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NATIONAL SYMPOSIUM ON RESEARCH AND DEVELOPMENT IN MARINE FISHERIES

MANDAPAM CAMP

16-18 September 1987

Papers Presented
Sessions V, VI & VII

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
P. B. No. 2704, E. R. G. Road, Cochin-682 031, India

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MARINE FISHERIES DEVELOPMENT IN TAMIL NADU

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Fisheries College, Tuticorin - 8

ABSTRACT

Fisheries development is governed by the stock of fishery resources, the level and types of fishing effort and the use of diversified craft and gear. The growing importance of fishery resources and the level of their exploitation are traced in this paper. The marine capture fisheries account for a substantial proportion of the total fish production in Tamil Nadu. The present level of fish landings, their seasonal variation and the major species groups are brought out. The developmental programme aimed at increasing fish production are reviwed. The need for innovations in and diversification of fishing methods is highlighted. The impact of investment on fish production is analysed with a time frame of ten years. Basic needs of fisherfolk which have a bearing on fisheries development are identified. Technological developments made over the last decade are mentioned with a note on the extent of non-adoption of new technology and the major determinants thereof are pointed out for remedying the situation. Culture practices in suitable areas along the coasts are stressed to provide employment opportunities that step up production. Developments in the preservation and processing of the seafoods are presented and the scope for the establishment of a stable internal and external market is explored. The state of affairs of marine or coastal fisheries management and suggestions for toning up resource management are stressed. The need for sea ranching and SCUBA diving is indicated. The vital feature of training and the nature and areas of extension programmes are also pointed out for ushering in speedier development of the sector.

INTRODUCTION

Tamil Nadu is one of the important maritime states of India with a geographical area of 1,30,069 km^2 (BOBP, 1983). Her coast both on the east and west runs to 1000 Km, which is the second longest in the country. Among the maritime states, Tamil Nadu took the lead in starting a department of Fisheries way back in 1907. Fisheries development in the state could be evidenced by its second rank in inland fish production and third rank in marine fish production. The contribution of marine sector to the total fish production of the state is more in terms of both quantity (60%) and value(72%) as could be seen form Table 1.

Table 1 *Annual marine and inland fish production in terms of quantity and value*

Year	Fish production (tonnes) Marine	Inland	%of marine products in Total	Value of fish production in Rs. lakhs Marine	Inland	% of marine fish value in Total
1980-'81	230532	165000	58.28	4580	1590	74.23
1981-'82	235820	165000	58.83	6460	2475	72.30
1982-'83	240012	175000	57.83	6519	2800	69.95
1983-'84	246204	160204	60.58	8440	3204	72.48
1984-'85	248533	160000	60.84	8363	3360	71.33
Average			59.27			72.06

Further, marine fish production is purely by capture while inland fish production is also by culture. Thus, there is a clear indication that marine fish production can be enhanced by culture operations apart from implementing improved methods of fishing. What is required for further development in marine fisheries is the implementation of productive schemes for the culture of molluscs, seaweeds and prawns.

There is an urgent need for marine fisheries development in the state. More than 80% of the population of Tamil Nadu consume fish. The present per capita consumption is only 9 kg. While in advanced countries, it is about 15 kg. The minimum per capita daily requirement for consumption is fixed as 50 g in Tamil Nadu against the actual availability of only 30 g. Hence, to bridge the gap and combat malnutrition and also to steadily improve our fish trade in external markets, it becomes necessary to scientifically assess and optimally utilise our fishing resources.

MARINE FISHERY RESOURCES

The continental shelf of Tamil Nadu has got a total area of 41,412 Km^2, represented by 16,058 Km^2 of inshore waters (0-10 fathoms) 7197 km^2 of offshore waters (10-40 fathoms) and 18,157 km^2 of the deep sea more than 40 fathoms (MPEDA, 1984). Tamil Nadu coast is divided into Coromandal coast, Palk Bay, Gulf of Mannar and the Wedge Bank which have specific regional characteristics. The areas present in the regions, their coastal length, demersal and pelagic fishes and important crafts used are furnished in Table.2.

