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समुद्री मात्स्यिकी सूचना सेवा : समुद्री मात्स्यिकी पर आधारित अनुसंधान परिणामों को आयोजकों, मत्स्य उद्योगों और मत्स्य पालकों के बीच प्रसार करना और तकनोलजी का प्रयोगशाला से भ्रमशाला तक हस्तांतरित करना इस तकनीकी और विस्तार अंकावली का लक्ष्य है।

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मुख आवरण फोटो : केरल के कोलचल में गोरगोनिड अवतरण।

COASTAL FISHERIES AND AQUACULTURE MANAGEMENT IN THE EAST COAST OF INDIA*

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I COASTAL FISHERIES MANAGEMENT

The east coast of India has s shore line of 2,581 km and has an EEZ area of 5,61,388 sq. km. in the Bay of Bengal. The continental shelf is 1,18,950 sq. km (Table 1). The inshore area (upto 50 m depth). which forms 56% of the continental shelf, is being intensively exploited using different types of crafts and gears. During the past one decade the marine fish production from the east coast has increased from 0.41 million tonnes (1985) to 0.69 million tonnes (1994) (Fig.2). In 1994, Tamil Nadu and Pondicherry, Andhra Pradesh, Orissa and West Bengal contributed 59.9, 24.3, 6.9 and 8.9% respectively to the total marine fish production along the east coast.

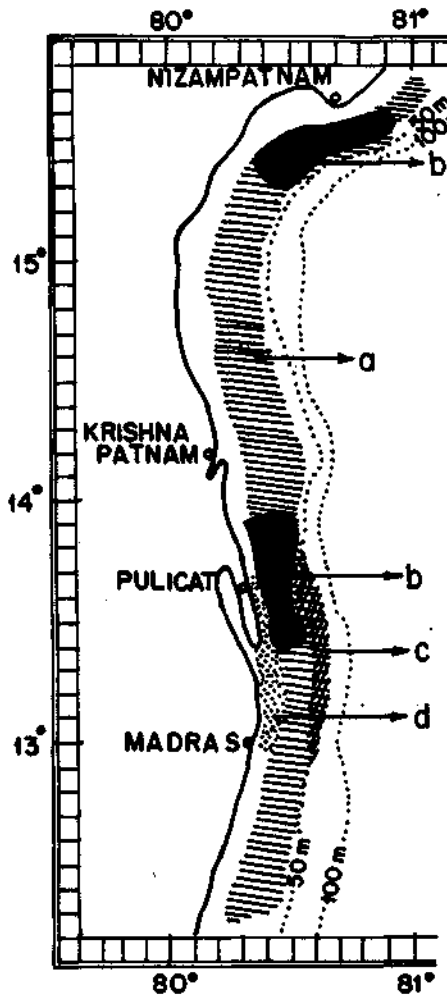

Fig. 1. Fishing areas of Madras based vessels. a. Area under trawling (4,650 sq. km). b. Areas under instensive trawling (1,250 sq. km) by small and large trawers, c. Area under mechanised gill net fishing (270 sq. km) and d. Area under artisanal fishing (40 sq.km).

TABLE 1. *Geographical profile of the east coast of India*

Parameters	West Bengal	Orissa	Andhra Pradesh	Tamil Nadu & Pondicherry	Total
Length of coast (km)	157	480	974	970	2,581
Area (x000ha)					
upto 50m	994	1,707	1,661	2,326	6,688
51-200m	1,292	656	1,443	1,816	5,207
Total	2286	2363	3104	4142	11895

Growth of fishing activity

i. *Fisherfolk population and availability of potential fishing area*

During the past 3 decades the fishing activity has increased throughout the east coast. The population of active fisherfolk increased by 3.5 times in 1991 compared to that of 1961. The substantial increase was in West Bengal (24 times) and Orissa (13 times). The increase was only 35% in Tamil Nadu and Pondicherry. Due to the increase in the population of active fisherfolk the potential fishing area per active fisherman has considerably decreased. For

