Marine Small-Scale Fisheries of Andhra Pradesh: A General Description

Bay of Bengal Programme

MARINE SMALL-SCALE FISHERIES OF ANDHRA PRADESH: A GENERAL DESCRIPTION

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PREFACE

This paper attempts a brief factual presentation of data and baseline information on the main features of marine small-scale fisheries in Andhra Pradesh.

It may serve as an introduction to the subject, leading to deeper studies; as a source of general information; or as a background document for use in discussions on planning and programming of development assistance.

The paper revises and updates an April 1978 document issued by the FAO/UNDP Project for Development of Small-Scale Fisheries in South West Asia, RAS/74/031. That document was partly financed by the preparatory phase of the FAO/SIDA Bay of Bengal Programme.

This document has been prepared in cooperation with the Directorate of Fisheries, Andhra Pradesh. It is a working paper and has not been officially cleared by the Government or the FAO.

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The state of Andhra Pradesh is situated between latitudes 13°40'N and 19°N and longitudes 80°E and 85°E. It is bordered by the Bay of Bengal in the east, Orissa and Madhya Pradesh in the north, Maharashtra in the north-west, Karnataka in the west and south-west, and Tamil Nadu in the south. The state is divided into 23 revenue districts; nine of the districts are coastal. An administrative map is given in Appendix 1.1. Some socio-economic indicators are given in Appendix 1.2.

The continental shelf is estimated to be 31,000 km^2 and is 32 km wide on the average. The 0-50 m depth range area covers about 16,000 km^2.

Andhra Pradesh accounted for more than 6% of India's total marine landings and 23% of the marine landings of the east coast states in 1979. Pelagic fish contributed 46% and demersal 54% to the total landings. About 84,000 fishermen earn their livelihood wholly or partially from marine fishing. Some 36,000 craft are engaged in sea fishing, of which over 99% are traditional and non-mechanised, mostly kattumarams. Motorisation of fishing craft was first attempted in the late 50's but there are only a few hundred motorised marine fishing boats. Synthetic twine has almost replaced cotton twine for making fish nets. At least 70% of the catch is landed by the non-mechanised traditional craft from waters hardly beyond 40 m depth.

Fishermen have a low caste status. They are classified a "backward class" and belong to the socially and economically weaker section of the population. The fishing villages are to a large extent geographically isolated : adequate infrastructure facilities, proper road communication and sufficient fresh water supplies are lacking. The standard of housing is usually very low, a fact aggravated by frequent fires and cyclones.

In view of the increased demand for fish and the scope offered by the resource potential for increasing catch, the government envisages expansion of the fishing fleet as well as increase of its operational range – by means of fleet improvements and diversification, provision of improved landing facilities, better marketing and transport infrastructure. The government is also focussing its attention on the development of potential brackishwater areas for fish and shrimp farming.

The Sixth Five-Year Plan (1980/81-1984/85) aims at increasing marine landings up to 134,000 tonne per annum by 1984/85.

Besides increasing production, the government aims at securing reasonable prices for fish producers and at improving the socio-economic status of fisherfolk.

2. FISHERY RESOURCES

Andhra Pradesh generally has a warm climate. Summer and winter temperatures in the coastal districts may vary between 43°C and 15°C. The effects of both monsoons are felt but greater rainfall is experienced during the southwest monsoon of July-September, particularly in the northern part. The northeast monsoon of October-December brings rain especially along the southern part of the coastal belt. The average annual rainfall is 90-1 20 cm. Cyclones with speeds of 90-130 km/hr are quite common during October-November. January-April is the calm season and the best for fishing. During October-December, cyclonic weather hinders fishing. Occasional gales interspersed with calm periods are experienced during May-September.

Comprehensive oceanographic data are not available for the region. On the entire east coast, the circulation of water along the coast is greatly influenced by the patterns of wind associated with the summer monsoons. Around February, a clockwise circulation sets in and becomes stronger during the southwest monsoon period. After October, the current reverses due to the northeast monsoon and an anti-clockwise circulation takes place from

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November to about the beginning of February. The average value of salinity ranges between 30 ppt and 34 ppt and the surface temperature is between 27°C and 29°C. Salinity in the bay comes down significantly during the monsoons because of dilution by the heavy discharge of fresh water from the Godavari and Krishna rivers.

The bottom of the continental shelf up to 70 m depth is predominantly flat with no trenches or sudden slopes and is hence suitable for trawling. Continuous echo-sounding surveys off Visakhapatnam have revealed several interesting topographic features such as terraces, pinnacles and reefs between 70 m water depth and the edge of the continental shelf. Deep water trawl nets often get entangled in these structures and suffer damage. Of the total area of the continental shelf about 53% is in the 0-50 m depth range. Appendix 2.1 (map) shows the coastal districts and the depth contours of the continental shelf.

Exploratory survey data collected during 1958-78 was analysed by Rao and Rajkumar in 1979. The analysis showed that the seasonal abundance of various groups of fishes in different zones remained more or less the same over the entire period. Six important groups of fish predominated : sharks; skates and rays; cathsh; miscellaneous big (larger than 30 cm) including mainly Pomadasys hasta, Stromateus niger and Muraenesox spp; miscellaneous small (smaller than 30 cm) including mainly Leiognathus spp, Upeneus spp, Johnius aneus, Nemipterus japonicus, Trichiurus spp, and Saurida tumbelit; and prawns.

The analysis showed that the average annual percentage of catch composition for the six important groups of fish in three depth zones (0-30 m, 31-40 m, 41-70 m) showed little variation; 55-60% of the catch was composed of the miscellaneous-small category. Catfish comprised 21-24% of the catch, sharks and rays from 5 to 7% and prawn 2 to 3%; catfish showed an inverse relationship with the miscellaneous fish in their monthly abundance. In some years, about 40% of the total shrimp catch was landed during July - August; the average catch rate in the depth zone 0-30 m was about 130 kg/hr, in the 31-40 m 100 kg/hr, and 110kg/hr in the 41-70 m zone.

There are no estimates of the overall resource potential of the continental shelf.

An analysis of the results of exploratory surveys carried out in areas lying between latitude zones 15°40'N and 19°40'N and in depths ranging from 10 m to 90 m for the period 1972-78 indicates that the richest latitude zones for elasmobranchs were 16° 40' and 18°40'; catfish were abundant south of Visakhapatnam; the highest catch rate for shrimp was in 18° 10'; the miscellaneous small fish were most abundant in the latitude zones 15° 40', 18° 10' and 18°40'; and the 16° 10', 16°40' and 15°40' zones were seen to be the richest when the catch rate of all fish was considered.

The analysis further showed that rays, catfish and miscellaneous-big abound at the 60-70 m depth; shrimp prefer shallower depths of 10-20 m; the miscellaneous-small category is concentrated at depths 20-30 m and 30-40 m and that, in general, the 60-70 m depth zone represents the most productive area.

3. FISHING FLEET

Fishing craft

The all-India census of marine fishermen, craft and gear, 1980, made a count of about 36,500 marine fishing craft in Andhra Pradesh. The figure included about 450 mechanised boats out of a total of 580 constituting less than 2% of the total number of craft. Of the traditional craft, the major component consisted of kattumarams accounting for 62%. The distribution of the mechanised boats and traditional craft owned/shared by fishermen by type and district is given in Appendices 3.1 and 3.2 respectively.

The traditional craft consist of kattumarams, masula boats, navas, dinghies and dhonies. Srikakulam and Visakhapatnam districts have the largest number of kattumarams. Dinghies are found almost exclusively in Krishna district while dhonies are common in East Godavari and Guntur.

The kattumaram is made up of 4 or 5 solid logs lashed together in two or three pieces. When assembled they take a boat form with a rockered bottom, sharp stem and a narrow stern. The dimensions are : length 4.5-7.5 m and beam 1 .0-1 .5 m. Wood with good buoyancy is preferred for construction and includes Melia dubia and Albizzia stipulata. The paddles, oars and other accessories are usually made from bamboo and casuarina. It is propelled by oars or paddles while crossing the surf and by sail in the open sea. The cost of a kattumaram is Rs.2,500 - 5,000 depending on the wood used, size, type of accessories, etc. It operates up to 35 km from the shore and up to 50 m depth, carrying a crew of 3-5 persons. Fishing methods used are mostly small-mesh gillnetting, line fishing and boat seining; and the main species caught are sardine, small mackerel, ribbon fish, silver belly, shrimp, etc. The craft has a life of 5-10 years, shorter when constructed with cheap wood.

The *nava* is a craft made of teak wood planks. Its dimensions are usually length 5-10 m, beam 1 to 2 m, depth 0.75 m. It operates all year round except during days of very rough weather. The craft is prominent in the East Godavari and Krishna districts. It is used for bottom set/gillnetting, drift/gillnetting, stake netting and beach seining. The cost is Rs. 5,000-10,000 and thc service life approximately 10 years.

The *Kakinada nava* is a bigger version of the nava. It is 9-1 2 m long, 2 m broad, 1 m deep, and is operated by a crew of 8 to 1 0.

The *Kothapa/em nava* is a modified version of the Kakinada nava, used mainly along the Guntur coast. It has a transom stern while the Kakinada nava is double-ended.

The *masula* or *padava* is generally made of mango wood planks stitched together with reeds and coir rope. The spaces between the planks are caulked with pitch and coir. Being keelless, the craft can be easily pulled ashore. It is used only for shore seining, mostly in Srikakulam, Visakhapatnam, Guntur and in smaller numbers in East Godavari, Prakasam and Nellore districts.

Mechanisation of fishing craft in Andhra Pradesh started in 1954-55, when the state government, in collaboration with FAO experts, introduced the first mechanised boats. The sizes of the mechanised boats vary from 9 m to 11 m, the most popular size being 10 m. Most of these boats are used for shrimp trawling.

Mechanised boats generally have uninsulated holds with a capacity of 3 tonne. The holds, however, are generally not used and the fish is dumped on the deck.

The horsepower of the engines generally varies between 50 HP and 80 HP. The hulls are made mostly of wood and often sheathed with aluminium to protect the wooden hulls from marine borer attack. Chemical wood preservatives with toxic ingredients are also used to protect the wood from decay, marine borers and other biofoulants.

Mechanised boats are not expected to operate within 5 km from the coast, as this strip of water is reserved for non-mechanised craft. The mechanised boats usually do not fish beyond the 40 m depth line. Vessels of 25 gross tonnage, or more, which have to be operated by certified skippers, are not expected to fish within the 10 km line. The economics of operation of a 10 m trawler based in Visakhapatnam are given in Appendix 3.4.

As a rule, all mechanised boats have to be registered with the state's port department under the harbour craft rules.

In addition to the 9-1 1 m mechanised boats, there are about 66 foreign built trawlers engaged in commercial shrimp trawling. Their length ranges between 21 and 30 m, the most popular size being 23 m.

The Andhra Pradesh Fisheries Corporation (APFC) owns and operates two 23 m trawlers; the private sector operates the rest. The APFC plans to procure and operate six more trawlers during the Sixth Plan Period.

Fishing gear

A variety of fishing gear is used in Andhra Pradesh. These include shore seines, boat seines, gillnets, drag nets, cast nets and traps. The distribution of fishing gear owned/shared by fishermen according to the count taken in the all-India census of marine fishermen, craft and gear of 1980, is shown in Appendix 3.3.

The bo3t seine (iragavala) is made of 20 count cotton yarn. The cod end is made of jute fibre. The mesh size varies from 12.5 to 250 mm – smallest at the cod end and gradually increasing in size at belly and wings. It is operated from a kattumaram by 4 or 5 fishermen. it costs Rs. 1,500-2,000

The shore seine (Ally/va/a) is made of 20 count cotton yarn. The head and foot ropes are made of hemp. Long coir ropes are attached to the wings on either side. The mesh size at the wings is about 300 mm and at the bag 12.5 mm. In the "chinna (small) alivivala", however, the mesh size is the same throughout. Floats are attached to the head ropes. Lead or stone sinkers are used with the "pedda (big) alivivala" whereas no sinkers are used with the chinna alivivala. The pedda alivivala has a bag and is operated by 40 to 50 men while the chinna alivivala has only a loose central portion which acts as a bag, and is operated by about 20 men.