Resource assessment of the pelagic and demersal fisheries of Tamil Nadu has been done by several survey agencies and their findings have been dealt in detail by Srinivasan (1980), according to whom the available potential is 11.50 lakh tonnes. The present average rate of exploitation during the last three years of the decade is around 2.60 lakh tonnes. Hence we have to improve our fishing effort. Further, our coastal waters are comparatively free from pollution. The shallow (0 - 50 m) and deeper regions (50 - 200 m) of the coasts are reported to be fertile with a fish production of 12 t/km^2 and 6 t/km^2 respectively.

Districtwise general fisheries information of the resources are given in Table 3 for an understanding of the facts, facilities and manpower, which may help in planning fisheries schemes in the state for the development of the sector.

The productive ecosystems such as estuaries, lagoons, backwaters, mangroves etc, which totally occupy an extent of 56,000 ha of brackishwaters, have a vital place in the fisheries scenario. They serve as suitable breeding and nursery grounds for many valuable species and offer scope for the collection of seeds including the precious prawn juveniles for culture (BOBP, 1983; MPEDA, 1980). The brackishwater spreads, suitable for development in the state are the Pulicat lake, Killai and Ennore backwaters, Adayar, Marakkanam, Vellar and Coleroon estuaries and Vedaranaym - Muthupet swamp. Considerable number of studies have been made on the ecology, resources and productivity for utilisation (Krishnamurthy, 1964; Ramadhas, 1977; Sundararaj, 1974; Sundararaj and Krishnamurthy, 1974).

Apart from the brackishwaters, a total of 15,000 ha of low lying coastal land, owned by the departments of Revenue, Salt, Forest and Railways are available for aquaculture. If all the

Table 2 *Region-wise coasted areas, demersal and pelagic fish production*

Parts of Tamil Nadu Coastal Region	Area & Length in Km.	Demersal fish	Pelagic fish	Important crafts used
Coromandal Region	Pulicat to Kodikarai 350 km	Ribbon fish Silver bellies shrimp	Sardines Anchovies Flyingfish Tuna Mackerel Seer Fish	Catamarans
Palk Bay and Gulf of Mannar	Tanjore Pudukottai Ramnad Tuticorin Tirunelveli 590 km	Silver bellies Perches Silver bellies	Sardines Seer fish Sardines Anchovies Tuna	Athiramapatinam Thiruppalaikudi Type boats Tuticorin Type vallams and boats Catamarans
Wedge Bank	Southwest coast of Kanyakumari District 60 km	Shrimp Deep sea Shrimp Lobster		

Source : BOBP, 1983

Table 3. *General Fisheries Information*

Maritime Districts	Coastal Length Km	No. of marine Fishing villages	Population	Density/ coastal length	Population/ village	No. of landing centers	No. of crafts Mecha-nised	Non-mecha nised	Total No. of gears
Madras	26	40	46232	1778	1156	10	343	2442	2662
Chengalpattu	135	64	38723	287	605	58	2	5784	11580
S. Arcot	89	56	42040	472	751	41	186	3681	10644
Thanjavur	216	84	87128	403	1037	75	760	6244	175854
Pudukkottai	39	29	10157	260	350	14	84	1085	13617
Ramanathapuram	261	99	65844	252	665	69	724	4330	72885
Tirunelveli	166	26	58779	354	2261	28	1073	3790	59814
Kanyakumari	68	44	14897	1690	2611	48	470	9215	15612
TOTAL	1000	442	463800	464	1049	343	3912	36571	362678

–Source Tripathy, 1986

lands could be brought under the ownership of a single agency like PFDA (Prawn Farmers Development Agency), which might lease them out to farmers, the subsidy facility of the MPEDA could be utilised for the development of brackiswater prawn farm. But the other problem is the low tidal amplitude. In most places, the daily average of tidal fluctuation is only around 0.5 m, requiring the use of pumps. Certain aspects on the engineering studies may lay the road for developing these areas. Using pumpsets for letting in water to the culture ponds increase the cost of production. Yet, prawn farming would make it economically worth viable. The districtwise distribution of brackishwaters and their fringing low lying lands in the state are given in Table 4.