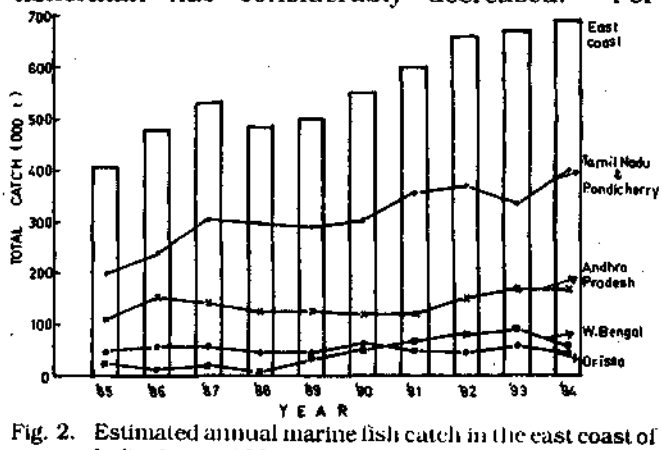

Fig. 2. Estimated annual marine fish catch in the east coast of India during 1985-'94.

* Based on document prepared for III phase of Bay of Bengal Programme (FAO).

TABLE 2. *Comparison of active fisherfolk population and number of fishing craft during 1961 and 1991.*

Parameters	West Bengal		Orissa		Andhra Pradesh		Tamil Nadu & Pondicherry		Total	
	1961	1991	1961	1991	1961	1991	1961	1991	1961	1991
Number of fishing villages	127	652	156	329	321	453	362	375	966	1,809
Fisherfolk population	3,340	81,223	8,828	1,13,242	48,571	1,45,495	56,586	76,366	1,17,325	4,16,326
Number of crafts:										
Mechanised	15	1,880	50	2,179	350	4,082	813	4,082	1,228	12,223
Motorised	0	250	0	529	0	1,688	0	3,298	0	5,765
Non-motorised	783	4,361	2,786	13,791	19,772	50,333	29,661	39,969	53,002	1,08,454
Potential fishing area (ha/fisherfolk):										
Inshore	298	12	193	15	34	11	41	30	57	16
Offshore	387	16	75	6	30	10	32	24	44	13
Total	685	28	268	21	64	21	73	54	101	29
Potential fishing area (ha/boat) :										
Inshore	1,245	158	602	105	83	30	76	50	123	53
Offshore*	No effort	6,872	No effort	3,009	No effort	3,537	No effort	4,451	No effort	4,261
Total	2,865	352	833	143	154	55	136	87	219	87

* 10% of mechanised effort expended in the offshore area

instance the potential fishing area off West Bengal decreased from 685 ha/fisherman in 1961 to 28 ha in 1991 (Table 2). As the increase in the fisherfolk population was the lowest in Tamil Nadu and Pondicherry, the area availability did not decrease substantially and was the highest (54 ha/fisherman) among the east coast states in the 1990s.

ii. Mechanization

There was large scale mechanization of fishing fleets during the past three decades in the east coast. The number of mechanised vessels increased by about 10 times, from 1,228 in 1961 to 12,223 in 1991. In addition, 5,765 motorised vessels were introduced in the 1990s. However, the number of non-mechanised vessels increased by only two times. The large scale expansion and mechanization of fishing fleets was in West Bengal, Orissa and Andhra Pradesh whereas in Tamil Nadu and Pondicherry, the expansion was limited (Table 2).