Gillnets (Vaddivala/Kaftavala) are used as drift or bottom set nets, according to the season and the type of fish caught. The mesh size varies from 50 mm to 150 mm. Cotton/hemp nets are being replaced by nylon nets in recent years.

Napuvala is a type of nylon gilinet with the head rope and foot rope (8 mm PP-PE) measuring 18 m and 16 m respectively. Local wooden floats called tilla karra or chilapa karra are used. Sinkers are not used. They are generally operated from Kothapalem navas, each craft carrying 60 to 80 units.

Kasula va/a is a prawn gillnet made of nylon twine and operated from kattumarams. Length of head/foot rope is 42 to 44 m of 2 or 3 mm of PP-PE rope. Wooden floats and 5-7 cm diameter cement or stone sinkers are used. Each kattumaram carries 8-10 units of this net.

A *stake net* made of 20 count cotton yarn is generally used in shallow areas and operated from dinghies, small Kothapalem navas and dhonies. Mesh size is 75 mm at the mouth and 12 mm at the cod end. This conical shaped bag net with a rectangular mouth is fixed to casuarina poles or palmyrah trunks driven into the bottom of the sea.

Longlines with 800-1 000 hooks fastened to lines of twisted cotton yarn are sometimes operated from kattumarams.

4. INFRASTRUCTURE AND SERVICE FACILITIES

There are about 450 coastal fishing villages and about 380 fish landing centres. There are formal landing facilities for mechanised boats only at two places, Visakhapatnam and Kakinada. The fishing harbour at Visakhapatnam, established in 1976, has a slipway and repair facilities. The harbour provides services for a fleet of 300 mechanised boats and 56 trawlers. Kakinada has a fishing harbour basin 180 m long and 22 m wide. Though designed to accommodate 75 10 m mechanised boats, it now handles about 300 vessels. A second harbour at Kakinada is being planned. The APFC is responsible for the establishment and operation of these harbours.

South of Kakinada, there are no landing facilities for regular use by mechanised boats. The establishment of three more harbours – one at Nizampatnam (Guntur district) for about 50 boats, one at Krishnapatnam (Nellore district) for 250 boats and one at Bhavanapadu (Srikakulam district) for 200 boats – is proposed during the Sixth Five-Year Plan.

Most of the freezing and frozen storage and a substantial portion of the ice-making facilities used for fisheries are in Visakhapatnam and East Godavari districts. The total capacity of the ice plants is 583 tonne/day. Freezing and frozen storage capacities are 157.7 tonne and 2560 tonne respectively. Distribution of these facilities by districts is indicated in Appendix 4.1.

At a large number of places along the coast, traditional fishing craft are constructed by artisanal boatbuilders without elaborate boatyard facilities. Talarevu in East Godavari district and Machilipatnam in Krishna district are two very important centres for this type of boatbuilding.

The APFC operates a boatyard for the construction of mechanised boats at Kakinada. The yard's original capacity was 60 10-12 m boats a year; it was recently expanded to 120 boats a year.

Repair and service facilities for mechanised boats are available only at Visakhapatnam and Kakinada. The APFC operates a fuel supply point at Kakinada to supply diesel, lubricants, etc., at reasonable rates for fishing boats. There is no net-making plant in the state.

Development of access roads in the fishing villages is a long-felt need. Specific plans exist to construct roads or improve the existing ones in four of the coastal districts, viz. Visakhapatnam, East Godavari, Guntur and Nellore, with foreign aid. A total of about 350 km of road is to be constructed under two projects.

5. PRODUCTION

The estimated fish production in 1980 from marine waters was about 116,000 tonne and represents 48.7% of the total landings from inland and marine sources. Andhra Pradesh ranks sixth among the eight maritime states of India and second among the four east coast states in marine fish production. The state's fish landings for 1970-80 are shown in Appendix 5.1.

Fish production statistics show a sharp increase in 1974 of nearly 60% from the previous year. Increases were maintained till 1976; landings returned thereafter to the pre-1974 level. The reason for the sudden increase in production is not known but was not apparently linked with fishing pressure. The composition of marine fish landings from 1972 to 1979 is shown in Appendix 5.2.

In 1979, the clupeid species constituted 22% of the total marine landings. The other important forms were elasmobranchs, penaeid shrimp, sciaenids, ribbon fish, mackerel, catfish and carangids.

Monthwise total fish landings for two years are shown in Table 5.1.

Table 5.1
Fish landings by month

	MONTHS												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1976	18.4	16.5	11.9	11.5	11.6	8.0	7.0	9.2	9.8	6.2	8.5	12.7	131.3
1977	7.3	8.0	16.4	12.6	9.1	7.9	10.3	6.5	6.3	4.4	5.0	6.9	100.7

Monthwise landings of selected fish species in 1977 are indicated in Appendix 5.3.

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An analysis made in 1978 showed that the share of mechanised craft in the total marine landings had steadily increased between 1974 and 1977 from 6% to about 27%. This trend is shown in Table 5.2.

Table 5.2
Contribution of non-mechanised and mechanised craft to fish landings

(Catch figures in tonne; figures in brackets represent percentage of total landings)

Type of craft	1974	1975	1976	1977
Non-mechanised	149269 (94)	145972 (93.8)	118953 (90.6)	73805 (73.3)
Mechanised	9549 (6)	9666 (6.2)	12368 (9.4)	26951 (26.7)

A list of the important commercial fish species is gfven in Appendix 5.4.

6. HANDLING AND PROCESSING

The fishermen using both traditional and mechanised craft, as a matter of tradition, make only day-long trips for fishing. They do not generally use ice/salt on board to preserve their catch it is dumped without cleaning or gutting. In certain places like Nizampatnam in Guntur district, fishermen go out in *Kothapalem* navas with gillnets on longer voyages, sometimes 5 or 6 days at a stretch. Then they take salt for curing the fish on board. The larger trawlers, which make long trips regularly, carry ice for preserving shrimp and other valuable fish species.

The catch is landed mostly on open beaches. Local traders buy the catch and pack them in large round straw baskets. Wet sand is used for preservation of large fish during transport. Transport to nearby markets is by headload, cycles, bullock carts or local buses. The fish may or may not be packed in ice depending on the destination/mode of sale. Insulated transport facilities do not exist in the private sector. Only the APFC has insulated vans.

For distant markets like Madras and Calcutta, fish is iced and packed in large baskets and transported by rail. Lack of insulation and long transport time (Madras 24 hours; Calcutta 48 hours) result in the arrival of poor quality fish at destinations.

The quantity of marine fish marketed fresh is less than the quantity dried and salt-cured, owing to insufficient landing and transport facilities. Salt-curing and sun-drying of fish is done at almost every fishing village and landing centre. The techniques used are traditional and primitive and not conducive to a good quality product. The government operates a few fish-curing yards but these are usually located only at selected salt distribution centres.

Shrimp, being in great demand, is sold out as soon as it is landed and finds its way quickly to processing factories where it is frozen and packed. The freezing plants are mostly in Kakinada and Visakhapatnam.

The extraction of shark-liver oil and production of capsules are carried out at the factory of the Andhra Pradesh Fishermen Cooperative Society at Kakinada.

A canning plant was established at Kakinada by the fisheries department in 1974, with an installed capacity of a thousand 4 lb cans/shift. There being no demand for canned products, the operation of the plant was stopped. The APFC plans to revive the factory for the canning of fish and crab meat. The APFC is setting up the following processing facilities:

- a fish-meal plant at Lawson's Bay in Visakhapatnam district with capacity to process five tonne of raw material/day.
- two fish drying plants, one at Visakhapatnam and the other at Krishnapatnam in Nellore district, each having capacity to process 1 tonne of raw material/day.
- three fish filleting and mincing plants at Visakhapatnam, Machilipatnam and Krishnapatnam.

7. DISTRIBUTION AND MARKETING

Very little marketing information and consumer survey data are available. It is estimated that about 36% of the marine catch is consumed fresh and the bulk of the balance dried or salted. It is also estimated that a considerable portion of the latter is fed to animals or sometimes wasted due to the inefficiency of the existing handling, distribution and marketing systems. The portion of the catch that is frozen for export is negligible.

The per capita availability of fish in 1976/77 in Andhra Pradesh was 4.95 kg if the entire population is taken into account or 6.2 kg in relation to the meat and fish eating population. Though slightly better than the all-India average of 4.93 kg, consumption is still much below the requirement according to nutritional standards.

A study carried out in 1977 by the Consulting and Applied Research Division (CARD) of the Administrative Staff College of India for the APFC indicates that consumer preference for freshwater fish is greater in the urban centres. In these centres, however, certain marine species such as pomfret, seer and catfish fetch competitive prices. Appendix 7.1 gives an indication of the demand for some selected fish species as worked out by the CARD study.

The existing marketing system involves both public and private sectors. APFC represents the public sector in the marketing system. It has so far been primarily concerned with the procurement and marketing of prawns for export. The APFC has 10 coastal marketing units located in seven districts. These are shown in Table 7.1.

Table 7.1 Coastal marketing units of APFC

District	Location of marketing unit
Nellore	K D Reservoir, Nellore, Kavali
Prakasam	Ongole, Chirala
Guntur	Nizampatnam
Krishna	Vijayawada
West Godavari	Eluru
East Godavari	Kakinada
Visakhapatnam	Visakhapatnam

To supply these marketing units, the APFC has set up 27 fish procurement centres along the coast to procure fish directly from the artisanal fishermen. The aim is to offer the fishermen a reasonable price for their catch so that they are not exploited by middlemen. The APFC has also opened 36 sales booths and five canteens at various places in the state. From its inception in 1974 to March 1981 the APFC procured 2,014 tonne of fish of which 1,092 tonne was sold within the state and the rest to other states.

The APFC operates insulated vans to carry fish and prawns from the procurement centres to the marketing units. Rail transport is also used to some extent. The private sector has the major share of fish marketing. A large number of private traders, small and big, handle the marketing in a complex labour-intensive operation.

Most of the fresh fish is sold on the beach. Bargains are struck through a multitude of hawkers and small vendors, many of them women. The fish is then taken in baskets by headload, cycles and local buses to markets and sold directly to the consumer. In general, there are no separate wholesale and retail fish markets in the coastal areas. The fish is sold either to consumers directly or to other vendors, who in turn retail the fish in the same or in other markets. In villages with reasonable road/rail communication links, bigger traders buy certain species of fish and send them to wholesale markets in Madras, Calcutta, etc. The bulk of the dried fish is salt-cured and/or sun-dried by local fisher-women. It is taken to the weekly shandies in the neighbouring agricultural villages and sold directly to the consumers, or to visiting vendors (many of them women) who transport it to the inland wholesale/retail markets. The bigger wholesale/retail markets also sell dried fish imported from other states (Kerala, Maharashtra).

Prawns are purchased mainly by petty wholesalers who sell them to wholesalers-cum-processors. Some wholesalers have contracts with a number of fishermen for supply of prawns against interest-free loans. The price paid by these traders is usually not below the price the APFC pays the fishermen. During the peak season and at certain important landing centres, the prawn catch is bought directly by wholesalers-cum-processors or their agents and taken by own/hired lorry to the processing plant. After processing, the prawns are sent either directly from Andhra Pradesh or via Tamil Nadu and Kerala to foreign markets.

There is generally a large gap between the price paid by the consumer and the price paid to the fishermen. Appendix 7.2 gives an indication of marketing mark-ups between producer and retail prices for some important species of fish during 1977-78.