Table 4 *Brackishwater areas in Tamil Nadu*

Districts	Brackishwaters (ha)	Low lying lands (ha)
Chinglepet	14,841	2,263
South Arcot	8,072	2,704
Thanjavur	31,426	7,297
Pudukkottai	-	247
Ramanathapuram	874	1,385
Tirunelveli	401	566
Kanyakumari	265	18
Total	55,897	14,880

(Source : BOBP, 1983)

According to Desai (1984), the potential brackishwater areas of the State have not been fully utilised for culture while 20,000 ha in West Bengal, 5117 ha in Kerala, 4,800 ha in Karnataka and 81 ha in Gujarat have been brought under culture. Committed involvement in this direction may lead to the development of profitable prawn practice, in which a dent has been made by the private sector.

There is bright scope for the development in this area in the light of the techonological developments and the support of the MPEDA for prawn farming and the establishment of the much needed hatcheries and prawn seed banks.

FISHERY RESOURCE USE

Fishery resources of Tamil Nadu coasts are exploited more (60%) by traditional fishing crafts (8,000 country boats and 30,000 catamarans) than by trawlers. These crafts, do not operate beyond the inshore waters. The present level of catch in the state is only about 20% of the stock. This clearly reveals the need for increasing our fishing efficiency and for the expansion of the area of fishing particularly in the offshore and the deep sea, which together constitute about 63% of the continental shelf area.

An analysis of fish catch data from 1955-56 to 1985-86 shows as in Table.5 that there has been general increase in the catch rate.

Table 5

Marine Fish Production in Tamil Nadu

Year	Marine fish Production (tonnes)	Increase over previous period	Percentage increase
1955-56	57,000	-	-
1965-66	1,65,000	1,08,000	190
1975-76	2,00,172	35,172	21
1985-86	2,44,759	44,587	20

(Source : Pandiyan, 1986)

It could be seen in Table 5 that rapid development has taken place in the earlier period and that the pace has not been sustainable, in the latter periods. An analysis made recently for the last 10 years of marine fish production, relating to the financial input indicated good correlation (Sundararaj, *et al.* 1987). However, the degree of development should have been more due to the need and the availability of a broad spectrum of resources. Since marine fisheries are capital intensive, there is need for the allotment of more funds for the development of the sector in the state.

In the history of marine fisheries, traditional crafts were responsible for a greater share of fish catch. But, after the introduction of the mechanisation programme as part of the first five year plan and the subsequent plans, the trend changed considerably and production increase could be achieved from 50,000 t per annum in the early 50's to a peak of 2,25,000 t in the 70's. Yet, considering the fish stock, production seems to be less since fishery is not exploited beyond 50 m depth (CMFRI,1987).

The contribution of deep sea fishing vessels to the annual marine fish landing is less than one per cent (Srinivasan, 1985). The fishery resources of the deep sea, which have not been adequately surveyed, need proper assessment of their stock. Though deep sea fishing is a more capital intensive task, the cost of one vessel being about Rs.100 lakhs, meaningful investment must be made with confidence to harvest the deep sea. Perhaps, chartering of foreign deep sea fishing vessels may be taken up initially and subsequently, learning from the experience with regard to the fishing grounds, types of fishing vessels, fishing methods etc, the TNFDC may continue deep sea fishing by itself successfully in the line of the operation of the Mexican trawlers.

DEVELOPMENT OF TRADITIONAL FISHERMEN AND THEIR FISHING CRAFTS

The traditional fishing sector, which contributes a large share in fish capture needs urgent and adequate support for improving fishing efficiency and increasing production. Around 2500 mechanised boats have been provided on credit with subsidy from the beginning of the 2nd Five Year Plan till the end of the 6th plan (Anon, 1986 b).

The Bay of Bengal Programme (BOBP) of the FAO, functioning from Madras in the State has designed a beach landing craft, suitable for the surf beaten areas of Tamil Nadu coast. Field tests conducted involving local fishermen has proved that IND.25/IND.20 beach crafts have better performance. They are free from the disadvantages of the catamarans such as limited range coverage, less carrying capacity, low productivity and no protection for the crew and the hazarduous fishing operation during bad weather. Instead, improved range and increased fishing time offer scope to the fishermen for a better financial status through more fishing resulting in five rupees increased per day income than the worked out income (Rs.27.50) through a catamaran. Further, though it costs Rs.10,000 (Rs.2,500 more than catamaran), its durability is about three fold greater. Hence, beach landing crafts can have a bright future in Tamil Nadu. They are being popularised at present.