Barring the 180 Mexican trawlers based in Visakhapatnam, the mechanised vessels in the east coast are of 32'-45' overall length. These vessels restrict the fishing activities mostly to the inshore areas and only about 10% of the total effort of the mechanised vessels is spent in areas beyond 50m depth. Hence, large potential area is available for fishing in the offshore area. The potential fishing area for the east coast is estimated as 53 ha/boat in the inshore and 4,261 ha/boat in the offshore areas.

iii. Production

The marine fish production in the east coast

TABLE 3. *Comparison of annual average catch for 1960-'64 and 1990-'94 in the east coast of India*

Catch	West Bengal		Orissa		Andhra Pradesh		Tamil Nadu and Pondicherry		Total	
	1960-'64	1990-'94	1960-'64	1990-'94	1960-'64	1990-'94	1960-'64	1990-'94	1960-'64	1990-'94
catch (t):										
Inshore	6,000	59,364	6,000	45,375	62,000	1,23,131	11,700	3,11,244	1,87,000	5,39,114
Offshore*	0	10,476	0	8,007	0	21,729	0	54,926	0	95,138
Total	6,000	69,840	6,000	53,382	65,000	1,44,860	1,10,000	3,66,170	1,87,000	6,34,252
Catch/ha (kg):										
Inshore	6.0	59.7	3.5	26.6	39.1	74.1	47.3	133.8	28.0	80.6
Offshore	0.0	8.1	0.0	12.2	0.0	15.1	0.0	30.3	0.0	18.3
Total	2.6	30.6	2.5	22.6	20.9	46.7	26.6	88.4	15.7	53.3
Catch/fisher folk (t)	1.8	0.9	0.7	0.5	1.3	1.0	1.9	4.8	1.6	1.5

* 15% of total catch

increased by 3.4 times in 30 years. The annual average landings increased from 1,87,000 t in 1960-'64 to 6,34,252 t in 1990-'94 (Table 3). The landings increased in all the maritime states. The contribution of West Bengal and Orissa alone to the total east coast landings increased from 3.2 to 11.0% for the former and 8.4% for the latter. The contribution of Andhra Pradesh decreased from 34.8 to 22.8%. Though there was only limited increase in the population of active fisherfolk and in the number of vessels, the

TABLE 4. *Potential yield and annual average catch for the years 1990-'94 in the east coast*

State	Potential yield (t)	Catch (t)	Production gap (t)	Production gap (%)
West Bengal				
Inshore	2,66,000	59,364	2,06,636	77.7
Offshore	98,000	10,476	87,524	89.3
Total	3,64,000	69,840	2,94,160	80.8
Orissa				
Inshore	3,00,000	45,375	2,54,625	84.9
Offshore	1,55,000	8,007	1,46,993	94.8
Total	4,55,000	53,382	4,01,618	88.3
Andhra Pradesh				
Inshore	2,00,000	1,23,131	76,869	38.4
Offshore	90,000	21,729	68,271	75.9
Total	2,90,000	1,44,860	1,45,140	50.1
Tamil Nadu & Pondicherry				
Inshore	2,80,000	3,11,244	-31,244	
Offshore	1,10,000	54,926	55,074	50.1
Total	3,90,000	3,66,170	23,830	6.1
Total				
Inshore	10,46,000	5,39,114	5,06,886	48.5
Offshore	4,53,000	95,138	3,57,862	79.1
Grand total	14,99,000	6,34,252	8,64,748	57.7

percentage contribution of Tamil Nadu and Pondicherry to the landings did not decrease and it remained almost constant at 58% in 1960-'64 and 1990-'94. The catch/fisherman in Tamil Nadu and Pondicherry substantially increased from 1.9 t/fisherman in 1960-'64 to 4.8 t/fisherman in 1990-'94 whereas the catch per fisherman decreased in the other states over the years (Table 3).

iv. Potential yield and catch

It has been estimated that the potential yield in the continental shelf of the east coast is 1.5 million tonnes. The annual average yield during 1990-'94 (6,34,252 t) was 42.3% of the potential yield and there is a production gap of 57.7% (Table 4). Hence, there is good scope for increasing the catch especially in the offshore areas of West Bengal, Orissa and Andhra Pradesh. In Tamil Nadu and Pondicherry, however, there is only a limited scope of increasing the catch. The catch from the inshore waters indicates an excess of 31,244 t above the potential accounted for mainly by the Madras based trawlers which fish in the contiguous Andhra Pradesh waters and land the catch in Madras.