8. EXPORT AND IMPORT

The state's fish exports in 1979 amounted to nearly 4% and 9% respectively of the total quantity and value of fish exported from India.

Data available for a period of eight years from 1972 shows a continuous upward trend both in quantity and value of fish exports except for 1975 (Table 8.1).

Table 8.1

Value and quantity of fish exports, 1972-79

Year	Quantity (tonne)	Percentage of total exports from India	Value (million) Rs.	Percentage of total exports from India
1972	202	0.53	5.00	0.86
1973	336	0.69	10.97	1.51
1974	356	0.76	10.77	1.41
1975	162	0.3	5.4	0.48
1976	1461	2.35	80.09	4.45
1977	2556	3.93	117.68	6.55
1978	3094	3.97	162.83	7.68
1979	3651	3.96	234.59	8.94

From 1976 fish exports increased considerably and the upward trend is expected to continue. Frozen shrimp constituted the bulk of the products exported.

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The quantity and value of the shrimp component in the fish exports for three years are seen in Table 8.2.

Table 8.2
Composition of fish exports, 1977-79

	Quantity (tonne)			Value (million Rs.)		
Production	1977	1978	1979	1977	1978	1979
Frozen shrimp	2541	3059	3637	117.61	162.59	233.91
Miscellaneous	15	35	14	0.07	0.23	0.15
Total	2556	3094	3651	117.68	162.82	234.06

Almost the entire export is handled through Visakhapatnam port, a negligible quantity goes through Kakinada.

Imports include outboard engines, deep-sea trawlers and spare parts for trawler engines, outboard engines, ice plants and freezing plants. The USA, Japan and Mexico are the main countries from which fishing equipment and material are imported.

9. COASTAL AQUACULTURE

The escalating cost of fossil fuels with the resultant adverse impact on fuel-dependent capture fisheries, a static shrimp catch, the need for creating rural employment opportunities, the availablity of large stretches of coastal fallows with potential for aquaculture, the export demand for shrimp, etc., have all led the state government to identify coastal aquaculture, particularly of shrimp, as a priority area for fisheries development.

The brackishwaters include open estuaries, tidal creeks, canals, flats and saline swamps. These cover about 0.2 million ha, of which about 64,000 ha are believed to have potential for coastal aquaculture. The geographical distribution and ownership pattern of these areas are shown in Table 9.1.

Table 9.1
Brackishwaters with aquaculture potential *(in hectares)*

District	Fisheries Dept.	Revenue Dept.	Forest Dept.	Salt Dept.	Port Dept.	Private	Total
Srikakulam	346	854	–	1029	200	1503	3932
Vizianagaram	–	2.5	–	–	–	9.5	12
Visakhapatnam	–	714	–	87	–	490	1291
EastGodavari	–	4273.5	19533	–	96	935	24837.5
West Godavari	–	1583	–	–	–	1884.5	3467.5
Krishna	–	16419	8000	–	**243**	**24662**	
Guntur	–	**254**	**1310**	–	–	31	1595
Prakasam	–	1059	–	**242**	–	111	141 2
Nellore	–	**2690**	–	**26**	–	37	2753
Total	**346**	**27849**	**28843**	**1384**	**296**	**5244**	**63962***

includes land submerged by the highest high tide, but excludes the Pulicat lake.

A 3-day macrolevel sample data survey carried out in September 1980 by the Directorate

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of Fisheries simultaneously in the nine coastal districts resulted in an estimate that an area of about 17,000 ha could be immediately developed for coastal aquaculture.

The Andhra Pradesh coast is generally characterised by a low tidal amplitude which does not exceed 1.6 m under normal conditions. In many areas, the tidal amplitude is lower. Srikakulam, West Godavari and East Godavari districts have a tidal amplitude of 1.2 to 1.6 m, Krishna district up to 0.9 m, while in Nellore district it does not exceed 0.8 m.

For optimum economic operation of a brackishwater fish farm, a location which permits the maintenance of a water depth of about a metre in the ponds by means of tidal rise and fall alone, is desirable. In order to satisfy this requirement, the daily tidal amplitude at the site should be in the 1-2 m range. The pond bottoms should be a little above the mean low water neap tide level permitting complete draining at any low tide. Such ideal conditions of tidal fluctuation and land elevation do not exist in Andhra Pradesh. The tidal fluctuation being low, the tidal inundation on any potential site during even the spring tide ranges only from 0.07 m to 0.44 m in Krishna district, 0.08 m to 0.80 m in West Godavari district and 0.02 m to 0.09 m in East Godavari district. Thus, construction of tide-fed ponds involves excavation of thick layers of top soil to obtain an adequate depth of tidal water in the ponds by gravitational flow. An alternative method is to use relatively light excavation and construct a dyke surrounding an area. This will, however, involve constant use of pumps for initial filling and subsequent replenishment of water. Both methods entail high costs and technical uncertainties.

The soil textures in Andhra Pradesh range from sandy loam to clayey loam in Srikakulam, sandy clay to silty clay in East Godavari, sandy clay to clayey loam in West Godavari and Krishna, and sandy to sandy loam in Nellore district. Clay, clayey loam and sandy clay soils are suitable for fish ponds. Suitable soil pH of 7.5 to 8.5 is found in most areas, though slightly higher and lower values are also occasionally encountered in some places.

In general, most of the potential sites in East Godavari district have mangrove vegetation of varying density supplying natural food and shelter to the post-larval and young shrimp and fish. In Krishna district also, mangrove vegetation is common. The shrub Avicennia is the predominant species while Rhizophora is occasionally found. The other coastal districts have little or no mangrove vegetation.

A systematic quantitative survey of the seed resources as to their seasonal and geographical occurrence and abundance has not been made. A few localised studies, however, seem to show that the supply of seed of Penaeus monodon, P. indicus, P. merguiensis, Metapenaeus monoceros, and Mugil spp. is plentiful particularly in the low saline Godavari-Krishna estuaries. Some information on the seasonal availability of seed at Kakinada obtained from the Department of Fisheries Science of the Andhra Pradesh Agricultural University is given in Table 9.2

Table 9.2
Shrimp/fish seed availability at Kakinada

Species	Peak season
P. monodon	June-September
P. indicus	April-June & September
Metapenaeus monoceros	April-May, September-Dec.
Chanos chanos	May, June, Aug., Dec.
Mugil cephalus	November, December

Commercial seed production in hatcheries is yet to be introduced. The Central Institute of Fisheries Education (CIFE) fish farm at Kakinada has laboratory facilities for induced maturation and spawning of shrimp, mainly for training purposes.

With regard to natural fish farming, the activities are still mainly public sector experimental activities. At Kakinada, CIFE's fish farm occupies an area of 7.5 ha with a 2.6 ha waterspread. Water supply and drainage are partly by gravitation, partly by pumping. On the basis of the results achieved in experimental work in a small water area, CIFE considers that a production rate of 20,000 kg/ha of fish and shrimp is possible. An Andhra Pradesh Agricultural University project is reported to have produced 430 kg/ha of shrimp in two crops under monoculture. Production to the extent of 1,063 kg/ha of mullet, chanos and shrimp under polyculture during a 10-month culture period at this centre has also been reported. The APFC has an experimental farm with 23 ponds, each 1 or 1.25 ha in extent. The performance of the farm has not yet been assessed.

APFC plans to construct large-scale brackishwater farms in different districts, lease them mainly to fishery cooperatives, provide technical assistance and purchase the product.

A few individuals from Visakhapatnam, East Godavari, Ongole and Nellore districts recently started brackishwater fish/shrimp farms but no critical assessment of their success or failure has been attempted.

The state government's declared policy is to use suitable state-owned coastal fallows for shrimp and fish culture, primarily through cooperatives of poor fishermen. Less suitable areas will be developed through richer classes of people who can invest capital of their own and introduce new and improved techno!ogy.

10. SOCIO-ECONOMICS

According to the all-India census of marine fishermen conducted by CMFRI in 1980, there are nearly 84,000 active fishermen in a total fisherfolk population of about 325,000.

The population is concentrated in Srikakulam, Visakhapatnam and East Godavari districts, which together account for 68% of the total. The composition and distribution of the fisherfolk population is shown in Appendix 10.1.

The fisherfolk are almost at the bottom of the social ladder. They belong to the three fishermen castes—Vadabalaji, Jallari and Aqnikulakshatriya. These are "backward classes", and fishing is considered to be a low-status occupation.

The joint extended family pattern of the traditional Indian agricultural community no longer exists among the Andhra Pradesh fisherfolk. The trend now is the nuclear family, i.e. husband, wife and children. The size of a household varies considerably—the average number of members in a household is six. Most members of the family including the women generally take part in fishery activity. The women engage themselves actively in sorting the catch, processing and marketing; the children mostly mend nets.

"Sangams" or associations of fishermen deal with social and religious affairs in fishing villages. Worshippers of a particular deity meet regularly for worship and help one another in times of emergency or need such as death, sickness or marriage.

Tribal leadership, where the position is exclusively inherited, is still in practice among the fisherfolk communities. The caste headman with a group of elders constitutes this informal system which generally concerns itself with solving problems connected with caste, family, marriage, divorce and other intra-village affairs. This informal system complements the formal system of administration, consisting of the "panchayat" with an elected president (sarpanch) and the elected members of the council. Their activities centre on problems of physical infrastructure and the village's relations in the wider political and administrative set-up of the "taluk samithi" and zilla parishad. Both systems are to some extent identical as far as members and representatives are concerned—e.g. office holders in the formal set-up are often members of the informal system.

Only a few fishermen own gear and/or craft. Many of them work for the gear/craft owners in return for a cash wage or a share of the catch. Earnings from fishing vary with the type of craft and gear used and ownership status. The average income ranges from Rs. 2,500 to 3,000 per annum for a household of five members. While in the south and the north, fishing is usually the sole source of income, fisherfolk in the central area (Guntur, Krishna and Godavari districts) earn additional income from agriculture (paddy, tobacco, coconut) and salt production. A major portion of the daily income is spent on food and liquor.

Housing in most fishing villages is similar to that of most agricultural communities or crowded agglomerations in the outskirts of towns – of poor standard, without basic amenities. However, the housing situation is aggravated by factors like the exposure of fishing villages to extreme climatic conditions (cyclones, floods) and the scarcity of housing sites along the coast, which lead to congested settlements where fire is a constant threat.

The daily diet of the fisherfolk consists of coarse rice, millet and fish. People usually suffer from severe vitamin deficiencies. Malnutrition is common among children. This, in addition to low hygienic standards in the villages and lack of proper water supply, is the main reason for the frequent occurrence of maladies. Medical services in the villages are either lacking or of very poor quality.

The literacy level among the fisherfolk is low. Facilities for primary education exist; however, enrolment is low. Invariably the children do not go to school as families make the children earn from an early age.

Feeder roads, transport facilities to nearby market towns, drinking water supply, health services, etc., are some of the immediate needs of fisherfolk communities.

11. FISHERIES ADMINISTRATION AND INSTITUTIONS

11.1 Fisheries administration

At the state level, a Cabinet Minister is in charge of fisheries. He is assisted by a Secretary to Government who is the administrative head of the Department of Forests and Rural Development. The administrative set-up of fisheries at national and state levels is shown in Appendixi 1.1(a).

The Directorate of Fisheries, established in 1959, is responsible for the development of fisheries in the state. The department has its headquarters at Hyderabad and is headed by a director who is also the registrar of the fishermen's cooperatives. He is assisted at headquarters by an additional director, three joint directors, a deputy registrar of cooperatives and other technical and administrative staff.

