermen's cooperative societies;
- problem-oriented research and extension ;
- extension and survey.

The proposed outlay for the programmes in the Sixth Plan is about Rs. 447 million of which the state's share is 240 million. A breakdown of the proposed schemes together with the physical and financial targets is given in Appendix 14.1.

The direct projected output of these schemes in terms of production is an increment of 80,000 tonne of marine fish and 50,000 tonne of inland fish.

The directly productive additional inputs planned for the marine sector are given in Table 14.2.

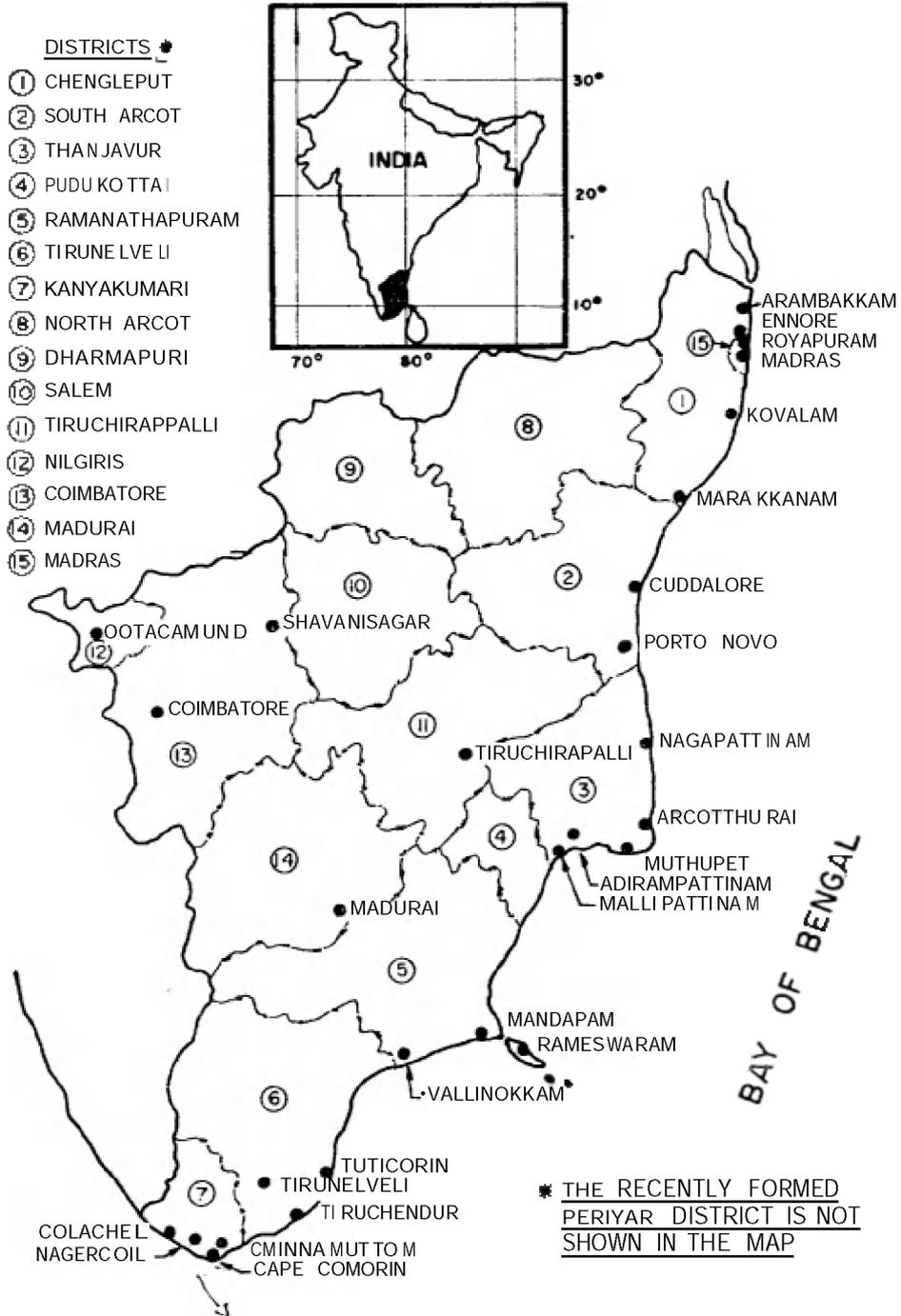
Table 14.2
Directly productive additional inputs and expected outputs
in the marine sector

Inputs	Base year 1979180 (number)	Terminal year of VI Plan 1984185 (number)	Expected increase in landing (tonne)
13.2 m boats for purse-seining ..	6	20	4,000
Deep-sea vessels for trawling ..	4	15	15,000
6 m (18 ft.) fibreglass boats with outboard motors	Nil	500	
7.6 m (25 ft.) fibreglass boats with inboard motors	Nil	500	61,000
Outboard motors to mechanise kattu- marams		1000	
Total			80,000

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- Central Marine Fisheries Research Institute:** Marine Fisheries Information Service, August 1981.

APPENDIX - H
ADMINISTRATIVE MAP OF TAMILNADU



Appendix 1.2

STATE DATA

1. Location.	North – Andhra Pradesh East – Bay of Bengal and Palk Bay Southeast – Gulf of Mannar South – Indian Ocean Southwest –Arabian Sea West – Kerala State Northwest – Karnataka State Latitudes : 8° 5' N – 13° 35' N Longitudes : 76° 15' E – 80° 20' E		
2. Size:	Area	130,069 km ²	(3.96%)*
	Districts	16	
	Revenue taluks	137	
	Revenue firkas	775	
	Revenue villages	16,546	
	<i>Local bodies</i>		
	Corporations	2	
	Municipalities	99	
	Township committees	8	
	Panchayat unions	374	
	Village panchayats	12,602	
	Town panchayats	621	
	Townships	12	
	Coastline	1,000 km	(13.3%)
	Continental shelf		
	(Area in sq.km) :		
	Total 0-200 m depth	41,412	(9.16%)*
	0-20 m depth	16,058	
	20-50 m depth	7,197	
	50-200 m depth	18,157	
	Average width of continental shelf		43.1 km
3. Population:	1971	41,199,168	(7.52%)*
	1980 (projected)	46,705,500	
	Urban	16,055,200	
	Rural	30,650,300	
	Density	350 per km ²	
	Rate of increase in population % per annum		
		2.23	
	Birth rate-1977 (per 1,000)	21.29	
	Death rate-1977 (per 1,000)	7.23	
	Infant mortality (per 1,000) 1977		
		43.86	
	Life expectancy (1976-80)		
	Males	59.9	(61 .1)*
	Females	58.0	(59.8) *
		1971	1981
4. Education.	Literacy rate	39.53%	(36.17%) *
	Males	51.32%	(46.74%) *
			(provisional)
	Females	26.87%	(24.88%) *