The trawl factor

The east coast fishery is dominated by lesser sardine, silverbelly, sciaenid, mackerel, anchovy, ribbonfish, threadfin bream and penaeid prawn. The resources are exploited by a multigear system: trawl net, drift gill net and bottom set gill net operated from mechanised crafts while bag net, boat seine, gill net, trammel net and hooks and line operated from motorised and non-motorised boats. In recent years more number of trawlers are being added on to the fleet. In 1994, it is estimated that 48.8% of the total catch in the east coast was by the trawlers (Fig. 3) compared to 38.3% in 1985 and 11.6% in 1969.

To understand the effect of intensification of trawl effort on the fishery, the data on catch and CPUE of trawlers for the period 1985-'94 were analysed and plotted as relative yield and absolute yield against trawl effort (boat days) (Fig. 4-8). The relative yield of the east coast has almost reached a peak beyond 7.4 lakh boat days (Fig.4a) whereas the absolute yield has linearly increased (Fig. 4b). It is clear from the following analysis that the trawling pattern has changed in all the states either in 1990 or in 1991.

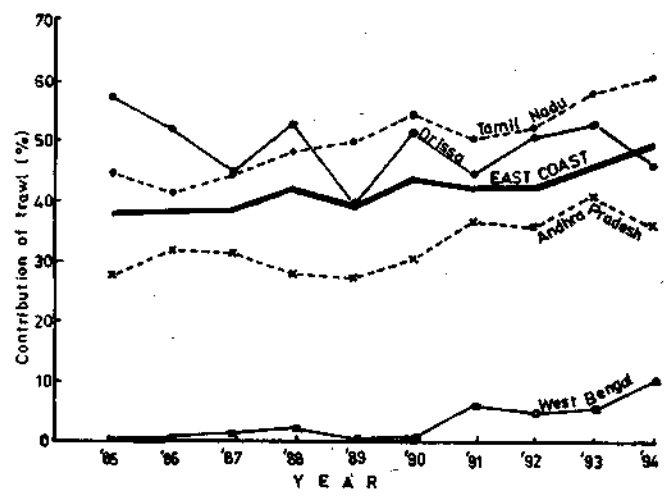

Fig. 3. Contribution of trawl to the total landings during 1985-'94.

i. In Tamil Nadu and Pondicherry, the stagnation observed in the relative (293-321 kg/boat day) and absolute (1.4 lakh t) yields during 1987-'89 changed and the yields increased (377 kg/boat day; 1.7 lakh t) in 1990 (Fig. 5a,b). For an almost equal annual effort of 4.5 lakh boat days during 1987, 1988, 1989 and 1990, the absolute yield was higher by about 20% in 1990 than during 1987-'89.

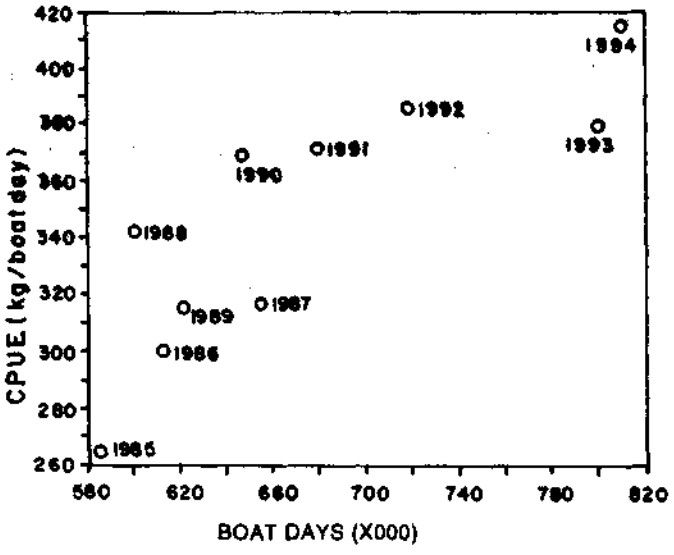

Fig. 4a. Relative yields of trawlers as a function of effort in the east coast during 1985-'94.

ii. In Andhra Pradesh the increase in yield was from 1991. For an equal annual effort of 99,000 boat days in 1990 and 1991, the relative and absolute yields were higher (Fig. 6a,b), by about 25% in 1991.