For administrative purposes, the state is divided into six zones, viz. Guntur, Kakinada, Visakhapatnam, Nizamabad, Kurnool and Warangal. The first three are coastal zones. Six deputy directors coordinate and supervise fisheries activities in these regions/zones. They are assisted by 30 assistant directors posted at the district level. Fisheries inspectors and extension officers assist the assistant directors. Fisheries extension officers work at the block level. Though there are 324 blocks in the state, extension officers have been assigned only in 51 blocks.

The total personnel strength of the directorate is 1,120, of which 109 are posted at the headquarters. An organisational chart of the Directorate is set out in Appendix 11.1(b).

The directorate of fisheries extends its development support to the following areas

harbour development; mechanisation of craft; manufacture and supply of gear; processing and marketing; inland fisheries and coastal aquaculture; credit and cooperatives; education and training and integrated fisheries development in particular regions.

11.2 Research and development institutions

The Central Marine Fisheries Research Institute has research centres at Waltair and Kakinada,which were established in 1956. They are engaged in the study of the biology of commercially important species, demersal fish, hydrology of inshore waters and the tagging of catfish.

The Visakhapatnam base of the Exploratory Fisheries Project (EFP), which is centrally sponsored, conducts experimental fishing in the offshore waters off the Visakhapatnam coast.

The Kakinada unit of the Central Institute of Fisheries Technology (CIFT) evaluates gear designs and is also concerned with post-harvest technology, including product development.

The following ICAR units operate in Andhra Pradesh — the prawn breeding unit at Kakinada working on the possibilities of breeding freshwater prawn in confined waters; the prawn culture unit at Tadepalligudam (West Godavari) for culture of *Macrobrachium rosenbergii;* the coordinated project on composite fish culture at Badampudi for polyculture of katla, rohu, mrigala, silver carp and grass carp; the coordinated research sub-station for reservoirs at Nagarjunasagar (Guntur).

The brackishwater fish farm, Kakinada, was originally established in 1976 under the state government and was partly financed by ICAR. It has now been transferred to the Agricultural University for polyculture and monoculture of shrimp and finfish.

A freshwater biological research station of the Agricultural University, Rajendranagar (Hyderabad), has its headquarters at Kakinada.

11.3 Training institutions

The Central Fisheries Extension Training Centre, Hyderabad, of the Central Institute of Fisheries Education (CIFE) was established in 1973. The centre conducts a 10-month course (June-March) every year for 25 in-service personnel selected from various state fisheries departments. Trainees from other developing countries are also accommodated. The areas of training include extension techniques and methods, fish farm engineering and fish culture. A wide range of audio-visual equipment/methods is used in teaching. The professional staff consists of a principal, two lecturers, four senior instructors and seven junior instructors.

The CIFE operates a fish farm at Balabhadrapuram (East Godavari) to provide training in carp breeding. The institute also operates a brackishwater fish farm at Kakinada which aims at developing new techniques for brackishwater fish farming, besides training fisheries officers and private fish farmers.

The Fish Farmers Development Agency, Government of India, has two fish culture demonstration units, one each in Karimnagar and Kurnool districts. Established in 1979, they aim at spreading fish culture practices among the fishermen.

The Fisheries Training Institute of the A.R fisheries directorate at Kakinada was established in 1958. It conducts 12-month courses in fishing methods, gear technology, elementary principles of navigation, and the operation and maintenance of internal combustion engines for fishermen who have studied up to the seventh standard in school and have five years of seagoing experience. Seventy-five candidates, mostly from the coastal districts, are enrolled in each batch of trainees. Till 1978, more than 700 fishermen had been trained in this institute. Trained candidates are given preference in the allocation of mechanised boats.

The Fisheries Training Institute of the fisheries directorate at Machilipatnam was established in 1979. The annual enrolment capacity is 20.

12. INDUSTRY ORGANISATION

12.1 Fisheries Corporations

The APFC was established in 1974 under the Companies Act (1 956) with headquarters at Kakinada. It took over the industrial activities of the fisheries department and has its headquarters at Visakhapatnam. It has an authorised capital of Rs. 30 million and a paid-up share capital of Rs.10.1 million. All the shares are owned by the Andhra Pradesh Government. It currently has more than 500 employees.

A Member of Parliament representing the state is appointed chairman of the corporation. There are a vice chairman-cum-managing director and a chief general manager. who belong to the Indian Administrative Service. There are five main technical divisions – trawler operations, boat-building, marketing, aquaculture and engineering, each headed by either a general manager or a deputy general manager. There are separate wings for personnel management, administration and finance. An organisation chart is provided in Appendix 12.1

The main activities of the corporation are: boat building, shrimp processing and export; deep-sea fishing; organisation and expansion of internal marketing; brackishwater fish farming; freshwater fish farming; diversification of fishery products; supply of inputs – high-speed diesel oil, outboard motors, ice, etc.

The boatbuilding yard and the ice and freezing plants at Visakhapatnam account for about 70% of the APFC staff. Its fishing fleet consists of two Mexican type refrigerated trawlers. The APFC also operates a brackishwater fish farm at Kakinada.

Infrastructure and fish processing facilities established by the Corporation are referred to in sections 4 & 6.

Between July 1976 and March 1981, the Corporation exported 1 ,400 tonne of frozen shrimp valued at about Rs.75.2 million.

12.2 Fisheries cooperative societies

The formation of fishermen's cooperative societies in Andhra Pradesh dates back to the days before Indian independence, but it was in the 1 96Os and 1970s that most of the existing cooperatives were established.

In 1960, a central society for the Andhra region known as the Andhra Fishermen Central Cooperative Society (AFCCS) Ltd. was registered, with headquarters at Chirala. The headquarters is now at Kakinada. The Collector of East Godavari is the chairman of the society and a joint director of fisheries is the managing director. The society covers all the districts of coastal Andhra and Rayalaseema. Its membership and share capital are shown in Table 1 2.2.

Table 12.2: Membership and share capital of AFCCS Ltd, 1979/80

	No. of members	Share capital (Rs.)
Government of Andhra Pradesh	1	1 ,052,000
Institutional members, i.e. primary fishermen cooperative societies	387	44,975
Individual members associated with fisheries activities	343	8,600

The main functions of the primary fishermen's cooperative societies are to

- obtain bank loans for members to purchase improved fishing gear and craft;
- market the catch of the fishermen on better terms, i.e. bypassing the private fish merchants;
- deal in fishing requisites, spare parts, diesel oil, etc.;
- provide consumer goods to the members at a low price;
- generally improve the socio-economic conditions of the fisherfolk.

To further the above objectives, the central society supplies items of fishery requisites such as nylon yarn, rope, floats, steel wire ropes, engine spares, etc., to fishermen members. These are exempt from sales tax. It also engages in activities such as the operation of a high-speed diesel supply point at the Kakinada harbour; operation of a shark-liver oil extraction and refining plant and vitamin capsule factory at Kakinada; and the implementation of a scheme to distribute 4510 m mechanised boats and 50 navas to fishermen. Other ongoing or proposed activities include the operation of an oil bowser, fish carrier transport, construction of a godown, and establishment of brackishwater fish farms.

Most of the primary cooperative societies concentrate on obtaining loans – for the purchase of yarn and twine to fabricate nets, for the purchase of fishing craft. (There are various loan schemes in operation in the state).

13. GOVERNMENT POLICY

The policy of the government is to accelerate the exploitation of existing resources by improving the available facilities, creating new facilities and taking proper care of all classes of people earning their livelihood from the fishery sector.

Besides aiming at higher production, it is also the government's policy to ensure producers good prices for their fish. Accordingly, much attention is being paid to improve the internal marketing system and fish landing and other infrastructure facilities.

The government's strategy in the marine sector to achieve higher production targets is to establish new fishing harbours; expand the mechanised fishing fleet for coastal fishing; introduce more deep-sea trawlers; diversify fishing techniques; and assist traditional fishermen by providing subsidies for fishing craft, nylon twine and other fishing implements. In the inland fresh waters, the strategy is to accelerate carp seed production; establish new fish seed farms; and augment fish production in reservoirs and tanks.

In coastal aquaculture, the strategy is the phased conversion of suitable brackishwater areas into shrimp and fish farms, particularly through the poorer sections of the coastal population.

The major steps taken so far to develop marine fisheries have been the introduction of fishing boats of improved design, motorisation of traditional country craft with outboard engines, establishment of fish harbours, boatyards, and processing and preservation facilities.

14. DEVELOPMENT PLANS

Development plans are prepared for five-year periods. The current five-year plan is the sixth running from 1980/81 to 1984/85.

The detailed budgeting of proposed development schemes is made in annual plans for those schemes selected for financing from the five-year plan.

The main activities undertaken during the past plan periods and the plan-wise financial allocations and expenditures are shown in Appendix 14.1.

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The Sixth Five-Year Plan aims at increasing total fish production to 281 ,500 tonne by the last year of the plan. The contribution of marine fisheries to this target would be 1 34,000 tonne, the remainder coming from the inland fisheries including aquaculture in freshwaters and brackishwaters.

Appendix 14.2 lists the sixth five-year plan schemes with their allocations.

Institutional financing agencies have been playing an important role in the development plans. They provide assistance to fishermen in the form of credit. The following are some of these agencies : Agricultural Refinance Development Corporation (ARDC), National Cooperative Development Corporation (NCDC), Integrated Rural Development Programme (IRDP), Drought Prone Area Programme (DPAP), Small Farmers Development Agency (SFDA), Scheduled Castes and Backward Castes Committee (SC & BC), and commercial banks.

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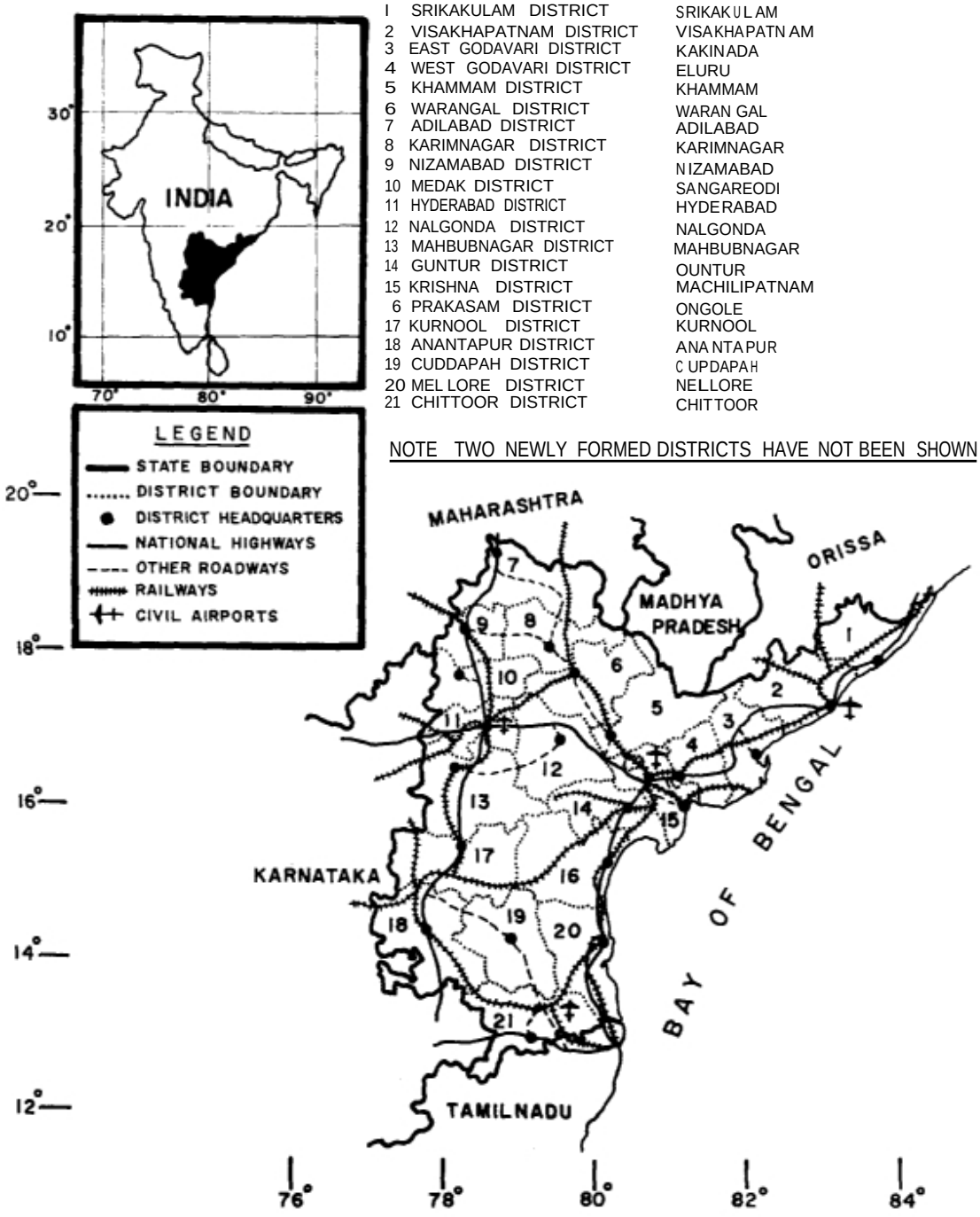
APPENDIX- 1.1