* Figures within brackets represent either the state share (%) of all-India or all-India figures-

School enrolment

Level	Age group (years)	% of population of each age group	
		Tamil Nadu (1974/75)	All-India (1981 provisional)
Primary School . .	6-11	90.0	84.01
Middle School . .	11-14	52.2	39.07
Secondary School . .	14-17	33.4	16.09
Universities and Colleges	17-24	4.5	4.41
7. Health (7974):	Population per hospital bed	1037	1978/79 (1200) *
	Population per doctor	907	(3700)*
8. Nutrition (7974) :	Calorie intake % of requirement (2,200 Cal/day)	80.5%	(78%) *
	Protein intake % of requirement (60 g/day)	76%	(75%) *
9. Employment (1977):			

Population by broad industrial categories of workers

Industrial category	Persons in Tamil Nadu	% to total population in Tamil Nadu	% to total workers in	
			Tamil Nadu	All-India
Workers				
(i) Cultivators	4,607,787	11.2	31.26	43.34
(ii) Agricultural labourers	4,490,065	10.8	30.46	26.33
(iii) Livestock, forestry, fishing and plantation	403,295	1.0	2.74	2.38
(iv) Mining and quarrying	50,654	0.1	0.33	0.51
(v) Manufacturing, processing, servicing and repairs :				
(a) Household industry	669,913	1.6	4.54	3.52
(b) Other than household industry	1,302,424	3.2	8.83	5.94
(vi) Construction	234,235	0.8	1.59	1.23
(vii) Trade and commerce	1,154,222	2.8	7.83	5.57
(viii) Transport, storage and communication	465,657	1.1	3.16	2.44
(ix) Other services	1,363,715	3.2	9.25	8.74
Total workers	14,741,967	35.8	100.00	100.00
Percentage of workers to total population			35.78	32.92
Non-workers	26,457,201		64.12	67.08
Total population	41,199,168		100.00	100.00

10. Net National Product and

Net State Domestic Product at factor cost (1978/79):

	Tamil Nadu	India 1979/80	Tamil Nadu as % of India
NNP at current prices million Rs.	52810	901730	6.35
NNP at current prices per capita Rs.	1151	1378	87.70

11. Trade (1976/77):

Exports of main commodities

Commodity	Value in million Rs.	% of total exports
Leather	1725.6	33.0
Tobacco	373.1	7.2
Handloom piece goods	324.9	6.2
Iron, ore and concentrates	304.1	5.8
Fish and fish preparations	242.8	4.6
Others	2252.2	43.2
Total	5222.7	100.0

Imports of main commodities

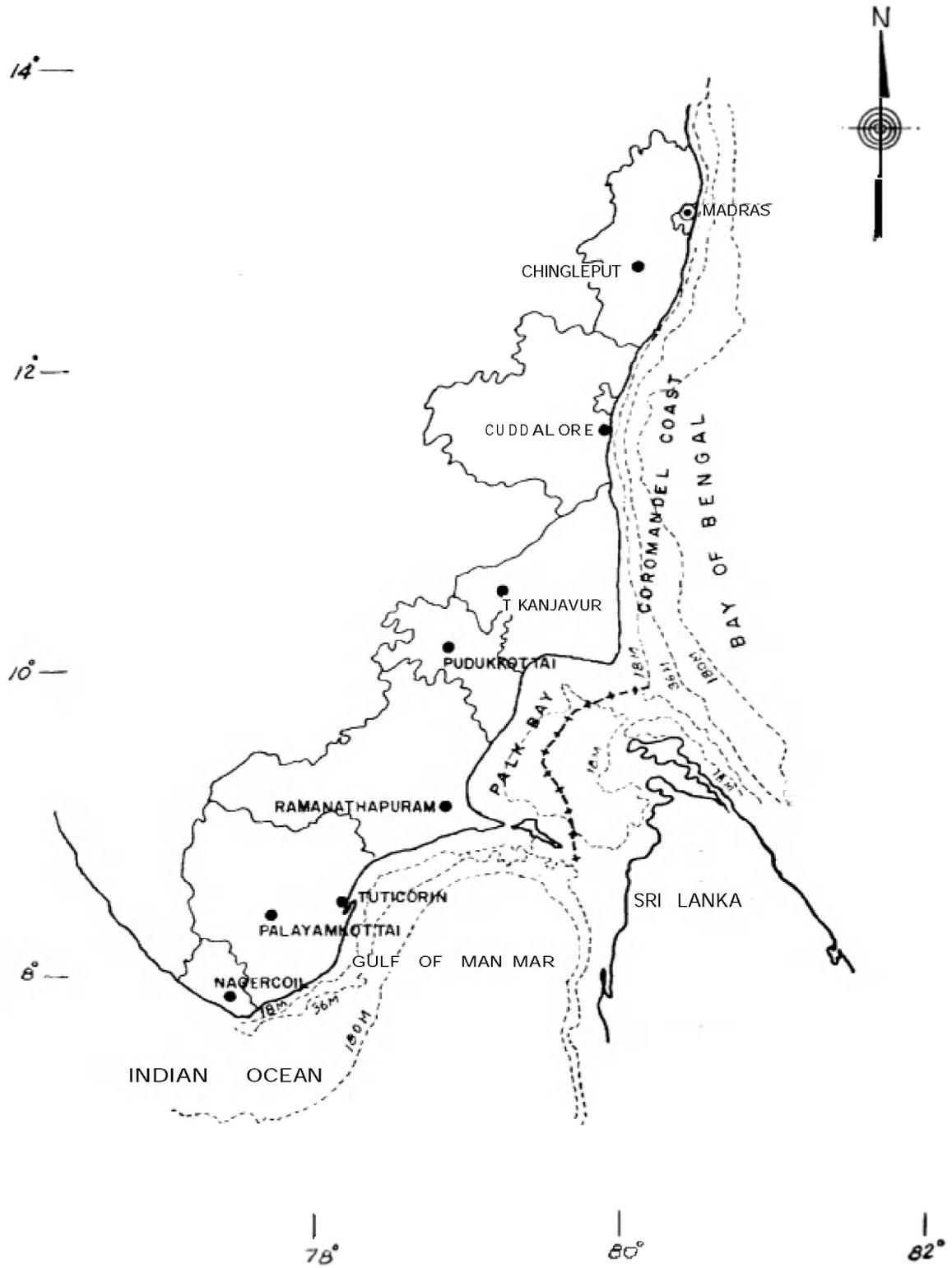
Commodity	Value in million Rs.	% of total imports
Machinery (not electric)	848.0	18.0
Iron and steel	614.5	13.1
Wheat	339.8	7.2
Petroleum products	377.5	8.0
Electric machinery and appliances	232.4	5.0
Transport equipment	192.0	4.1
Urea and rock phosphate	180.5	3.8
Copper	92.5	1.9
Newsprint paper	91.1	1.9
Others	1741.8	37.0
Total	4710.1	100.0