The Kottar Social Service Society in Kanyakumari District, first implemented the programme of motorisation of the traditional crafts during 1966 (Anon, 1986 b). The Government took up this task from 1981-82 and supplied outboard motors to catamarans and in-board engines to canoes and Vallams. So far, 250 outboard motors and 264 inboard engines have been distributed. A total of 884 outboard motors/inboard engines have been fitted by private owners also. This scheme is very popular in Kanyakumari and Tirunelveli districts and is gaining momentum in other districts. The State Government offers 20% subsidy for each engine up to a limit of Rs. 2,500 and the commercial banks provide the balance of 80% as loan to the fishermen. The MPEDA is also running a developmental programme with the attracation of enhanced subsidy ceilling of Rs.5000 (Swamy, 1987).

SUPPLY OF MECHANISED FISHING BOATS

The programme of mechanisation began during 1955 when the government issued orders for the construction of mechanised boats of 28', 30' and 32'. The boats were supllied to the co-operatives and groups of fishermen. The details of boats supplied are presented in Table.6.

Table 6

Boats supplied by Different Sources

Sources of boat supply	No. of boats supplied
Fisheries Department	1721
Co-operative Fedaration	112
Private Entrepreneurs	16
Tamil Nadu Fisheries Development Corporation	602
National Co-oparative Development Corporation	51
Total	2502

(Source : Anon, 1986 b)

The value of the boats distributed is Rs.1832.44 lakhs. The Government encouraged extending subsidy on the distribution of mechanised boats. However, step by step, there was cut in this as seen in Table.7.

Table 7

Details of subsidy for Motorisation of Traditional crafts

Year	Details of subsidy
1958-'59 to	50% on the cost of engine
1967-68	25% on the cost of hull
1968-'69	25% on the cost of entire boat
1970-'71	20% -do-
1971-'72	15% -do-

(Source : Anon, 1986 b)

Service Centres for the mechanised crafts were established in Nagapattinam, Rameshwaram, Tuticorin, Colachel, Madras, Mandapam and Cuddalore between the years 1963 and 1970. The fishermen may be trained to attend minor repairs of marine diesel engines of mechanised crafts and ouboard/inboard engines of motorised traditional crafts.

BERTHING FACILITIES

Safe anchorage, as a major infrastructural facility is an important requisite for the mechanised vessel along with other basic amenities such as diesel bunks, water, fish landing and auctioning facilities. The details of berthing facilities made and are being developed are presented in Table.8.

Table 8 *Details of Berthing Facilities*

Details		Place and year of completion	Capacity
Major Fishing Harbours	Tuticorin	1976	400 MFBs*, 10 Trawlers
	Madras	1983	500 MFBS, 50 Trawlers
Minor Fishing Harbours	Cuddalore	1963	40 MFBs
	Nagapattinam	1969	10 MFBs
Landing jetty ('T' Head Jetty)	Mandapam	1962	
	Rameswaram	1972	
	Mathipattinam	1980	
	Kodiakkarai	1982	
		Work in progress	
Major Fishing Harbour	Chinnamuttom		240 MFBs, 10 Trawlers
Minor Fishing Harbour	Valinokkam	150 MFBs	
	Thondi	100 MFBs	
	Pazhayar	75 MFBs	
Landing jetty	Kottaipattinam	40 MFBs	

(Source : Anon, 1986 b) * Mechanised Fishing Boats

Closing of river mouths due to siltation is a problem in several fishing villages. This problem has more biological impact on the migration of fishes. Matured prawns may not be able to enter the sea for breeding and as well, the juveniles may not be able to enter the fertile brackishwaters with rich planktonic food for feeding. Thus several valuable resources may be depleted and particularly availability of prawn seeds may be drastically affected. Hence, suitable remedial measures must be made for a scientific and meaningful coastal management.