AN ADMINISTRATIVE CUM COASTAL MAP OF ANDHRA PRADESH



DISTRICTS	DISTRICT HEADQUARTERS
1 SRIKAKULAM DISTRICT	SRIKAKULAM
2 VISAKHAPATNAM DISTRICT	VISAKHAPATNAM
3 EAST GODAVARI DISTRICT	KAKINADA
4 WEST GODAVARI DISTRICT	ELURU
5 KHAMMAM DISTRICT	KHAMMAM
6 WARANGAL DISTRICT	WARANGAL
7 ADILABAD DISTRICT	ADILABAD
8 KARIMNAGAR DISTRICT	KARIMNAGAR
9 NIZAMABAD DISTRICT	NIZAMABAD
10 MEDAK DISTRICT	SANGAREODI
11 HYDERABAD DISTRICT	HYDERABAD
12 NALGONDA DISTRICT	NALGONDA
13 MAHBUBNAGAR DISTRICT	MAHBUBNAGAR
14 GUNTUR DISTRICT	OUNTUR
15 KRISHNA DISTRICT	MACHILIPATNAM
6 PRAKASAM DISTRICT	ONGOLE
17 KURNOOL DISTRICT	KURNOOL
18 ANANTAPUR DISTRICT	ANANTAPUR
19 CUDDAPAH DISTRICT	CUPDAPAH
20 MELLORE DISTRICT	NELLORE
21 CHITTOOR DISTRICT	CHITTOOR

NOTE TWO NEWLY FORMED DISTRICTS HAVE NOT BEEN SHOWN

Appendix 1.2 STATE DATA

		Andhra Pradesh	India
1. Size:	Area	277,000 km^2	(8.4%)
	Districts	23	
	Revenue taluks	308	
	Revenue villages	27,221	
	Coastline	942 km	(12.5%)
	Continental shelf (200 m depth)	31,044 km^2	(7.5%)
2. Population:	Total (1981 census)	53,592,605	(7.81%)
	Urban	23.25 %	N.A.
	Rural	76.75 %	N.A.
	Density per km^2	195	221
	Growth rate (1971-81)	23.19%	24.75%
	Birth rate (1979) per thousand		
	Rural	32.4	34.3
	Urban	28.9	27.8
	Death rate (1979) per thousand		
	Rural	13.7	13.9
	Urban	8.0	8.2
	Infant mortality (1977) per thousand		
	Rural	134.7	130(1978)
	Urban	61.6	
	Life expectancy (1976-81)		
	Male	51.5	46.4 (1960-70)
	Female	51 .0	44.7
3. Education :	Literacy rate (1 981)		
	Total	29.72%	36.17%
	Male	39.03 %	46.74%
	Female	20.18%	24.88%

* Figures in this column give state share **(%) of** all-India *or* all-India figures as applicable.

School enrolment :	Level	Age group	Age group as percentage of population	
			Andhra Pradesh (1969/70)	India (1979/80)
	Primary School	6-11	45.7	84.01
	Middle School	11-14	30.5	39.07
	Secondary School	14-17	34.1	16.09
	College/ University	17-24	2.4	4.41

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4.	Health	Population per doctor (allopathic)	12825 (1980/81)	3700 (1978/79)
		Population per hospital bed	2153 (1978/79)	1200
5.	Nutrition :	Caloric intake as % of requirement (2,000 cal/day)	78	77.8
		Per capita protein intake (60 gm/day)	40 gm/day	40-52 gm/day

6. Employment: Population by category of workers (1971)

Category	% of total population		% of total workers	
	Andhra Pradesh	India	Andhra Pradesh	India
1. TotalWorkers	41.4	32.9	100	100
i. Cultivators	13.3	14.3	32.3	43.3
ii. Agricultural labourers	15.7	8.6	37.9	26.3
iii. Livestock, forestry, fishing, hunting, plantations, orchards	1.4	0.8	3.3	2.4
iv. Mining and quarrying	0.2	0.2	0.5	0.5
v. Manufacturing, processing, service, repairs	3.7	3.1	9.1	9.5
vi. Construction	0.7	0.4	1.6	1.2
vii. Trade and commerce	2.3	1.8	5.4	5.6
viii. Transport, storage, and communications	0.9	0.8	2.2	2.5
ix. Other services	3.2	2.9	7.8	8.7
2. Non-Workers	58.6	67.1	—	—

7. Net (State) Product (1978/79)

NNP at constant 1970/71 prices (As. million)	33526
NNP at current prices (Rs.million)	53608
NNP per capita at constant 1970/71 price (As.)	677.58
NNP per capita at current prices (Rs.)	1083.41

8. Trade

Exports (1978-79)

Commodities	Value '000 Rs.	% of each commodity in total
1. Iron ore	754,895	37.28
2. Manganese ore	58,526	2.89
3. Ferro products	89,890	4.43
4. Pig iron	7,263	0.36
5. Steelrails	146,175	7.22
6. Steel billets	115,008	5.68
7. Other manufactures of iron and steel materials	128,620	6.35
8. Alumina	76,403	3.77

9.	Myrobalan	2,272	0.11
10.	Wheat	133,746	6.60
11.	Sugar	317,445	15.68
12.	Shrimp	191,705	9.47
13.	Others	3,150	0.16
	Total export value	2,025,098	100.00

Source.: Statistical Bulletin 1978-79
Research and Planning Department, Visakhapatnam Port Trust, Visakhapatnam
Data relate to exports through Visakhapatnam Port only
Export data in respect of minor ports are not available.

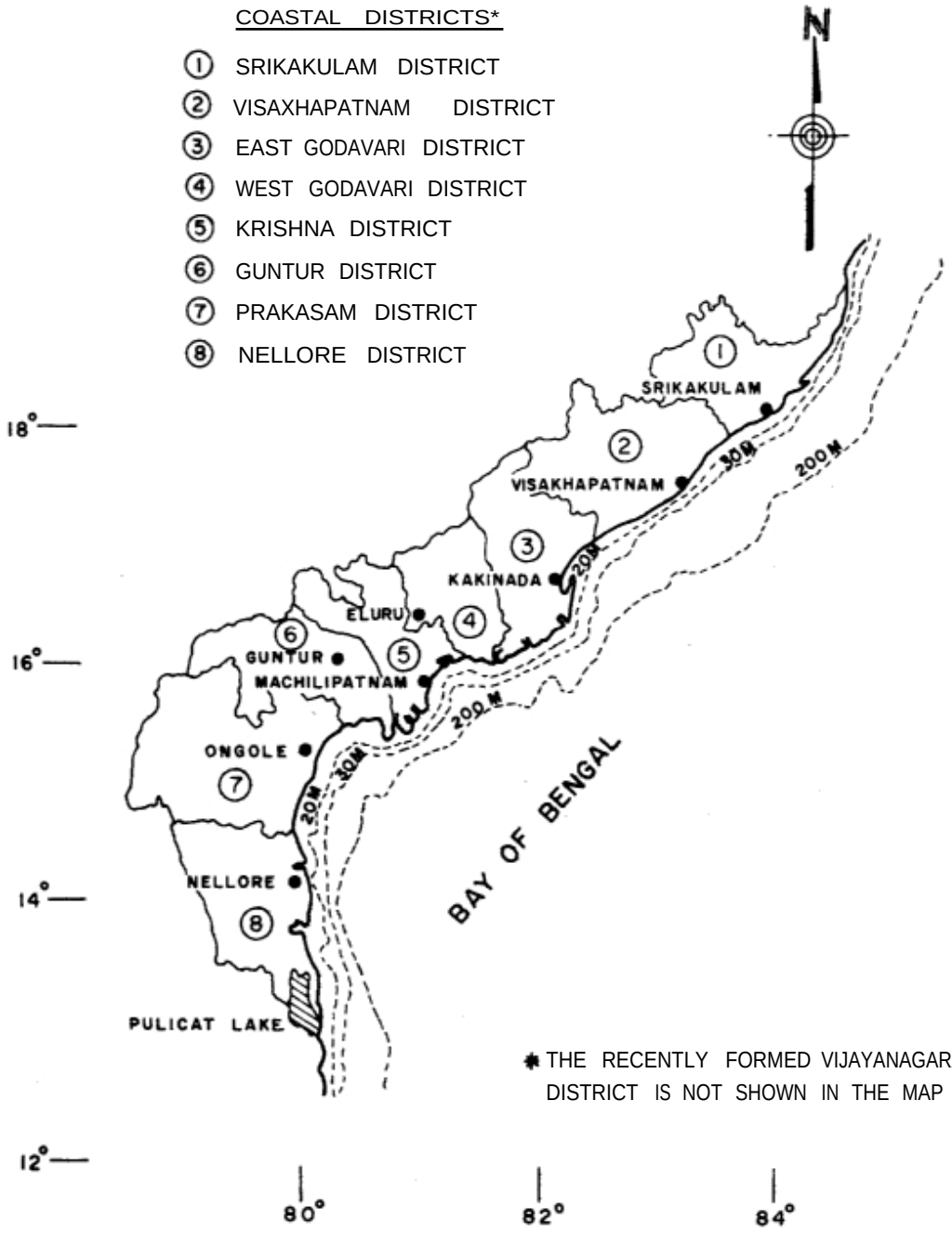
Imports (1978-79)

	Commodities	Value	% of each commodity
		000 Rs.	in total
1.	Urea	413,578	10.90
2.	Ammonium sulphate	48,498	1.28
3.	Diammonium phosphate	93,041	2.45
4.	Calcium ammonium nitrate	11,511	0.30
5.	Muriate of potash	39,816	1.05
6.	Ammonium nitrate	1,151	0.03
7.	Sulphur	62,080	1.63
8.	Rock phosphate	90,363	2.38
9.	Zinc concentrate	87,712	4.01
10.	Cooking coal	34,427	0.91
11.	Total petroleum and petroleum products	1,844,660	48.60
12.	Manufactures of iron and steel including machinery	590,695	15.56
13.	Electrical goods	68,085	1.79
14.	Refractories	21,204	0.56
15.	Magnesium clinker	11,021	0.29
16.	Cement	146,605	3.86
17.	Edible oils	201,046	5.30
18.	Others	30,099	0.80
	Total imports	3,795,592	

Source: Statistical Bulletin 1978-79
Research and Planning Department, Visakhapatnam Port Trust, Visakhapatnam
Data relate to imports through Visakhapatnam Port only
Import data in respect of minor ports are not available.