12. General Consumer Price index number for agricultural labourers

(Base year 1960-61= 100):

	1977	1978	1979
Tamil Nadu	305	299	312
Annual change %	-2.0	4.3	
All-India	312	319	333
Annual change %	2.2	4.3	

APPENDIX 2.1
CONFIGURATION OF CONTINENTAL SHELF OFF TAMIL NADU



Appendix 3.1

DISTRICTWISE DISTRIBUTION OF MARINE FISHING CRAFT, 1980

Type of craft	DISTRICTS									Total
	Chengle- put	Madras	South Arcot	Thanjavur	Puduk- kotta i	Ramanatha- puram	Tirunelveli	Kanya- kumari		
<i>(a) Mechanised:</i>										
Trawlers	2	96	299	552	36	981	103	226	2,295	
Gillnetters	—	8	—	5	—	27	5	279	324	
Others	—	—	—	2	—	1	—	5	8	
Total	2	104	299	559	36	1,009	108	510	2,627	
<i>(b) Non-mechanised:</i>										
Dugout canoes	206	18	527	284	9	626	3	537	2,210	
Plank-built boats	902	50	197	1,176	908	4,074	958	692	8,957	
Kattumarams	7,371	2,287	2,541	5,043	128	370	2,584	11,527	31,851	
Others	83	—	1	195	—	44	1	1	325	
Total	8,562	2,355	3,266	6,698	1,045	5,114	3,546	12,757	43,343	

Source: Marine Fisheries Information Service, August 1981.

Appendix 3.2

ECONOMICS OF 9.7 M MECHANISED FISHING BOAT (Shrimp trawler)

	Rs.	P.
A. CAPITAL COST:		
(1) Cost of hull	78,300.00	
(2) Cost of engine 67 HP with stern gear and P.T.O.	1,00,000.00	
	<u>1,78,300.00</u>	
(3) Excise duty at 8%	14,264.00	
	<u>1,92,564.00</u>	
(4) Sales-tax at 6%	11,553.84	
(5) Surcharge on sales-tax at 5%	693.23	
(6) Winch	11,000.00	
(7) Excise duty at 8%	880.00	
(8) Sales-tax at 6%	660.00	
(9) Surcharge on sales-tax at 5%	33.00	
(10) Monofilament	5,210.00	
Total cost of a boat	<u>2,22,594.07</u>	
B. OPERATIONAL ANNUAL COST:		
(1) Cost of HSD oil (engine working for 12 hrs./day for 200 days at 10 ltrs./hr. at Rs. 3.05/litre)	73,200.00	
(2) Engine oil	2,500.00	
(3) Wages at Rs. 15+food Rs. 10 per day for 6 persons for 200 days	30,000.00	
(4) Maintenance of hull, engine, equipment and repairs	10,000.00	
(5) Maintenance of fishing gears and repairs	11,372.00	
(6) Insurance	34,413.00	
(7) Monthly establishments	<u>1,71,485.00</u>	
C. OPERATIONAL ANNUAL INCOME :		
Annual landings for 200 days 80 tonne		
(1) Prawn catch 5% at Rs. 30,000/tonne	1,20,000.00	
(2) First quality fish 10% at Rs. 7,000/tonne	56,000.00	
(3) Second quality 30% at Rs. 3,000/tonne	72,000.00	
(4) Trash fish 55% at Rs. 500/tonne	22,000.00	
	<u>2,70,000.00</u>	
ANNUAL GROSS SURPLUS (C-B)	<u>98,515.00</u>	

Note: The unit economics has been worked out on the assumption that the mechanised boat will be working as per the planned capacity on all working days. In practice, the operation of mechanised boats is restricted to nearly 50% of the planned capacity because of various reasons like regulations consequent upon the disputes between countrycraft fishermen and mechanised boat operators. The high cost of fuel in proportion to daily catch during the lean season also keeps boats ashore.

Appendix 3.3

ECONOMICS OF 9.1 M MECHANISED FISHING BOAT (Shrimp trawler)

				Rs. P.
A. CAPITAL COST:				
(1) Cost of hull	..	..	..	43,700.00
(2) Cost of engine 40.7 HP with stern gear ,	..	..	..	65,000.00
				<u>1,08,700.00</u>
(3) Excise duty of 8%	..	..		8,696.00
				<u>1,17,296.00</u>
(4) Sales-tax at 6%	..	..	..	7,042.76
				<u>1,24,439.76</u>
(5) Surcharge on sales tax at 5%	..	..	..	352.13
				<u>1,24,791.89</u>
(6) Monofilament	..	..	..	4,168.00
Total cost of a boat	..	..	..	<u>1,28,959.89</u>
B. OPERATIONAL ANNUAL COST:				
(1) Cost of HSD oil (engine working for 12 hrs./day for 200 days at 5 ltrs/hr. at Rs. 3.05/litre)	..	..	..	36,600.00
(2) Engine oil	..	..	..	2,000.00
(3) Wages at Rs. 10 per day for 6 persons for 200 days . .	..	..	..	30,000.00
(4) Maintenance of hull, engine, equipment and repairs .	..	..	..	15,000.00
(5) Maintenance of fishing gears and repairs . .	..	..	..	10,000.00
(6) Comprehensive insurance	..	..	..	6,655.00
(7) Monthly establishment	..	..	..	21,663.00
				<u>1,21,918.00</u>
C. OPERATIONAL ANNUAL INCOME :				
Annual landings for 200 days for 60 tonnes				
(1) Prawn catch 5% at Rs. 30,000/tonne	..	..	..	90,000.00
(2) First quality fish 10% at Rs. 7,000/tonne . .	..	..	..	42,000.00
(3) Second quality 30% at Rs. 3,000/tonne	..	..	..	54,000.00
(4) Trash fish 55% at Rs. 500/tonne	..	..	..	16,500.00
				<u>2,02,500.00</u>
ANNUAL GROSS SURPLUS (C-B)	..	..	..	<u>80,582.00</u>

Note: The unit economics has been worked out on the assumption that the mechanised boat will be working as per the planned capacity on all working days. In practice, the operation of mechanised boats is restricted to nearly 50% of the planned capacity because of various reasons like regulations consequent upon the disputes between countrycraft fishermen and mechanised boat operators.

Appendix 3.4

DISTRICTWISE DISTRIBUTION OF MARINE FISHING GEARS, 1980

Type of gear	DISTRICTS								Total
	Chengle-put	Madras	South Arcot	Thanjavur	Puduk-kotta i	Ramanatha-puram	Tirunelveli	Kanya-kumari	
Trawl nets	10	287	574	1,496	82	3,029	217	524	6,219
Drift/gillnet	8,362	2,107	4,797	22,337	14,479	35,048	14,338	16,832	118,300
Boat seine	1,273	327	539	2,262	519	24	206	2,070	7,220
Fixed bag net	525	101	158	168	32	737	12	109	1,842
Hooks and lines	3,068	519	3,263	4,140	2,756	5,362	487	2,516	22,111
Shore seine	306	46	211	1,637	57	1,523	66	703	4,549
Traps	2	7	—	166	4,062	3,312	—	1,370	8,919
Scoop nets	68	—	252	698	—	22	—	—	1,040
Others	485	6	3,078	1,571	31	1,168	—	—	6,339

Source: Marine Fisheries Information Service, August 1981.