FISHING REGULATION ACT 1983

Frequent conflicts between the traditional and mechanised fisherman while fishing are common. This being a hurdle for fisheries development, the State Government enacted the marine fisheries regulation Act 1983, which permits catamarans and other country crafts alone to conduct fishing upto 3 nautical miles from the shores. Mechanised vessels can fish only beyond this limit. Further, they must leave for fishing by 5 am and return for berthing before 9 pm.

WELFARE PROGRAMMES

Among the welfare programmes of the State Government in operation, services of the co-operative societies, schemes for quick transportation and link roads, housing, relief to fishermen through ex-gratia payment of relief, communication of weather warnings and shelter for cyclones are worth mentioning.

CO-OPERATIVES

Since most fishermen do not save for a 'rainy day' they have to borrow from the middlemen during lean season thereby placing themselves in the clutches of the middlemen. To relieve them, 235 marine fishermen co-operative societies have been formed by the Govt. and sufficient funds are channalised for working capital (Anon, 1986 c). Through these co-operatives, the development grants flow to the fishermen for their economic upliftment. The performance of the fishermen/fisherwomen co-operatives may be studied in-depth to formulate policies for toning up the societies.

QUICK TRANSPORTATION AND LINK ROADS

The 'quick transport scheme' was introduced in 1950 to facilitate quick transportation of catches, in fresh condition to the markets at concessional hire charges. Under this scheme, 10 vans were purchased initially and by the end of the 5th Five Year Plan, 56 vehicles were purchased. But, since the co-operatives could not run the vehicles on no loss no profit basis, paying the hire charges, the scheme could not continue beyond 1974. However, the Govt. came forward to remove the major constraint of link roads, connecting coastal villages and their nearest roads. In a phased manner, from 1956/60, link roads were laid. From February 1980 to July 1983 alone, the Government has accorded sanction for 86 link roads with an investment of 181.50 lakhs (Anon, 1986). Such programmes are likely to continue in the state in the light of the rapid and continued improvement in transport facilities in the state.

HOUSING

To have basic amenities, fishermen have been provided 4917 houses under special housing scheme and 11724 houses under free housing sceheme (Anon, 1986 c). Also, to enable the fishermen to have the facility to assemble for meetings and social functions, about 25 community halls have been constructed. Panchayat Unions are looking after their utilisation and maintanance.

WEATHER BULLETINS

During periods of cyclonic weather, to save fishermen and their crafts from danger, the department of fisheries, in consultation with the authorities of the Dept. of Port, Meteriology and Navy, takes all precautionary steps to broadcast and announce weather warnings. It has also given transistor sets to fishermen co-operative societies to enable the fishermen to hear AIR broadcasts on weather warning. Facilities have also been made for aerial search of the missing fishermen in the sea. Search operations are done by the cost guards placed in the stations at Mandapam and Madras.

Since fishermen suffer more for shelter, particularly during the cyclone periods, 100 cyclone shelters have been constructed in six coastal districts utilising an amount of 110 lakhs, obtained from national and international philanthropic organisations.

NATURAL CALAMITIES

When fishermen are affected by natural clalmities liberal and immediate relief measures are extended on 50% grant and 50% loan basis. Now, considering the real problems of the affected fishermen, the government assistance is extended fully on the basis of grant. From the year 1977/78 to 1985/86, a total of Rs.322.39 lakhs have been utilised towards relief measures (Anon, 1986 c).

Fishermen and chank divers if happened to lose their life in the sea an ex-gratia amount of Rs.5000/- is paid as relief and another Rs. 5000 is payable to the children of the diceased fisherman to take vocational training. Though 248 families have been benefited, none has utilised the accompanying relief measure facility for vocational training.

This can be taken as a clear index of the lack of awareness of the fishermen of the rigidity in this system or of the lack of opportunity or suitable representation from the affected side. There can be some flexibility towards genuine and reasonable utilisation of the relief.

Implementation of the group insurance scheme, among the fishermen supports them

well with the relief of Rs.15,000 in case of death and Rs.7500 in case of any disability.

COASTAL FARMING

Compared to inland fish culture, coastal farming is not simple since the ecosystems are beyond human control. Yet we have to manage with them and exploit the culture possibilities to meet the rising demand for fish. Sincere attempts made by CMFRI, NIO and BOBP (FAO) have resulted in the development of viable technologies for farming the edge of the sea.