APPENDIX-2

ANDHRA PRADESH COASTAL DISTRICTS AND THE CONTINENTAL SHELF



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Appendix 3.1 Distribution of traditional marine fishing craft owned/shared by fishermen

Type	DISTRICTS									
	Srika-kulam	Vijaya-nagaram	Visakha-patnam	East Godavari	West Godavari	Krishna	Guntur	Prakasam	Nellore	Total
Plank-built boats	898	634	2,180	5,387	144	1,226	828	14	48	11,359
Dugout canoes	285	6	123	599	99	5	159	291	214	1,781
Kattumarams	7,555	370	5,163	2,340	—	1	323	3,694	2,752	22,198
Others	2	1	108	218	17	2	11	192	124	675
Total	8,740	1,011	7,574	8,544	260	1,234	1,321	4,191	3,138	36,013

Source : Marine Fisheries Information Service (August 1981)

Appendix 3.2 Distribution of mochanised fishing craft owned/shared by fishermen

Type	DISTRICTS									
	Srika-kulam	Vijaya-nagaram	Visakha-patnam	East Godavari	West Godavari	Krishna	Guntur	Prakasam	Nellore	Total
Trawlers	—	—	1	113	—	60	273	—	—	447
Gillnetters	—	—	—	1	—	—	8	—	—	9
Total	—	—	1	114	—	60	281		—	456

Source : Marine Fisheries Information Service (August 1981)

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Appendix 3.3 Distribution of fishing gear owned/shared by fishermen

Type	DISTRICTS									
	Srika-kulam	Vijaya-nagaram	Visakha-patnam	East Godavari	West Godavari	Krishna	Guntur	Prakasam	Nellore	Total
Trawl net	–	128	–	367	1	130	197	–	–	823
Drift/gillnet	13,060	1,570	10,818	5,753	164	1,344	1,510	3,448	4,718	42,385
Boat seine	2,821	592	2,648	1,953	58	–	46	949	671	9,738
Fixed bag net	830	–	288	4,412	98	4,181	2,862	413	1,533	14,617
Hooks and lines	4,769	974	2,871	341	–	302	50	1,164	281	10,752
Shore seines	926	245	907	284	21	24	201	281	153	3,042
Traps	–	–	125	–	–	5	–	–	–	130
Scoop nets	55	43	276	1 .380	2	921	3	19	226	2,925
Others	3,828	537	2,450	9,128	5,490	5,485	3,233	4,628	2,420	37,199

Source : Marine Fisheries Information Service (August 1981)

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Appendix 3.4 Economics of operation of a 10 m mechanised boat

Base: Visakhapatnam

1	*General Information*		
1.1	Length	10	m
1.2	Fish carrying capacity	3	tonne
1.3	Crew number	6	
1.4	Type of fishing	Trawling	
2	*Operational Schedule*		
2.1	Numberoftripsperyear	250	
2.2	Number of days per trip	less than 1	
2.3	Number of fishing hours/day	6	hrs
2.4	Total fishing hours/year	1500	hrs
2.5	Total steaming hours/year	2750	hrs
3	*Investment*	Rs. P.	
3.1	Hull with winch including all taxes	108,000.00	
3.2	Engine54hp	81,500.00	
	Excise duty	2,338.00	
	Sales tax	4,367.99	
	Surcharge on sales tax		
	Total of 3.2	88,205.99	
3.3	Trawls (2 nos)	4,000.00	
3.4	Operational capital	4,000.00	
3.5	Total investment	204,205.99	
4	*Operating costs* (Rupees)		
4.1	Wages of crew per year	30,570.00	
4.2	Cost of HSD oil (engine working for 11 hrs/day, for 250 days at 8.1 lit/hr. at 3.18/lit)	70,835.00	
4.3	Engine oil (250 days at Rs. 14/lit/year),	3,500.00	
4.4	Grease (Rs.10/ day for 250 days)	2,500.00	
4.5	Maintenance of gear per annum	400.00	
4.6	Maintenance of craft per annum	2,000.00	
4.7	Maintenance of engine per annum at 10% of cost	8,820.00	
4.8	Insurance	6,650.00	
4.9	Interest on operating capital	400.00	
4.10	i) Depreciation on hull at 10%	10,800.00	
	ii) Depreciation on engine at 10%	8,820 00	

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iii) Depreciation on gear at 50%	2,000.00
4.11 Other operating costs:	147,475.00
i) Commission on sale	
ii) Registration fees (renewal)	1 50.00
iii) Wharfage	226.00
iv) Ice	4000.00
v) Spares for engine and hull repairs	5,000.00
vi) Other sundry expenses	2,000.00
Total of 4.11	11,376.00
4.12 Total operating costs	1 ,58,671 .00
5 Annual Income	
a) Shrimp Grade I (1 340 kg) at Rs.70/kg	93 800.00
Grade II (2250 kg) at Rs.40/kg	90,000.00
Grade III (1610 kg) at Rs.5/kg	80 5000
	1,91,850 00
b) Fish Grade I (504 kg) at Rs.2/kg	1,008.00
Grade II (2020 kg) at Rs.1 /kg	2,020.00
Grade III (47,900 kg) at Rs.0.50/kg	23,950.00
	26,978.00
Gross annual income	2,18,828.00
Net annual income	60,157.00

Source: Handbook of Fisheries Statistics, Andhra Pradesh, 1980.

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Appendix 4.1 Distribution of freezing, frozen storage and ice-making facilities in the coastal districts

Districts	Freezing capacity (tonne)		Frozen storage capacity (tonne)		Ice production tonne/day	
	Private sector	Public sector	Private sector	Public sector	Private sector	Public sector
Srikakulam	30	–	–	–	–	–
Visakhapatnam	71	5	1770	100	196	20
East Godavari	19	2.7	600	50	81.5	10
West Godavari	–	–	–	10	81.5	6
Krishna	–	–	–	–	100	–
Guntur	–	–	–	10	36	5
Prakasam	–	–	–	–	20	–
Nellore	20	10	–	20	27	–
Total	140	17.7	2370	190	542	41
Grand total	157.7		2560		583	

Source : Directorate of Fisheries

Appendix 5.1 Fish landings in Andhra Pradesh,1970-80 *(In tonne)*

Year	Marine	Inland	Total
1970	74,459	85,691	160,150
1971	84,010	88,320	172,330
1972	84,480	94,081	178,561
1973	99,544	89,613	189,157
1974	158,818	99,733	258,551
1975	155,638	94,943	250,581
1976	131,321	104,339	235,660
1977	100,756	119,013	219,769
1978	82,116	119,850	201,966
1979	91,426	116,566	207,992
1980	116,013	121,893	237,906

Appendix 5.2 Composition of marine fish landings 1972-1979 *(in tonne)*

Sl:No.	Name of fish	1972	1973	1974	1975	1976	1977	1978	1979
1.	**Elasmobranchs**	**7400**	**8354**	**11394**	**9977**	**6688**	6450	8704	6994
2.	Eels	110	270	451	1837	205	438	1082	245
3.	Catfish	3651	10780	15890	9824	6131	5662	3281	3799
4.	Chirocentrus	2248	2635	2281	2920	1837	1217	1262	976
5. a.	Oil sardine	—	125	564	131	112	—	—	
b.	Lesser sardines	7587	11928	31520	32994	23220	10972	7685	6180
c.	Hilsa ilisha	220	45	—	70	280	41	2	78
d.	Other Hilsa	3087	2783	2347	930	1815	1654	1349	1092
e.	Anchoviella	2005	4865	9869	7037	11309	8947	7810	5888
f.	Thrissocles	1111	2486	1895	1776	1763	1398	1824	3433
g.	Otherclupeids	8892	9184	10195	7536	8410	2363	1794	2518
6. a.	Harpodon nehereus	297	221	125	359	214	960	1099	717
b.	Saurida & Saurus	504	386	267	242	166	875	1057	1379
7.	Hemirhamphus&Belone	17	3	194	24	14	135	60	100
8.	Flying Fish	52	105	2	1	—	84	65	71
9.	Perches	1485	1470	2213	4888	1751	2727	1945	3095
10.	Red Mullets	447	220	305	721	553	315	335	426
11.	Polynemids	2185	1393	2231	1836	1813	698	1075	1412
12.	Sciaenids	7277	7576	12358	11682	10891	10182	5597	8825
13.	Ribbonfish	3585	3761	11834	11701	12443	8546	5505	6337
14. a.	Caranx	2425	2589	2901	3498	3047	4003	2000	3185
b.	Chorinemus	552	1056	1620	1790	1820	530	665	444
c.	Trachynotus				6	1			—
d.	Other carangids				6	5	78	87	56
e.	Coryphaena	106	36	101	251	89	137	24	7
f.	Elacate	38	56	2	25	14	7	53	—

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15.	a. Leiognathus	2971	2806	4830	11268	3876	5903	2174	3585
	b. Gazza	1	3	12	101	48	—	—	—
16.	Lactarius	1396	982	1914	2513	1718	1132	684	945
17.	Pomfret	4165	4087	3945	5697	4088	2529	2445	2069
18.	Mackerel	5396	2519	1734	1593	2084	1040	2520	2621
19.	Seerfish	5830	4054	4438	5277	3412	3261	2600	5547
20.	Tunnies	495	141	683	664	334	449	328	437
21.	Sphyraena	88	18	19	119	187	108	43	62
22.	Mugil	118	255	1848	954	892	170	237	159
23.	Bregmaceros								
24.	Soles	21 5	187	220	305	56	680	347	610
25.	a. Penaeid prawns	5145	8170	9857	7152	8833	6266	8031	8697
	b. Non-penaeid prawns	437	669	2842	3523	2275	5109	1532	3117
	c. Lobsters				102	3	2	20	33
	d. Crabs & other crustaceans	279	364	934	605	329	719	477	1109
26.	Cephalopods	67	61	165	151	242	408	297	523
27.	Miscellaneous	2596	2901	4818	3552	8353	4561	6021	4655
	Total	84480	99544	158818	155638	131321	100756	82116	91426

Source : Central Marine Fisheries Research Institute.