Appendix 4.1

FISH LANDING FACILITIES

District Location (District)	Nature of facility	Berthing capacity	Year/expected year of completion	Supporting facilities in vicinity
Kasimedu (Madras)	Major harbour 1380 m wharf, eastern break- water 1325 m, northern breakwater 830 m.	500 mb 50tr	1981	Boat-building yard, cold storage, freez- ing plant.
Tuticorin (Tirunelveli)	Major harbour 400 m wharf, 136 m x 363 m basin.	400 mb 10tr	1976	Boat-building yard, service centre.
Cuddalore (South Arcot)	Minor harbour 258 m wharf.	40 mb	1974	Service centre.
Nagapattinam (Thanjavur)	90 m wharf wall.	10mb	1969	Boat-building yard, service centre.
Kodikari	T-type jetty.	40 mb	under construction	
Mallipattinam	T-type jetty	54 mb	under construction	Service centre
Rameswaram (Ramanathapuram)	T-type jetty 60 m.	10mb	1972	Service centre
Mandapam	Shore quay of 110 m on Palk Bay side, wharf and basin on Gulf of Mannar side.	40 mb	1972	Boat-building yard, service centre.

mb = mechanised boats tr – trawler

Appendix 4.2

ICE-MAKING, COLD STORAGE, FREEZING AND FROZEN-FISH STORAGE FACILITIES BY DISTRICT, 1979

District	Ice Production (tonne/day)			Cold Storage Capacity (tonne)			Freezing Capacity (tonne/day)			Frozen Storage Capacity (tonne)		
	Govt./ Corpn.	Private	Total	Govt./ Corpn.	Private	Total	Govt./ Corpn.	Private	Total	Govt./ Corpn.	Private	Total
Madras				2	2,006	2,008						
Chingleput }	11.0	209.0	220.0	8	293	301	5.0	104.25	109.25	50	3,267	3,317
South Arcot	4.0	59.0	63.0	7	105	112	—	12.00	12.00	—	235	235
Thanjavur	11.0	19.5	30.5	7	—	7	—	—	—	—	—	—
Pudukkottai	—	—	—	—	—	—	—	—	—	—	—	—
Ramanathapuram	22.0	51.0	73.0	7	25	32	11.5	20.00	31.50	50	250	300
Tirunelveli	14.0	21.0	35.0	98	13	111	3.0	2.50	5.50	50	60	110
Kanyakumari	14.0	44.5	58.5	31	—	31	—	16.00	16.00	—	140	140
Total	76.0	404.0	480.0	160	2,442	2,602	19.5	154.75	174.25	150	3,952	4,102

Appendix 4.3

BOAT-BUILDING YARDS

Location	Ownership		Capacity (No. of boats)					Type of boats constructed
			8.5 m	9.2 m	9.7 m	10.3 m	13.2 m	
Madras	Private	(1)	—	12	6	—	—	Wooden boats
		(2)	—	15	6	—	—	Wooden boats
		(3)	—	—	—	20	—	Fibreglass mech.boat
Ennore	Cooperative			N/A			Wooden boats	
Cuddalore	Private	(1)	—	15	6	—	—	Wooden boats for trawling and gillnetting
		(2)	—	80	35	—	—	
		(3)	—	6	4	—	—	
Tuticorin	Cooperative		—	8	2	—	—	
Colachel	Private		4	—	—	—	—	Dory-type boats with fibreglass material.

Appendix 5.1

ANNUAL MARINE FISH LANDINGS IN TAMIL NADU

Plan	Year	Production in tonne		
		Marine	inland	Total
First Plan	1951-52	45700	36000	81700
	1952-53	48200	36800	85000
	1953-54	52300	38400	90700
	1954-55	56500	38700	95200
	1955-56	57000	36000	93000
Second Plan	1956-57	60900	39200	100100
	1957-58	68600	40900	109500
	1958-59	73900	41200	115100
	1959-60	81900	42400	124300
	1960-61	91120	43130	134250
Third Plan	1961-62	93280	48490	141770
	1962-63	134100	52300	186400
	1963-64	153600	93280	246880
	1964-65	160219	99568	259787
	1965-66	165395	86555	251950
Annual Plan	1966-67	175067	104908	279975
	1967-68	204916	115936	320852
	1968-69	212005	119784	331789
Fourth Plan	1969-70	201481	92316	293797
	1970-71	209984	107903	317887
	1971-72	212937	109476	322413
	1972-73	218307	135000	353307
	1973-74	224083	150000	374083
Fifth Plan	1974-75	192338	120000	312338
	1975-76	200172	135000	335172
	1976-77	201838	140000	341838
	1977-78	205058	150000	355058
Annual Plan	1978-79	210316	150000	360316
	1979-80	216689	160000	376689

Source: Fisheries Department, Tamil Nadu.

Appendix 5.2

LIST OF COMMERCIALLY IMPORTANT SPECIES OF MARINE FISH

Popular name	Scientific name	Tamil name
Longtailed shark	Carcharias	Matta churah
	Gangeticus	Mundan churah
Tiger shark	Galeocerda tigrinus	Valluvan churah
	G. rayneri	Komarin churah
	Stegostoma tigrinum	Pulliyam churah
Hammerhead shark	Zygaena blochii	Nettai karamben churah
Saw fish	Pristis spp.	Vela, Iluppa
Sting ray	Trygon sephen	Aadathirukkai
Catfish	Arius thalassinus	Mandaikeliru
	A. dussumieri	Nedumankeliru
	A. jella	Vellaikeliru
	A. sona	Keluthi
	A. falcarius	Uppukalikeluthi
	Osteogeneiosus militaris	Mannavakeluthi
	Plotosus canius	Akkannankeliru
P. arab	Akkeluthi	
Silver bar	Chirocentrus dorab	Vallai
Oil sardine	Clupea longiceps	Nonnalai
	C. brachysoma	Paichalachudai
White sardine	Clupea lile	
	Dussumieria	Thondan
	Hasseltii	Punduvirinjan
	D. acuta	Kavalai
Indian sprat	Clupea fimbriata	Marakkendai
	C. kanagurta	Chudai
	Sardinella gibbosa	Challai
Anchovy	Engraulis purava	Poruva
	E. mystax	
	E. hamiltoni	
	E. setirostris	Vaniam poruva
	E. malabaricus	Nethili
White bait	E. indica	Pottla, Pottai
	E. commersonii	Nengulli
Indian herring	Pellona hoevenii	Venkannai
	P. elongata	Venkannu
	P. brachysoma	Poovali
	P. hoevenii	Uenkan