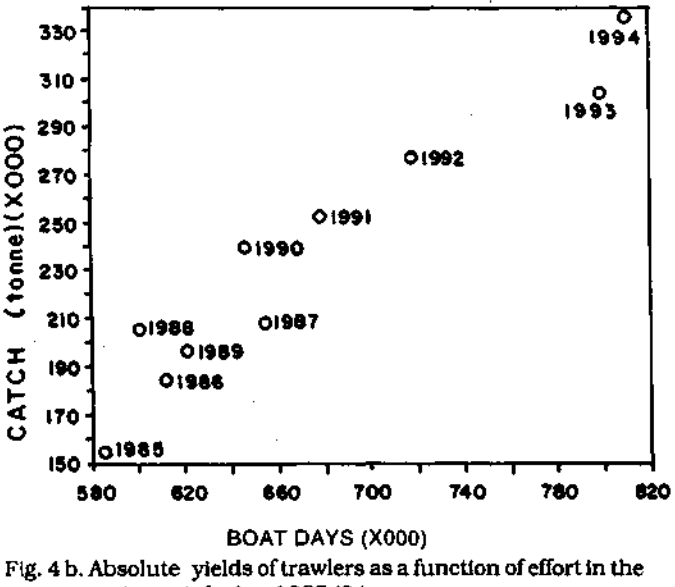

Fig. 4 b. Absolute yields of trawlers as a function of effort in the east coast during 1985-'94.

iii. Orissa was an exception to the above trend. The annual trawl effort and absolute yield fluctuated widely over the decade (Fig. 7b). However, there was a clear decreasing pattern in relative yield with increasing effort (Fig. 7a).

iv. In West Bengal, the difference in yields between 1985-'90 and 1991-'94 was significant. The effort (<900 boat days) and the absolute yield (<4000 t) were very low and the relative yield fluctuated between 321-704 kg/boat day during 1985-'90 (Fig. 8a,b). The effort and absolute yield increased substantially to 6,772 boat days and 3,823 t, respectively in 1991.

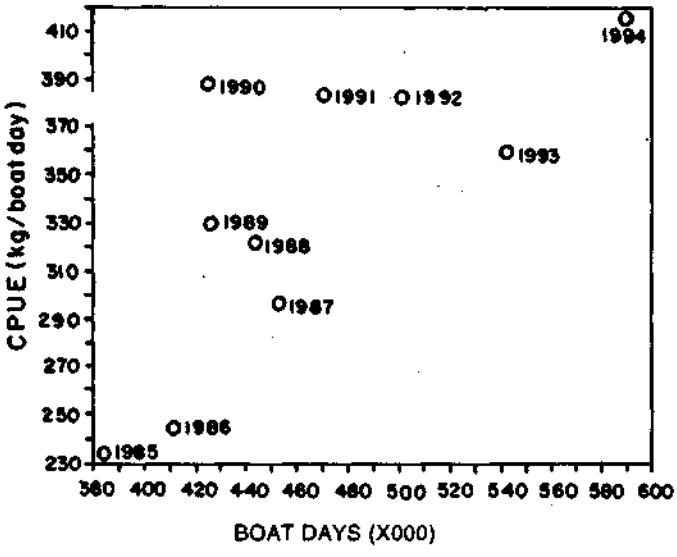

Fig. 5a. Relative yields of trawlers as a function of effort in Tamil Nadu & Pondicherry.