Rack culture technique has been developed by the CMFRI (Tuticorin) and perfected to culture *Crassostrea madrasensis*. In this method, individual oysters are reported to attain a size of 90 mm in a year and the yeild obtained range from 120 to 150 t/ha/yr with a total meat weight of about 12 t (Nagappan Nayar, 1980). Experimental culture carried out on oysters in Vaigai estuary at Athankarai in Tamil Nadu (Rao *et al.* 1983), Bheemunipatnam backwaters (Andhra Pradesh), Mulki estuary (Karnataka), Cochin backwaters (Kerala) and Goa also have yielded good production and profit indicating the culture prospects (Nagappan Nayar, 1987).

Raft culture technique has been developed for the culture of *Perna indica* and *P. viridis*. Among the various experiments conducted on green mussel using this technique in Madras (Near Kovalam in the sea and in Ennore estuary), Calicut, Goa (in estuary), Vizhinjam, Ratnagiri, Waltair and Tuticorin the maximum annual production of 480 t/ha was achieved in Goa (Parulekar, 1980). In the same technique *Perna indica*, the brown mussel has yielded an annual production of 150 t/ha in Vizhinjam Bay and 180 t/ha in the open sea of Vizhinjam (Appukuttan, 1980; Appukutan *et al.* 1980). Developing an on-bottom culture technique for clams, Narasimham (1980) has reported a possible productivity of 92.4 t/ha/yr.

Continued research work carried out in Tamil Nadu by CMFRI to regain the fame of the Indian Pearl oyster, *Pinctada fucata* from 1972, has resulted in the perfection of the culture technique, production of cultured pearls, success in induced breeding and the management of hatchery (Alagarswami, 1987). Attempts taken in sea ranching programmes stand as a sign of scientific management for rebuilding the stock in the sea.

Farming fin fishes such as milk fish, mullet etc. in coastal water ponds is also in progress in Mandapam and Tuticorin. It is possible to culture seaweeds like *Gracilaria edulis, G. corticata, Gelidiella acerosa* and *Sargassum* sp. in coir ropes and attain appreciable yield (CMFRI, 1978). Considering the importance given to seaweed culture in Japan and China and also the values of the seaweeds including the use for the preparation of medicinal compounds, culture practices must be taken up on mass scale. This will lead to the establishment of the seaweed based industries offering employment opportunities.

Considering the low and defective tidal amplitude in Tamil Nadu coast, the BOBP had developed the technique of pen culture and has experimentally proved the technological and economical viability of the same in Killai. Field works such as pen errection, screening of predators, reinforcement of pen walls against crab cuts and the use of appropriate mesh size have been perfected. This viable technique has yielded prawn (*Penaeus monodon*) production from 600 to 700 kg/ha/80 days in different pens (Karim, 1983; Karim and Victor Chandra Bose, 1985).

Between research achievements and development in the coastal areas, there is a definite gap, possible due to problems in technology transfer and non provision of the basic needs such as cultivable areas and financial support. A policy decision may be taken by the government and the cultivable areas may be allotted on lease to the fishermen, trained in prawn farming. Prawn Farmer's Development Agencies (PFDA) may also be formed in the coastal districts for an organised development along the successful lines of the FFDA.

Steps must be taken to establish seed banks in all the coastal districts with provision for a hatchery. The present extension system should be made practical and more meaningful linking the farmers with the technologists, financial organisations and the traders.

The techniques developed for application are successful but their economic viability may be a question. Further, the problems of area selection and area allotment should be studied in detail. After ascertaining success in different area of the state through various demonstrations, mariculture programmes may be taken up.

The weakness in fisheries extension could be easily understood by the fact that no technology is known to the concerned people, other than prawn farming. Further, the scope for consumption of molluscan meat is also unpopular among

them since extension activities are not regular, adequate and co-ordinated. The various problems encountering the extension work need to be identified correctly for a remedy.

In accepting the productive technologies, finance seems to be a vital constraint among the coastal people. Hence, the government may advise organisations for liberal financial support besides its own support. Having developed the other priority sector in the country or state considerably, it is ideal to attach importance to Fisheries with reference to aquaculture. If blue revloution should become a reality, there must be fair allotment and free flow of finance towards coastal fisheries development.