Popular name	Scientific name	Tamil name
Milk fish or White mullet	<i>Chanos salmoneus</i> <i>Chanos Chanos</i>	Paalmeen Paalkendai
Oxeyed herring	<i>Megalops cyprinoides</i> <i>Elops saurus</i>	Thorankendai Allathi
Half beak	<i>Hemirhamphus georgii</i>	Kozhuthmural Kallamural
Gar fish Et	<i>B. melanostigma</i>	Saathamural
Full beak	<i>B. choram</i> <i>B. livia</i> <i>B. strongylura</i> <i>B. cancila</i>	Maaccola Karivalamkola Nedumural Kola
Cockup	<i>Lates calcarifer</i>	Koduva
Rock cod	<i>Serranus pantherinus</i> <i>S. undulosus</i> <i>S. maculatus</i>	Chembarampalli Vanchkalava Chengani
Snapper	<i>Lutjanus fulviflamma</i> <i>L. marginatus</i> <i>L. annularis</i>	Chepili Paruthivalaimeen Kalmeen Paruthikalli Mattanpiriyan
Perch	<i>Therapon puta</i> <i>T. jarbua</i> <i>Diagramma griseum</i> <i>D. punctatum</i> <i>Synagris spp.</i> <i>Gerres lucidus</i>	Kili keechan Mattakeechan Kalmadhanam Tholan Thullukendai Lomiyan Oodan Challiodan
Croakers,	<i>Sciaena albida</i>	Vellakathalai
Drums	<i>S. maculata</i>	Pullikathalai
Ribbon fish	<i>Trichiurus savala</i> <i>T. haumela</i> <i>T. muticus</i>	Mattachavalai Olavalai Karthigaivalai
Horse mackerel	<i>Caranx rottleri</i> <i>C. nigresens</i> <i>C. hippos</i>	Killisai Komaraparai Chemmarai
Silver belly	<i>Equula spp</i> <i>Gazza spp</i> <i>Leiognathus bindus</i> <i>L. ruconius</i> <i>L. daura</i>	Caral Carappodi Kaliccaral Namaccaral
Pomfret	<i>Stromateus spp</i>	Vaval Vellaivaval Karuvaval

Popular name	Scientific name	Tamil name
Mackerel	Rastreliger kanagurta	Kumla Mavulasi
Seer	Cybiium commersoni C. guttatum	Vanjiram Seela
Tunny fish	Thynnus spp	Soorai
Bonito	Pelamis spp	Keliyvarai
Barracuda	Sphyraena spp	Irathachurai Elichurai
Mullet	Mugil borneensis M. troscheli M. dussumieri	Madavakendai Madavai Seluvakendai
Malabar sole	Cynoglossus semifasciatus	Nakkumeen
Prawn	Penaeus indicus P. monodon P. semisulcatus Metapenaeus monoceros M. affinis Hippolysmata Acetes Leander Palaemon Solenocera	Vellara Kottera Pasieral Pochieral
Crab	Scylla serrata Neptunus pelagicus	Varinandu Pallinandu

Appendix 5.3

MARINE FISH LANDINGS BY SPECIES

Sl.No.	Name of Fish	Quantity (tonne)					
		1979/80	1978/79	1977/78	1976/77	1975/76	1974/75
1.	Sharks	4353	3946	3478	5357	5541	9405
2.	Skates and Rays	6803	8317	9948	5784	8723	7470
3.	Eels	157	261	142	612	247	90
4.	Cat Fish	4993	6426	4970	3880	4720	9098
5.	Sabre Fish	4678	3209	1928	836	3863	3407
6.	Sardines	29357	25502	34478	24992	36966	21881
7.	Hilsa Ilisha	129	235	14	21	712	565
8.	Anchoviella	10794	15451	19227	8831	7334	6810
9.	Other Clupeids	2090	1849	1913	1800	3582	2741
10.	Saurida and Saurus	1902	1638	2446	1242	1125	693
11.	Hemirhamphus & Belone	8972	10438	8523	5031	6974	3403
12.	Flying Fish	—	—	—	2906	78	1003
13.	Perches	7920	5526	6444	6943	7964	9061
14.	Red Mullet	2277	2584	2075	2132	1825	2234
15.	Polynemids	11567	3018	1244	1265	969	952
16.	Sciaenids	8024	7494	7224	8546	6673	4354
17.	Ribbon Fish	19805	25928	2140	33324	17076	5947
18.	Caranx	5312	3649	4002	4389	5018	4162
19.	Other Carangids	—	—	11	—	100	41
20.	Chorinemus	906	1013	1499	2107	1774	1210
21.	Trachinotus	146	24	69	81	798	67
22.	Elecate	725	496	487	237	182	322
23.	Leiognathus	21301	20308	27070	23621	20598	24513
24.	Lactarius	1586	2401	3021	1587	2074	2078
25.	Pomfrets	755	624	1271	1177	1364	1721

Appendix 5.3 (contd.)

Sl.No.	Name of Fish	Quantity (tonne)					
		1979/80	1978/79	1977/78	1976/77	1975/76	1974/75
26.	Mackerel	9879	7664	15896	8981	7888	5701
27.	Seer Fish	6336	5169	5756	7076	7383	5530
28.	Tunnies	2787	2315	1034	1453	1931	1280
29.	Sphyraena	1685	917	598	353	865	570
30.	Mulletts	780	1382	638	832	1673	2026
31.	Soles	512	203	308	200	273	769
32.	Penaeid prawns	5135	5738	5894	8182	8616	11389
33.	Non-penaeid prawns	1986	2135	1272	484	55	340
34.	Other crustaceans:						
	Lobsters	199	134	323	648	186	519
	Crabs	7326	5263	5464	6336	4361	4180
35.	Cephalopods	1568	1570	631	891	680	1413
36.	Miscellaneous	18912	23583	23620	15248	16584	31190
37.	Drepane	503	282	—	667	940	46
38.	Lethrinus	3085	2244	—	1690	1272	2922
39.	Sillago	187	160	—	91	380	259
40.	Turtle	4	—	—	—	—	82
41.	Balistes	711	668	—	1622	579	544
42.	Ora	389	525	—	393	197	138
43.	Dugong	—	—	—	—	29	201
44.	Bregmaceres	1	6	—	—	—	—
45.	Thrissocles	6	—	—	—	—	—
46.	Coryphaena	146	—	—	—	—	—
	Total	216689	210316	205508	201838	200172	192338

Source: Directorate of Fisheries, Tamil Nadu.