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Appendix 5.3 Landings of selected fish species by months (1977) *(in tonne)*

Species	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Elasmobranchs	651	372	345	733	649	782	910	652	501	433	94	328	6,450
Catfish	319	789	560	251	881	392	776	287	352	287	428	340	5,662
Non-oil sardines	1093	440	1813	1566	1125	628	612	171	402	416	1154	1552	10,972
Anchoviella	**187**	**441**	**3797**	**2514**	**51**	**655**	**91**	**74**	**182**	**81**	**88**	**786**	**8,947**
Miscellaneous clupeids	320	267	116	170	150	207	317	78	342	95	187	114	2,363
Sciaenids	438	584	1461	1151	2581	857	939	530	417	393	377	454	10,182
Ribbon fish	130	192	1107	830	1015	429	1174	703	1990	206	147	623	8,546
Leiognathus	202	1294	1202	1233	408	216	298	342	288	74	130	216	5,903
Pomfrets	424	88	502	389	178	128	262	277	75	42	58	106	2,529
Mackerel	78	104	205	209	166	11 5	14	12	6	5	124	2	1,040
Seer fish	534	203	506	180	163	202	829	154	167	67	158	98	3,261
Perches	450	287	514	360	233	87	54	219	48	34	201	240	2,727
Polynemids	158	110	79	101	24	18	48	23	12	25	51	49	698
Penaeidshrimps	223	360	793	568	212	914	318	541	177	270	184	223	4,783
Allotherspecies	2104	2502	3408	8319	1268	2231	3644	2465	1327	2010	1637	1778	26,693
Total	7311	8033	16408	12574	9104	7861	10286	6528	6286	4438	5018	6909	100,756

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Appendix 5.4 Some important commercial marine fish species of Andhra Pradesh

Sl. No.	English name	Scientific name	Telugu/local name
1.	Whitepomfret	Stromateus	Tellachanduva
2.	Blackpomfret	S.niger	Nallachanduva
3.	Seer	Scomberomorous commersoni	Konema
4.	Seer	S. guttatum	Vanjaram
5.	Sardine	Sardinella longiceps	Kavallu
6.	Rainbow sardine	Kowala koval	Morava
7.	Anchovy	Thrissocles sp.	Poorava
8.	Whitebait	Anchoviella sp.	Nethallu
9.	Hilsa	Hilsa ilisha	Killalu
10.	Thread fin	Polynemus sp.	Maga
11.	Ribbon fish	Trichiurus sp.	Savallu
12.	Catfish	Tachysurus sp.	Jella
13.	Mackerel	Rastrelliger kanagurta	Kanagarthalu
14.	White fish	Lactarius	Sadumi
15.	Jewfish	Sciaenids	Gorasa or Goraka
16.	Perch	Saranus sp.	Chamallu
		Lutjanus sp.	Kataili
17.	Horse mackerel	Carangids	Para
18.	Silver belly	Leiognathus	Kara
19.	Seabass	Lates calcarifer	Pandugoppa
20.	Milk fish	Chanos chanos	Palabontha
21.	Bombay duck	Harpodon nehereus	Vanamattalu
22.	Shark	Scoliodon sp.	Sora
23.	Saw-fish	Pristis	Yalla
24.	Skate	Rhinobatis	Ulava
25.	Ray	Dasyatis sp.	Teki, Belugiri, Tenku
26.	Crab	Neptunus, etc.	Peetha
27.	Shrimp	Metapenaeus brevicornis	Royyalu
		M. dobsonii	
		M. monoceros	
		Penaeus spp.	
		Acetes spp.	

Appendix 7.1 Demand for marine fish (1977)

Species	Demand in 78 selected urban centres (t)	Demand in all urban centres (t)
Pomfret	6,259	7,510
Seer	3,495	4,193
Polynemus	2,992	3,590
Jewfish	1,387	1,664
Lates	1,435	1,721
Catfish	3,144	3,652
Chanos	725	870
Lacanius	1,008	1,209
Mullet	2,261	2,713
Mackerel	2,498	2,997
Rock cod	692	830

Source: Consumer preference and demand survey for fish in Andhra Pradesh, 1977, conducted by CARD, Administrative Staff College of India, Hyderabad.

Appendix 7.2 Comparison of fish prices at various levels (1977-78)

Species	Producer price Rs/kg	Wholesale price Rs/kg	Retail price *Rs/kg*						Average retail price Rs/kg	Retail price in % of producer price
			Guntur	Hyderabad	Madras	Calcutta	Rourkela	Kharagpur		
Lates	2.50	2.70	3.20	4.50	4.50	6.00	5.50	5.50	4.90	196
Polynemus	2.25	2.50	3.00	3.75	3.75	5.25	4.75	4.75	4.20	187
Seer	2.25	2.50	3.00	3.75	3.75	5.25	4.75	4.75	4.20	187
Pomfret	2.50	2.75	3.25	4.00	4.00	5.50	5.00	5.00	4.50	180
Lactarius	2.00	2.25	3.00	3.50	3.50	5.00	4.50	4.50	4.00	200
Jewfish	2.00	2.25	2.75	3.00	3.00	4.50	4.00	4.00	3.50	175
Eels	1.50	1.75	2.50	3.00	3.00	4.50	4.00	4.00	3.50	233
Mugils	1.75	2.00	2.50	3.25	3.25	4.75	4.25	4.25	3.70	211
Clupeids	0.80	1.00	2.25	2.50	2.50	3.75	3.75	3.25	3.00	375
Sharks and rays	0.40	0.60	1.50	2.00	2.00	3.50	3.25	3.25	2.60	650
Bombayduck	0.40	0.60	1.25	1.50	1.50	3.00	2.50	2.50	2.00	500

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Appendix 10.1 Fisherfolk population (1980)

Item	DISTRICTS									
	Srika-kulam	Vijaya-nagaram	Visakha-patnam	East Godavari	West Godavari	Krishna	Guntur	Prakasam	Nellore	Total
No. of fishing villages	105	16	62	84	14	28	22	60	62	453
No. of landing centres	86	15	50	75	10	26	9	52	56	379
No. of fisherman households	16,026	2,195	11,472	20,045	2,328	4,658	3,960	6,939	5,379	72,862
Fishermenpopulation:										
Male	21,362	3,694	17,661	25,812	2,822	5,921	4,892	8,777	6,423	97,364
Female	23,291	2,953	17,515	24,957	2,919	5,588	4,624	8,325	6,287	96,459
Children	31,577	4,456	24,969	34,442	3,399	6,945	6,337	11,373	8,983	132,481
Total	76,230	11,103	60,145	85,211	9,140	18,454	15,853	28,475	21,693	326,304
Educational status										
Primary	5,974	97	2,004	5,432	1,253	1,285	1,167	1,721	1,453	20,386
Secondary	1,779	4	239	683	165	220	176	226	70	3,562
Above Secondary	201	—	20	75	34	25	21	50	3	429
Total	7,954	101	2,263	6,190	1,452	1,530	1,364	1,997	1,526	24,377
No. of fishermen engaged in actual fishing										
Fulltime	12,279	3,164	14,716	20,368	1,798	4,125	3,570	7,273	6,213	73,506
Parttime	427	294	500	1,643	316	569	994	146	21	4,910
Occasional	1,400	143	834	997	416	796	473	384	44	5,487
Total	14,106	3,601	16,050	23,008	2,530	5,490	5,037	7,803	6,278	83,903

Source : Marine Fisheries Information Service.

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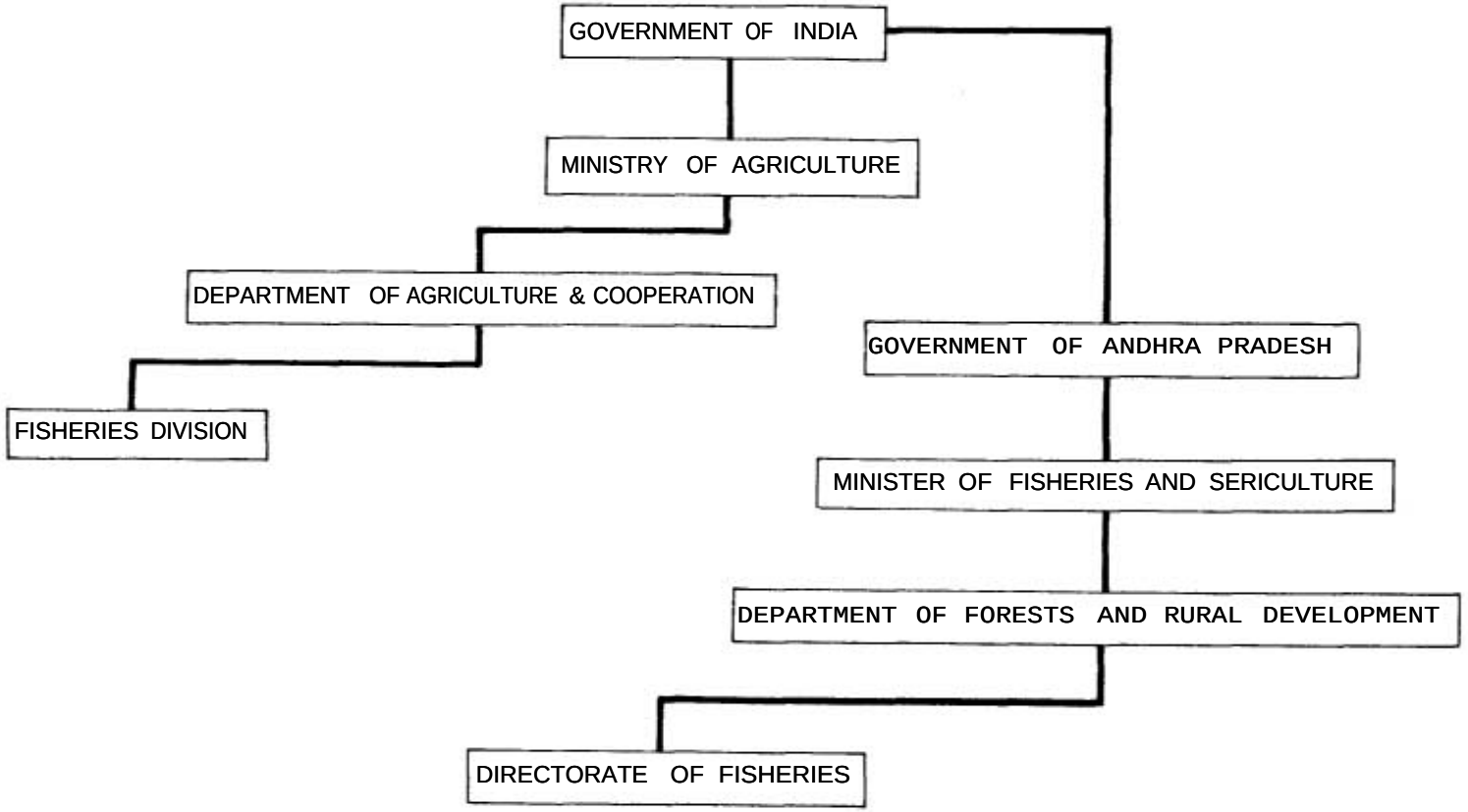
APPENDIX -11.1(a)

FISHERIES IN NATIONAL AND STATE ADMINISTRATIONS



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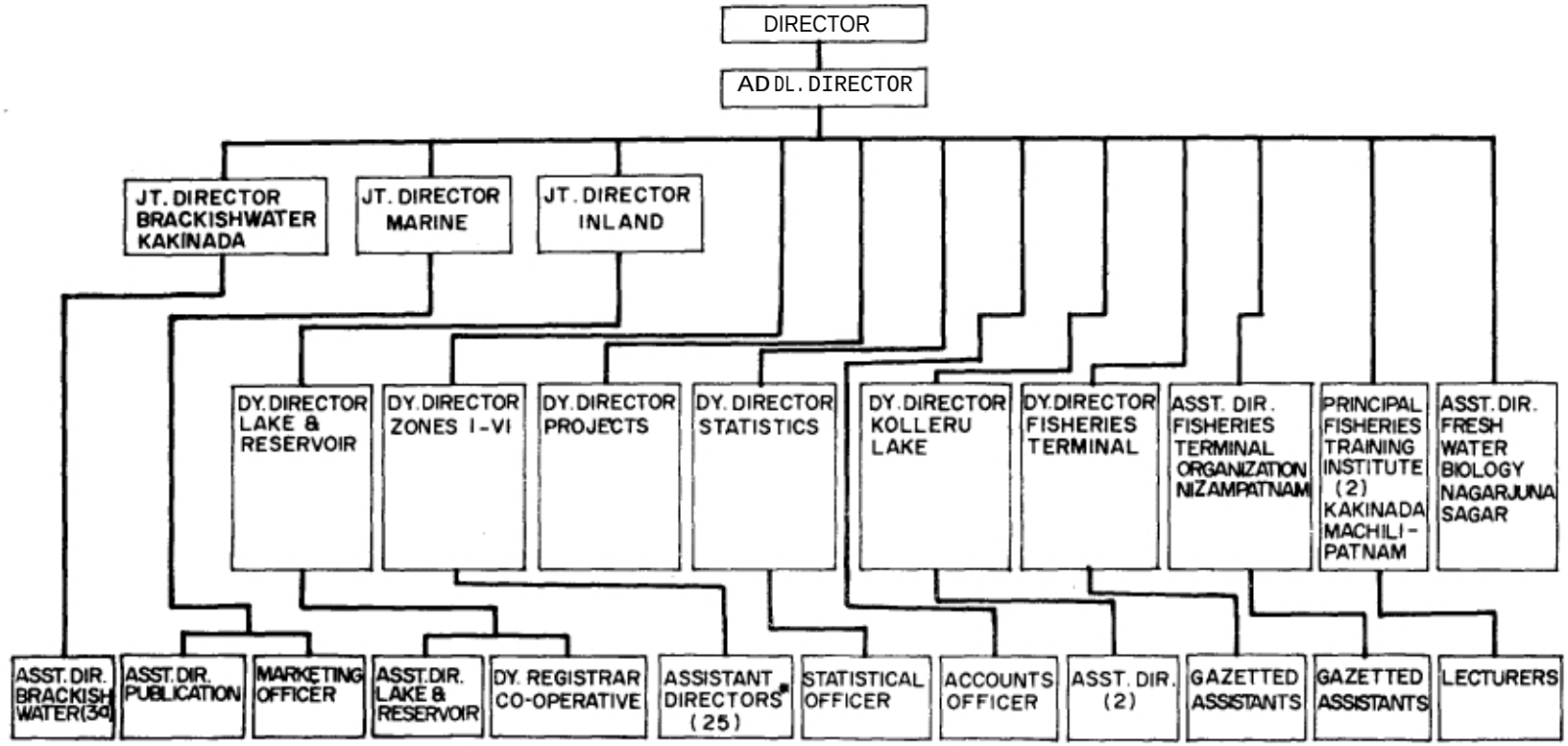
APPENDIX -11.1(b)