TECHNICAL MANPOWER

Tamil Nadu has developed technical manpower mainly by the CAS in Marine Biology and the Fisheries College. Suitably trained field level supportive staff have been brought out by the training centres in the state (Selvaraj and Sundararaj, 1987). The above valuable human resource can be utilised in implementing several production oriented projects, developmental schemes and management measures to solve the threatening unemployment problems and provide the much needed protein food for the state and to increase the export of sea foods.

FISHERIES TRAINING CENTRES

For mechanisation programmes to be effective, fishermen should be trained to operate and maintain the mechanised crafts and in fishing methods. Hence the government set up Fishermen Training Centres (FTC) in Tuticorin (1956), Nagapattinam (1957) and Madras (1961) in different years and three more centres in Cuddalore, Colachel and Mandapam during 1964. These centres offer practical training to 310 fishermen annually. So far 3000 fishermen have been trained (Anon, 1986 b). In a recent study, Selvaraj (1986) has pointed out the priority requirements of the fishermen for a rapid fisheries development.

An analysis of the national budget allotment during the past five year plans reveal that adequate provisions have not been made to fisheries sector. They were not even 1% of the maximum provision given to certain sectors like irrigation and flood control or 2% of that alloted for Agriculture as sharply pointed out by Desai (1984). The allotment in Tamil Nadu state for the year 1986-87 was 302 lakhs. These would highlight lack of attention focused on fisheries both at national and state levels respectively.

EXPORT OF MARINE PRODUCTS

About 41 items of marine products are exported to international markets. Frozen shrimps, lobster, cuttlefish and squid, crab meat and fish are important materials among them. A total of 26 seafood freezing plants are present in Tamil Nadu with the capacity to freeze 181 t/day with a total storage capacity of 4363 tonnes. Due to the need for more good quality prawns, prawn farming should be given priority in the state. This area needs more encouragement with total technical support, financial assistance and effective extension programme. Tamil Nadu had recently (1984-'85) exported 18,792 tonnes of marine products worth of Rs. 5128 lakhs in which the share of prawns was about 70% (Anon, 1986 d).

REFERENCES

ALAGARSWAMI, K (Ed) 1987. Pearl culture. *CMFRI Bulletin* 39 pp. 142.

ANON,1980. Report of the State working group on fisheries for the sixth five year plan - 1980-81 Tamil Nadu.

ANON, 1986 a. Fish preservation and processing in Tamil Nadu. *Directorate of Fisheries, Information brochure* No. 8 pp. 34.

ANON, 1986 b. A status report on mechanisation programme for the development of Marine fisheries. *Directorate of Fisheries. Information brochure* No. 4, pp. 22.

ANON, 1986 c. A status report on welfare programmes for fisherfolk of Tamil Nadu. *Directorate of Fisheries. Information brochure* No. 6 pp. 17.

ANON, 1986 d. Exportable Fish and fishery products in Tamil Nadu. *Directorate of Fisheries. Information brochure* No.7 pp. 17.

APPUKUTTAN,K.K, 1980. Brown mussel production and economics at Vizhinjam. *Workshop on mussel farming* 25-27 - *Sept.* 1980 *Madras*. p. 102-109.

APPUKUTTAN,K.K., T.PRABHAKARAN NAIR, MATHEW JOSEPH AND K.T.THOMAS, 1980.Culture of brown mussel at Vizhinjam. *CMFRI Bulletin* 29 p. 30-32.

BOBP, 1983. Marine Small-scale fisheries of Tamil Nadu: A general description. BOBP/INF/5 pp. 52.

CMFRI, 1978. Mariculture research and developmental activities CMFRI *Special Publication* No.2 pp. 48.

CMFRI, 1987. An appraisal of the Marine fisheries of Tamil Nadu and Pondicherry. CMFRI *Special publication* No. 34 pp.63.

DESAI, G.R. 1984. Transfer of technology and aquaclutural development. Background Paper. *Workshop on Problems of transfer of technology in aquaculture.* (21-23 Nos. 1984). *Natl. Institute of Rural Development. Rajendranagar, Hyderabad.* pp. 42.