Appendix 5.4

FISH LANDINGS BY CRAFT TYPE AND DISTRICT, 1978/79

Name of District	Mech. boats (tonne)	%	Non-mech. craft (tonne)	%	Shore seine (tonne)	%	Night landing (tonne)	%	Total (tonne)	%
Madras	8,511	60.88	5,354	38.30	78	0.56	37	0.26	13,980	6.65
Chingleput	1,811	12.80	10,566	74.68	1,170	8.27	601	4.25	14,148	6.73
South Arcot	2,363	32.00	4,661	63.11	262	3.55	99	1.34	7,385	3.51
Thanjavur	30,835	49.21	30,027	47.91	455	0.73	1,348	2.15	62,665	29.80
Pudukkottai	2,071	45.45	2,486	54.55	—	—	—	—	4,557	2.16
Ramanathapuram	14,997	51.22	10,601	36.20	3,294	11.25	389	1.33	29,281	13.92
Tirunelveli	1,420	6.00	21,076	89.20	252	1.07	880	3.73	23,628	11.23
Kanyakumari	54	0.09	49,898	91.27	1,347	2.47	3,373	6.17	54,672	26.00
Total	62,062	29.51	134,669	64.03	6,858	3.26	6,727	3.20	210,316	100.00

Appendix 5.5

FISHING SEASONS FOR COMMERCIALY IMPORTANT SPECIES AT SELECTED CENTRES

Species 1	Madras 2	Cuddalore 3	Nagapattinam 4	Rameswaram 5	Tuticorin 6	Colachel 7
Seer	January-December	November-April	February-October	January-December	January-December	December-January
Horse mackerel	January-September	February-November	January-April October-December	January-December	July, August, October, December	August
Big jawed jumper	January-April July-September November, December	January-June	February-May	July, August, November	December-March	January, February, May, June September-December
Catfish	January-December	January-February July, October, November	January-March May-July September-December	January-December	January-May July-September November, December	January-May July-December
Sharks, skates and rays	January-December	January-February July, October November	January-December	January-December	December-March May, September	February-July
Mullet	January-December	June-February	January, March- October, December	January-December	January-December	December-January
Prawns	January-December	January-December	January	April-October	January-December	December-January

Appendix 7.1

7

AVERAGE RETAIL PRICES OF SOME MARINE FISH SPECIES AT SELECTED CENTRES (1979/80) Rs./Kg.

Species	Madras	Kanchi-puram	Chidam-baram	Puduk-kottai	Madurai	Salem	Ooty	Ramanatha-puram	Palayam-kottai	Nagerkoil
Sharks	11.75	7.50	6.50	3.50	5.50	4.75	8.00	4.00	6.00	6.00
Catfish	7.75	—	4.75	2.75	5.00	4.70	7.25	3.00	7.00	6.50
Anchoviella	4.25	—	2.50	—	—	—	6.25	—	—	5.00
Sardines	3.50	—	3.50	—	2.50	2.50	4.00	2.50	4.50	4.00
Saurida	4.50	7.00	—	—	3.75	—	7.50	3.00	—	—
Perches	11.25	—	8.00	—	6.50	—	7.75	7.00	7.25	6.00
Red mullet	5.50	—	6.50	3.00	6.00	—	—	—	—	—
Polynemids	11.50	6.25	8.25	—	6.50	—	8.00	3.50	—	—
Sciaenids	4.00	—	4.50	3.75	4.50	—	5.00	4.25	—	3.00
Ribbon fish	4.00	4.50	5.50	2.25	4.50	—	—	—	5.00	4.00
Caranx	11.00	—	3.25	3.25	5.50	3.25	—	6.50	—	7.50
Chorinemus	5.50	—	4.00	3.00	—	—	—	—	—	5.00
Leiognathus	3.25	—	3.00	3.00	—	—	—	1.25	—	4.00
Lactarius	3.50	3.50	5.25	—	9.00	—	7.00	7.50	—	7.50
Pomfret	11.50	8.00	7.00	7.50	9.50	—	10.00	8.00	11.00	9.00
Seer	14.50	9.00	8.00	—	14.50	12.00	10.00	11.50	14.00	14.50
Tunnies	8.50	—	3.50	—	7.50	—	—	—	—	6.20
Soles	5.00	6.00	4.50	—	—	4.00	—	3.00	—	—
Mugil	6.00	4.50	4.50	—	6.00	4.50	—	—	—	—
Prawns	12.00	14.50	6.50	7.50	—	—	—	—	9.00	—

Sea fish [43]

Appendix 9.1

PERIODS OF SEED AVAILABILITY IN VARIOUS BRACKISHWATERS

District/Place	Shrimp	Chanos	Mullet	Etoplus	Others
<i>ChinglepLit Dt.</i> Pulicat Kovalam Adyar	<i>P. indicus</i> February—May <i>P. monodon</i> March—May September_December <i>P. semisulcatuS</i> February—May August_September	March—May	February—June	January—December	
<i>South Arcot Dt.</i> Kazhiveli Vellar Killal	<i>P. indicus</i> January—April june_September <i>P. monodon</i> January, March, June <i>P. semisLi/CatUS</i> March—October	Fingerlings in small numbers year round	February—May	January—December	
<i>Thanjavur Dt.</i> Thirumullai Nagoor Thondiakadu Jambavanodal Vedaranyam Maravakkadu	<i>P. indicus</i> january—April June_September <i>P. monodon</i> January—March, June <i>P. semisulcatUS</i> March—October	April—May (Small numbers year round)	February—May (Small numbers year round)		<i>Lates seeds in large numbers in Muthupet swamp.</i>
<i>PudukkottaiDt.</i> Gopalapatnam	<i>P. semisulcatus</i>	Not available	Not available	Not available	NoestuarieSin Pudukkottai District.

<i>Ramanathapuram Dt.</i>	<i>P. indicus</i> Year round	April—June very abundant	February—June	—do—	Pamban is an excellent source for <i>Chanos</i> and <i>P. indicus</i> seed.
Karangadu	<i>P. monodon</i>	Small number year round			
Tiruppalakudy	March—June				
Kannamunai	<i>P. semisulcatus</i>				
Athankaral	Not available				
Pamban					
Chinapalam					
<i>Tirunelveli/Ot.</i>	<i>P. indicus</i>	Small number year round	March—June	Year round	Excellent for <i>P. semisul-</i> <i>catus</i> .
Punnakkayal	January—April				
Palayakkayal	June—September				
Keelavaipar	<i>P. monodon</i>				
Amalinagar	January and March—June				
	<i>P. semisulcatus</i>				
	March and Sept.—Nov.				
<i>KanyakumariDt.</i>	<i>P. indicus</i>	Small number in estuary year round	February—June	Year round	
Manakudy	January—April				
Thangapattinam	June—September				
	<i>P. monodon</i>				
	Not available				
	<i>P. semisulcatus</i>				
	Not available				