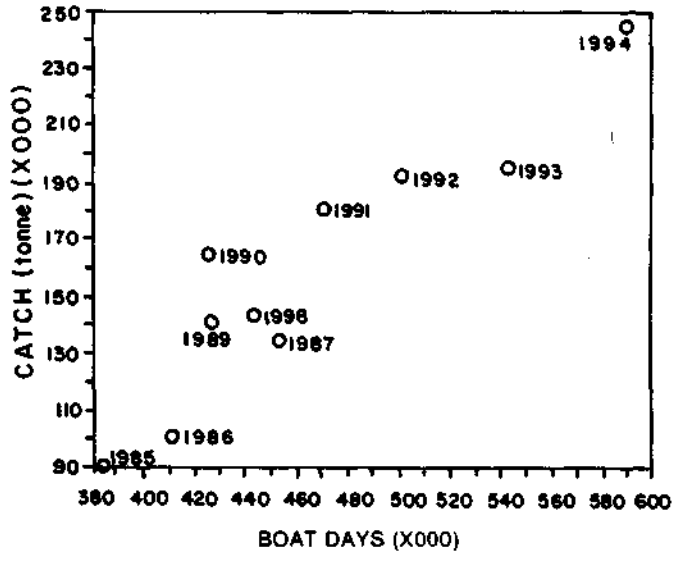

Fig. 5b. Absolute yields of trawlers as a function of effort in Tamil Nadu & Pondicherry.

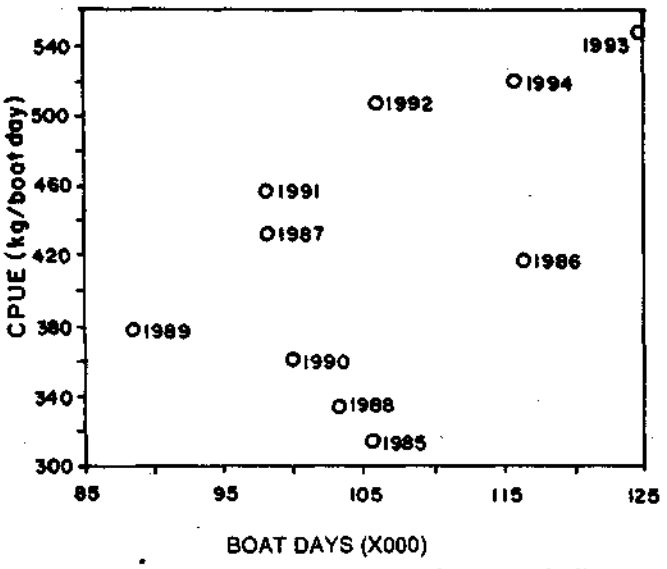

Fig. 6a. Relative yields of trawlers as a function of effort in Andhra Pradesh.

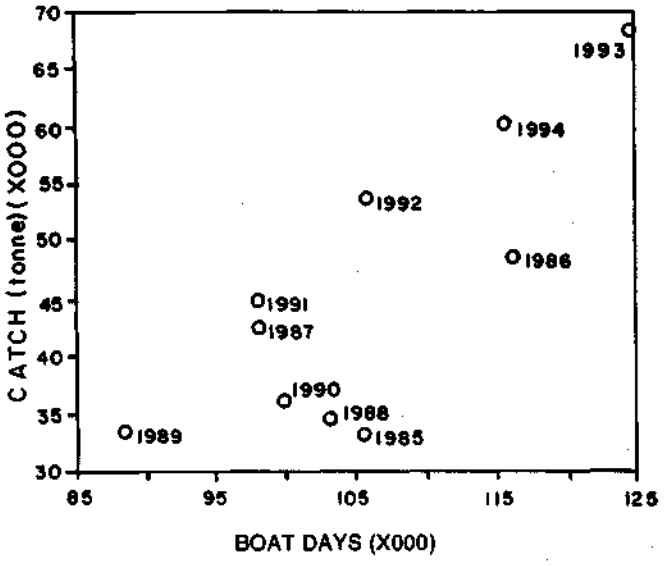

Fig. 6b. Absolute yields of trawlers as a function of effort in Andhra Pradesh.