ADMINISTRATIVE SET—UP OF DIRECTORATE OF FISHERIES



	ZONES	*ASST. DIRECTORS
i	VISAKHAPATNAM	VISAKHAPATNAM, SRIKAKULAM, VIJAYANAGARAM (3)
ii	KAKINADA	RAJAHMUNDRY, KAKINADA, ELURU MACHILIPATNAM (4)
III	GUNTUR	GUNTUR, ONGOLE, NELLORE (3)
IV	KURNOOL	KURNOOL, ANANTAPUR, CHITTOOR, CUDAPPAH, NANDYAL (5)
v	WARANGAL	WARANGAL, KHAMMAM, KARIMNAGAR, ADILABAD (4)
vi	HYDERABAD	NIZAMABAD, HYDERABAD, MAHBUBNAGAR, MEDAK, NALGONDA, RANGAREDDI (6)

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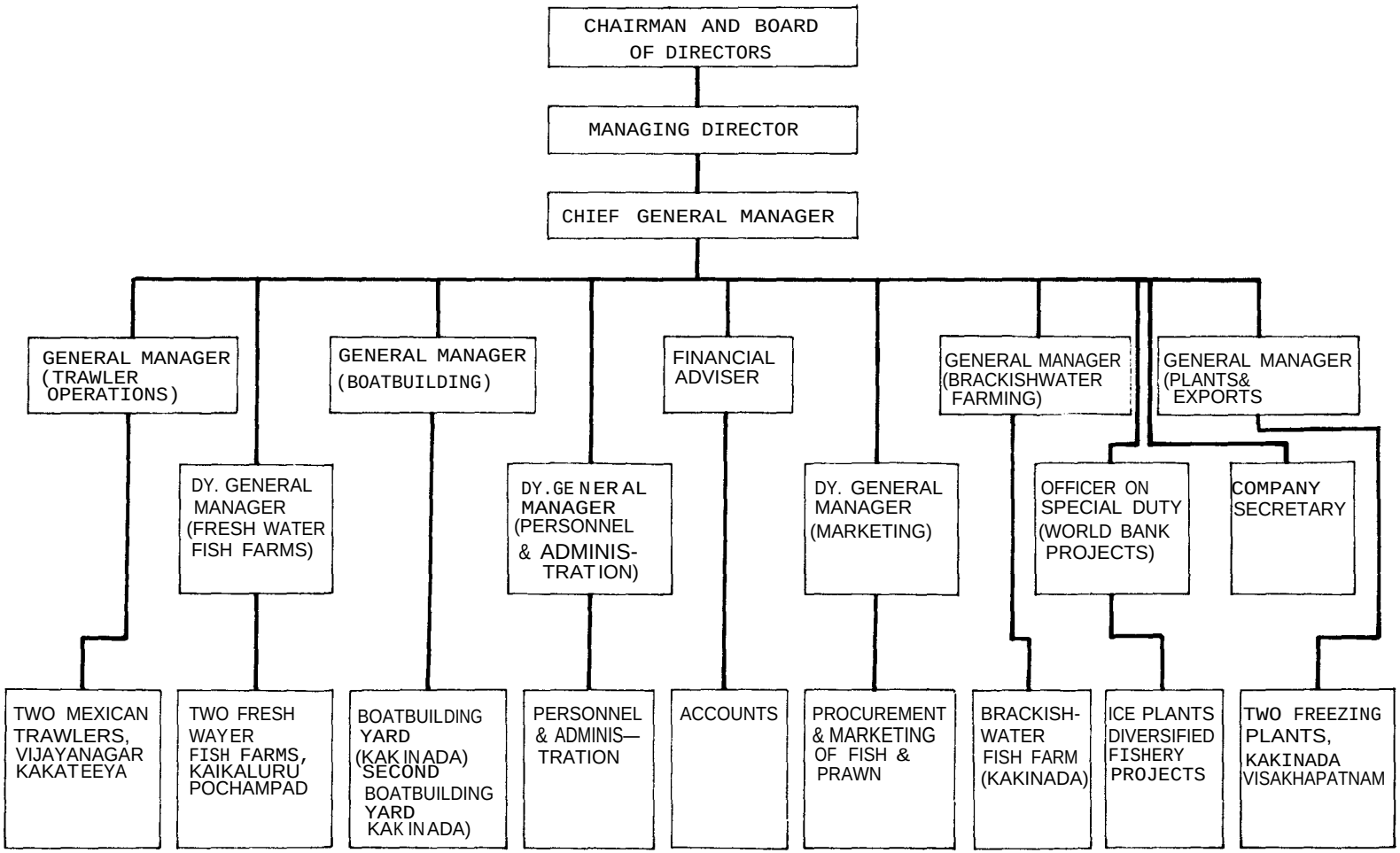
APPENDIX -12.1

ORG4NIZATION CHART OF ANDHRA PRADESH FISHERIES CORPORATION (A P F C)



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Appendix 14.1 Fisheries development schemes (1951-1979)

Plan	Plan outlay	Actual expenditure	Main activities
First Five-Year Plan (1951-56)	10.49	10.39	Motorisation of indigenous fishing craft, introduction of synthetic fishing twine, supply of salt for fish Curing, fish seed collection and distribution
Second Five-Year Plan (1956-61)	70.28	63.61	Intensification of motorisation programme, organisation of fish seed collection, production and distribution, establishment of training centre for fishermen, conducting of deep water fishing experiments, establishment of boatyard, supply of fishery requisites and staff for survey and development of inland fishery resources in the Telengana area
Third Five-Year Plan (1961-66)	131.22	141.53	Establishment of ice plants, cold storage, fish farms, small fishing harbour at Kakinada, supply of synthetic fishing twine and establishment of boatbuilding yard.
Annual Plans			
1966-67	43.82	44.25	The same schemes as in the third Five-Year Plan were continued these three years.
1967-68	42.32	37.97	
1968-69	**32.19**	**22.32**	
Fourth Five-Year Plan (1969-74)	223.40	1 80.30	Exploitation of marine fishery resources by mechanised fishing, special scheme for providing drinking water facilities, roads, bridges, fish curing yards, supply of nylon yarn and construction of nurseries for production of fish seed, etc. in backward areas, pilot survey for evolving a methodology for estimating inland fisheries production under the guidance of the National Sample Survey Organisation.
Fifth Five-Year Plan (1974-79)	316.00	301 .53	Scheme for freshwater prawn culture at Kovvali. I.C.A.R. schemes involving research on brackishwater farming at Kakinada and culture of air-breathing fishes at Palair, survey of Pulicat lake. Starting of an Inland Training Centre at Kurnool and increasing the capacity of the Fisheries Training Institute. Kakinada, from 20 to 75 candidates per annum. An integrated marine fisheries project with credit assistance from the World Bank.

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Appendix 14.2 Proposed fisheries development **projects during the sixth five-year plan (1980/81 – 1984/85)**

	Schemes	Sixth allocation (As. million)	Sources of finance
	Marine Fishers		
1.	Integrated marine fisheries project	64.149	World Bank
	– harbour		Centrally
	– fishing vessels		sponsored
	– connecting roads		
	fish processing facilities		
	– water supply to Nizampatnam		
2.	Fishing harbour, Bhavanapadu	7.452	Centrally sponsored
3.	Integrated marine fisheries project	33.661	U K (Pipeline)
	– fishing harbour at Krishnapatnam		
	connecting roads		
	– share capital for deep-sea trawlers		
	– fish processing facilities		
	– marketing facilities		
4.	Token provision for acquiring site and granting margin money for processing plants	0.300	SIDA (Pipeline)
	Share capital contribution to APFC for acquiring deep-sea trawlers	0.300	
	Share capital assistance to APFC for acquiring trawlers from Gujarat Agro Marine Products	2.000	
	Share capital for acquiring cold storage and processing plants	0.800	
	Construction of a building at Vizag for marine fishermen	0.120	
	Marine Fisheries Training Institute, Machilipatnam	1.791	
	Construction of a bridge on Buckingham canal	0.300	
	Introduction of fibreglass boats	0.225	
	Total	111.098	
	Coastal Aquaculture		
1.	Assistance to APFC for brackishwater fish farming	0.660	
2.	Joint Director of Fisheries and his staff	0.289	
3.	Brackishwater fish farming including survey staff	2.235	
4.	Visit of Indonesian TCDC mission	0.010	
		3.194	

Development of Small-Scale Fisheries (GCP/RAS/040/SWE)

Reports (BOBP/REP/....)

1. Report of the First Meeting of the Advisory Committee. Colombo, Sri Lanka, 28-29 October 1976. (Published as Appendix 1 of IOFC/DEV/78/44.1, FAO, Rome, 1978)

2. Report of the Second Meeting of the Advisory Committee. Madras, India, 29-30 June 1977. (Published as Appendix 2 of IOFC/DEV/78/44.1, FAO, Rome, 1978)

3. Report of the Third Meeting of the Advisory Committee. Chittagong, Bangladesh, 1-10 November 1978. Colombo, Sri Lanka, 1978. (Reissued Madras, India, September 1980)

4. Role of Women in Small-Scale Fisheries of the Bay of Bengal. Madras, India, October 1980.

5. Report of the Workshop on Social Feasibility in Small-Scale Fisheries Development. Madras, India, 3-8 September 1979. Madras, India, April 1980.

6. Report of the Workshop on Extension Service Requirements in Small-Scale Fisheries. Colombo, Sri Lanka, 8-12 October 1979. Madras, India, June 1980.

7. Report of the Fourth Meeting of the Advisory Committee. Phuket, Thailand, 27-30 November 1979. Madras, India, February 1980.

8. Pre-Feasibility Study of a Floating Fish Receiving and Distribution Unit for Dubla Char, Bangladesh. G. Eddie, M. T. Nathan. Madras, India, April 1980.

9. Report of the Training Course for Fish Marketing Personnel of Tamil Nadu. Madras, India, 3-14 December 1979. Madras, India, September 1980.

10.1 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16-21 June 1980. Volume 1 Proceedings. Madras, India, September 1980.

10.2 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16-21 June 1980. Volume 2 : Papers. Madras, India, October 1980.

11. Report of the Fifth Meeting of the Advisory Committee. Penang, Malaysia, 4-7 November 1980. Madras, India, January 1981.

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