Appendix 9.2

CATCH OF SEEDS PER MAN-HOUR EFFORT IN ADYAR ESTUARY

Year/month	Nature of river mouth	Hepa net catch (numbers)/Man/hr.							
		<i>Shrimp</i>			<i>Fish</i>				
		P. indicus	P. monodon	Metapenaeids	Mulletts	Chanos			
January	Fully opened	..	..	..	7088	202	3868	1180	—
February	- d o -	..	..	..	6915	172	3905	2984	—
March	- d o -	..	..	..	9414	343	1916	619	288
April	Partially closed	.	.	..	1576	112	2952	1496	312
May	Fully open (cyclone)	..	..	..	3222	14	8694	2420	1260
June	Shallow/feeble flow		..	.	5014	88	3001	1829	48
July	I fortnight feeble flow II fortnight fully closed }	..	..	..	3830	55	2189	985	187
August	Fully closed	..	..	..	2015	—	2673	3247	—
September	- d o -	..	..	..	—	—	—	—	—
October	Partially open	.	.	..	3834	306	1800	1062	414
November	Fully open -free tidal play	..	..	..	686	396	1510	1505	—
December	- d o -	..	..	..	8756	704	3212	4136	—
	Total	..	.	.	52350	2392	35720	21463	2509

Appendix 10.1

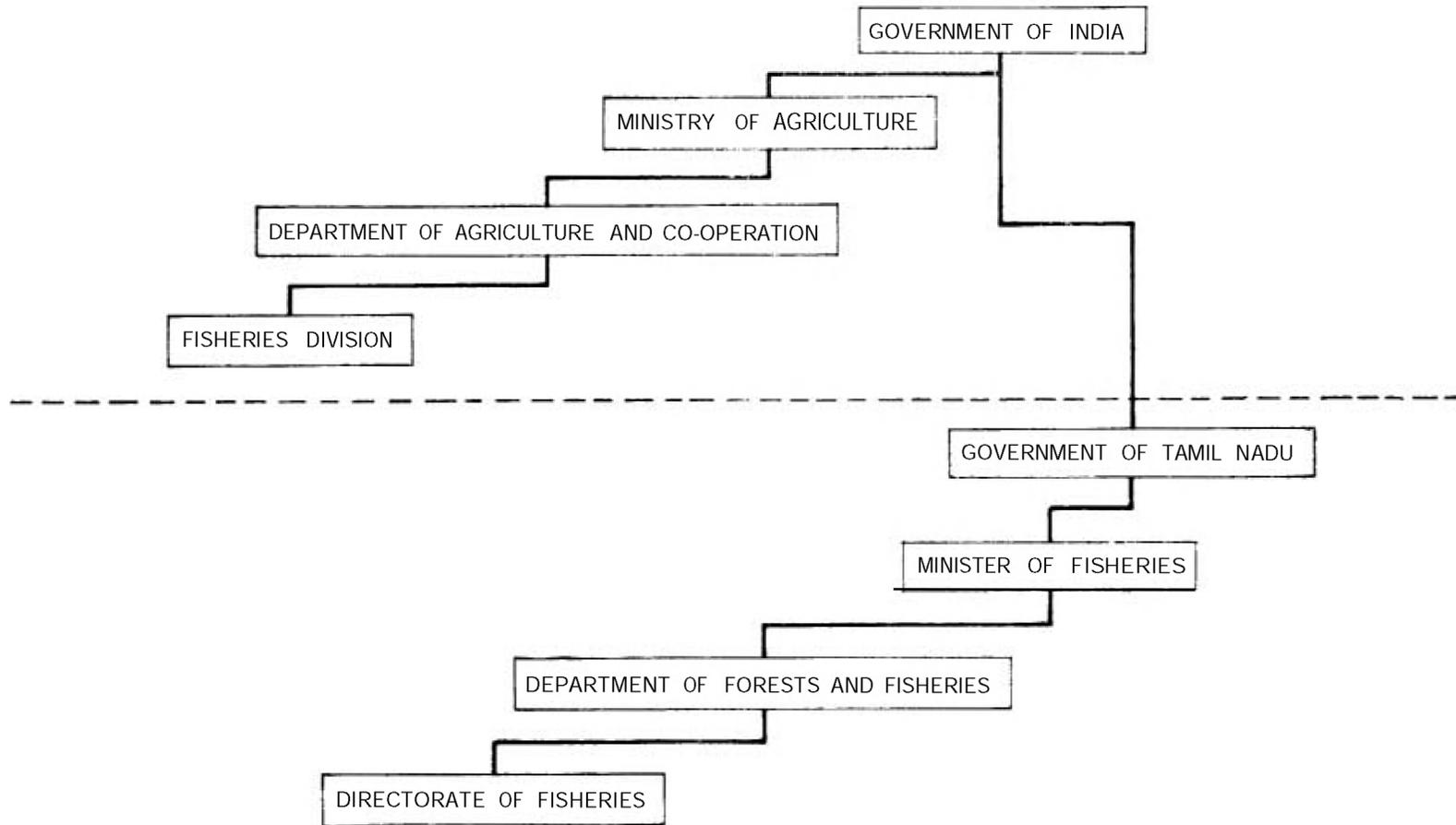
DISTRICTWISE FIGURES OF MARINE FISHING VILLAGES AND FISHERMEN POPULATION-TAMIL NADU 1980

	DISTRICTS									Total
	Chengle- put	Madras	South Arcot	Thanjavur	Puduk- kotta i	Ramnatha- puram	Tirunelveli	Ka n ya - kumari		
No. of fishing villages	65	37	55	87	20	80	32	46	422	
No. of landing centres	65	16	53	84	20	64	28	45	375	
No. of fishermen households	7,263	5,662	7,021	15,348	1,539	12,473	7,858	18,557	75,721	
(a) Male	10,426	10,667	11,538	21,782	2,473	21,582	14,559	33,940	1,26,967	
(b) Female	10,753	10,337	11,433	22,209	2,285	24,598	13,320	31,756	1,26,691	
(c) Children	13,227	12,041	13,506	26,223	3,016	24,963	15,914	33,355	1,42,245	
Total	34,406	33,045	36,477	70,214	7,774	71,143	43,793	99,051	3,95,903	
Educational status										
(a) Primary	8,394	5,639	7,383	4,496	622	9,676	10,515	13,350	60,075	
(b) Secondary	1,761	3,403	2,038	567	72	1,092	773	2,191	11,897	
(c) Above secondary	375	300	306	265	17	260	550	1,787	3,860	
Total	10,530	9,342	9,727	5,328	711	11,028	11,838	17,328	75,832	
No. of fishermen engaged in actual fishing										
(a) Full time	7,722	6,586	8,581	16,884	1,779	14,785	10,363	20,742	87,442	
(b) Part-time	314	90	133	716	80	430	218	2,039	4,020	
(c) Occasional	951	368	413	546	52	345	334	2,029	5,038	
Total	8,987	7,044	9,127	18,146	1,911	15,560	10,915	24,810	96,500	