KARIM, M. 1983. An exciting pilot project on pen culture of shrimp. *Bay of Bengal News* No. 10.p. 1-7.

KARIM, M. AND S. VICTOR CHANDRA BOSE 1985. Penculture of shrimp in the backwaters of Killai, Tamil Nadu. BOBP/WP/35, PP. 44.

KRISHNAMURTHY, K. 1964. Studies on plankton and nutrients in the inshore and estuarine waters of Porto Novo. Ph. D. *Thesis. Annamalai University*, PP. 239.

MPEDA, 1980. Proceedings of the First National Symposium on shrimp farming. Bombay 16-18 August, 1978. *MPEDA. Publication* pp.269.

MPEDA, 1984. *Report on export potential survey of marine products Tamil Nadu.* MPEDA, Cochin. PP. 148.

NAGAPPAN NAYAR, K. 1980. Technology of edible oyster culture. *In: Proceedings of Summer Intitute on culture of edible mulluscs, Tuticorin*, May 26th to June 24th 1980. p. 84-88.

NAGAPPAN NAYAR, K. 1987. Technology of oyster farming. In: Oyster culture Status and Prospects. CMFRI *Bulletin.* 38. p. 59-62.

NARASIMHAM, K.A. 1980. Technology of clams and cockle culture. In: *Proceedings of Summer Institute in culture of edible molluscs.* p. 99-104.

PANDIYAN, P.S., 1986. Report on marine fisheries Tamil Nadu, 1983-84 and 1984-85. *Issued by Commissioner of Statistics*, pp. 54.

PARULEKAR, A.H. 1980. Production and economics of mussels in Goa. *Workshop on mussel farming 25-27 Sept. Madras.* CMFRI - CAS/MF/80, B.P.16.

RAMADHAS, V. 1977. Studies on phytoplakton, nutrients in the inshore and estuarine waters of Porto Novo. Ph. D. *Thesis Annamalai University.* pp. 135.

RAO, K.S., D. SIVALINGAM AND K.A. UNNITHAN, 1983. Observations on the setting of spat and growth of *Crassostrea madrasensis* in Vaigai estuary at Athankari. *Proc. Symp. Coastal Aquaculture*, Pt 2: 436-443.

SELVARAJ, P. AND V. SUNDARARAJ, 1986. Training Institutions and the Socio-economic conditions of fisherfolk. *Seminar on "Fishing and allied industries in and around Tuticorin" Spic Nagar.* Oct. 5,1986.

SELVARAJ, P. 1986. Profile of Fishing villages in Tirunelveli District. *Report of the Department of Fisheries Economics, Fisheries College, Tamil Nadu Agricultural University, Tuticorin*, 1985-86.

SRINIVASAN, R. 1985. Field problems in development of fisheries in Tamil Nadu. *Seminar on Field Problems in Development of fisheries in Tamil Nadu.* 26th June 1985. Madras.

SUNDARARAJ, V. 1974. Hydrobiological studies in Porto Novo waters. Ph. D. *Thesis. Annamalai University*, pp. 200.

SUNDARARAJ, V. AND K. KRISHNAMURTHY, 1974. Studies on phytoplankton pigments in Porto Novo waters (India). I Mangrove, *J. Exp. Mar. bol. Ecol.* 14: 278-284.

SUNDARARAJ, V., V.K. VENKATARAMANI AND B. SRIKRISHNADOSS, 1987. Marine Fisheries of Tamil Nadu - An analysis. *Seafood Export Journal* 19 (6) p. 21-28

SWAMY, P. K. 1987. Marine Products Export potential of Tamil Nadu. *Fishing chimes.*

TRIPATHY C.K. 1986. A census of Tamil Nadu Marine fishermen, 1986. *Directorate of Fisheries.* pp. 7.

VENKATESAN, V., S. VICTOR CHANDRA BOSE AND D. SUNDARARAJAN 1980. An approach for the development of brackish water prawn farming in Tamil Nadu. *Proceedings of the first National Symposium on shrimp farming.* 16-18 August 1978. *Bombay* MPEDA. *Publication* pp. 268.