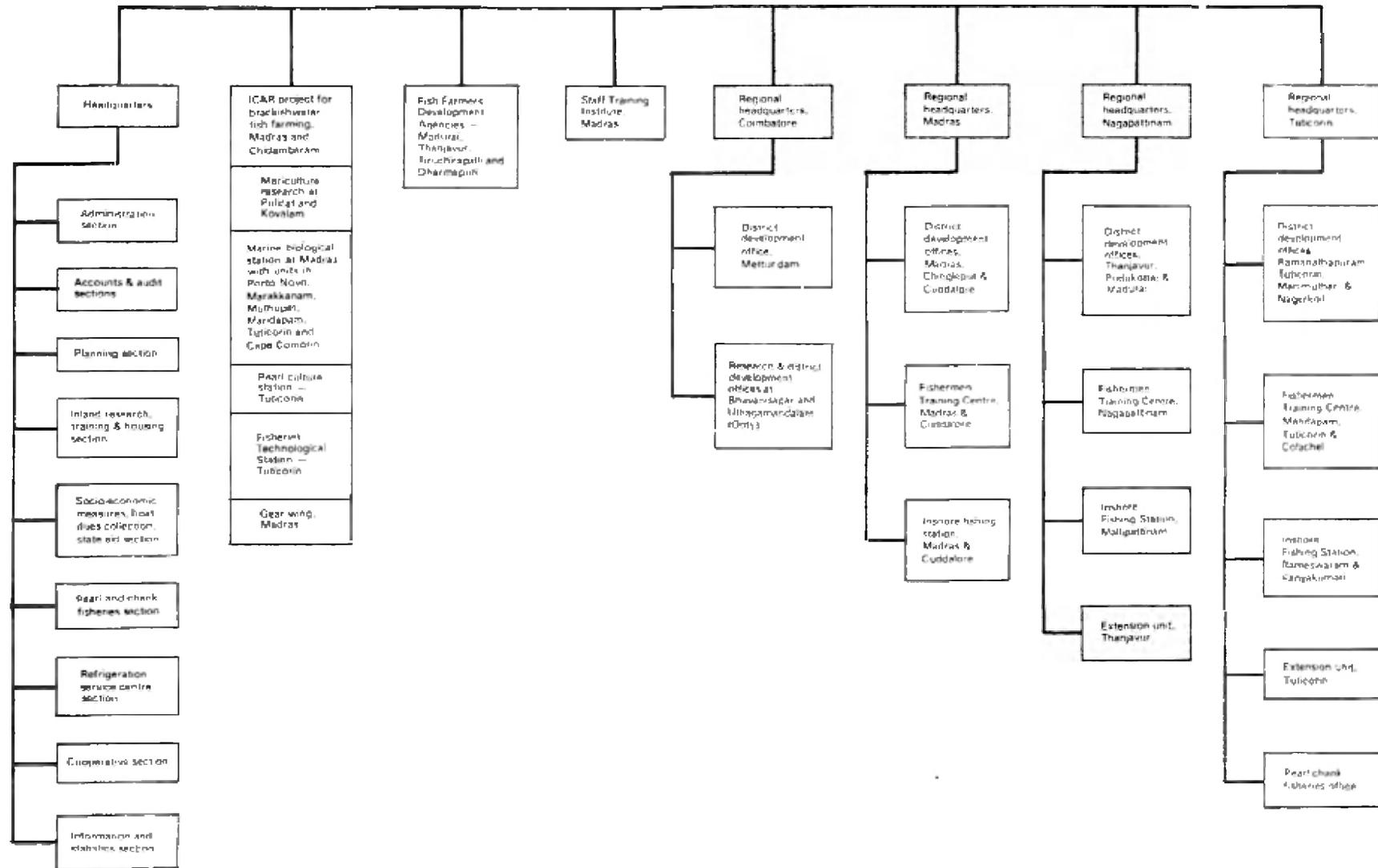
Source: Marine Fisheries Information Service, August 1981

APPENDIX -11.1.1

FISHERIES IN NATIONAL AND STATE ADMINISTRATIONS



APPENDIX 11.1.2
 ORGANISATIONAL CHART OF THE DIRECTORATE OF FISHERIES



Appendix 14.1

ALLOCATIONS AND TARGETS OF THE SCHEMES INCLUDED IN THE SIXTH FIVE-YEAR PLAN (198045)

S.No.	Name of programme	Allocation (Mill. Rs.)	Physical targets
1.	Grant of 20% subsidy on out-board motors with combination nets at Rs. 10,000 per unit ..	2.00	1000 out-board motors and nets.
2.	Grant of 20% subsidy for the introduction of 5.5 m fibreglass boats with out-board motors and combination nets Rs. 30,000 per unit	2.00	350 boats
3.	Grant of 20% subsidy for the introduction of 5.5 m fibreglass boats with in-board engines and combination nets Rs. 75,000 per unit	7.50	500 boats
4.	Extension of financial assistance to the Tamil Nadu Fisheries Development Corporation for the acquisition of 25 m vessels for Deep Sea Fishing operations at Rs. 5 million per unit	5.00	10 vessels
5.	Construction or acquisition of 13 m boats for mid-water trawling	3.00	15 vessels
6.	Establishment of landing and berthing facilities..	30.00	3 major fishing harbour and landing jetties
7.	Provision of infrastructural facilities in coastal fishing villages	6.80	5 centres
8.	Construction of fish seed farms consisting of nurseries equipment and operational staff ..	30.00	30 hectares
9.	Taking over of new reservoirs and large water spreads for stocking and exploitation ..	5.00	
10.	Setting up of Fish Farmers' Development Agencies	4.00	8 units
11.	Construction of brackishwater fish farms .	5.90	106 hectares
12.	Training in brackishwater fish farming .	0.20	2000 persons
13.	Construction of hatchery ponds for production of prawn seeds	1.25	1 hatchery
14.	Construction of prawn seed farms	0.65	2 farms
15.	Cage culture	0.20	500 cages
16.	Culture of edible oysters and mussels ..	0.50	2 units 500 cages each
17.	Green mussels	1.20	60 rafts
18.	Culture of pearl oysters	2.30	1 centre
19.	Culture of sea weeds	1.00	1 centre
20.	Research and Development	1.50	
21.	Aquarium and Marine National Park	1.00	1 modern aquarium
22.	Extension of financial assistance to the Tamilnadu Fisheries Development Corporation for strengthening its equity base	7.50	
23.	Survey of inland water spreads	2.50	Setting up of 3 survey-cum-extension units
24.	Training of fishermen and officials	1.50	Strengthening existing training centres and deputation of officials.
25.	Formation of link roads	4.00	200 roads
26.	Guide lights	1.00	40 guide lights
27.	Housing	10.00	7000 houses
28.	Training centres for fisher-women	0.50	2 centres
29.	Assistance to fishermen cooperatives ..	2.00	Loan scheme
30.	World Bank assistance	100.00	One marine fisheries project
	Total allocation	240.00	

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