The increase in effort and relative and absolute yields in Tamil Nadu, Pondicherry, Andhra Pradesh and West Bengal since 1990-'91 were due to the increase in the fishing efficiency of the trawlers. In the 1990s larger trawlers (above 42' overall length) have been added on to the fleet all along the east coast. The higher fish hold capacity of these larger vessels has increased the sea endurance and enabled fishing off the contiguous maritime states. For instance, the tralwers based at Madras conduct fishing off Nizampatnam in Andhra Pradesh, which is about 300 km away. The trawlers of Visakhapatnam and Paradip fish off Sandheads and land the catch in the respective base ports. Intensification of fishing in hitherto underexploited areas has increased the relative and absolute yields in 1990/1991.

Considering the induction of larger trawlers and resultant fishing off the contiguous maritime states, the estimation of effort and yields individually for each maritime state may no longer be relevant. Moreover, the open access to the resource has resulted in frequent clashes in sharing the stock especially between the fishermen of Tamil Nadu and Andhra Pradesh. The conflict of sharing the stock is likely to be a major problem in the years to come. A comprehensive fishery management policy for the trawl fishery of the entire east coast rather than for each maritime state/Union Territory is necessary.

Economics of trawlers

The economic assessment of the trawlers during 1993-'94 (Table 5) has indicated fairly high

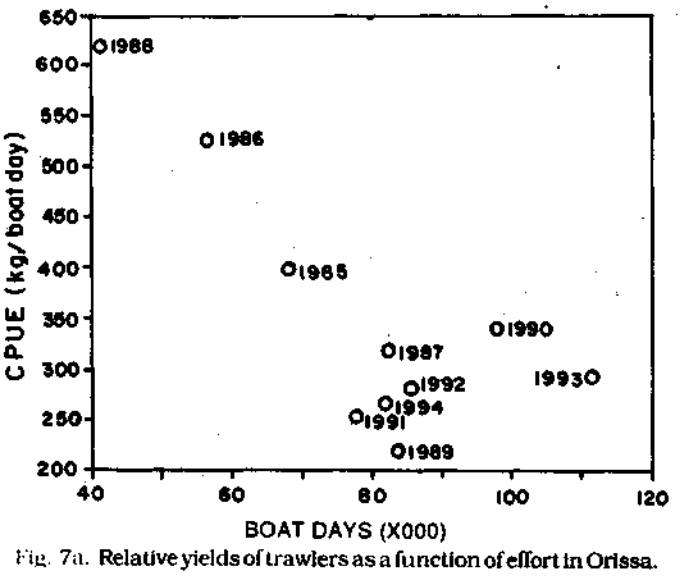

Fig. 7a. Relative yields of trawlers as a function of effort in Orissa.

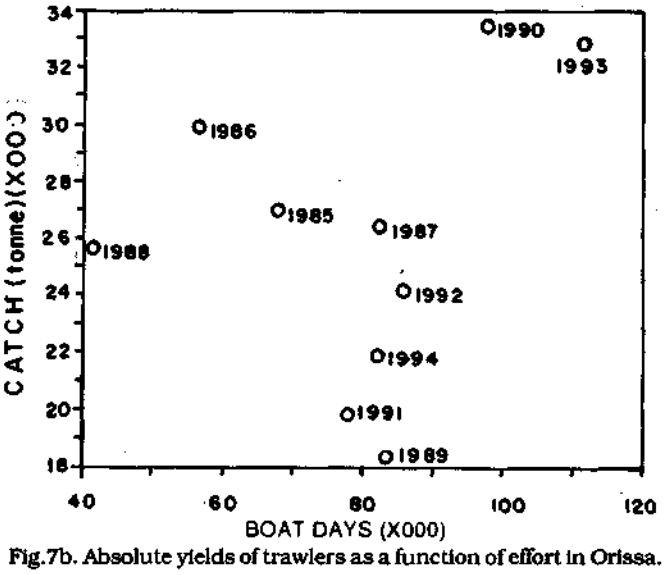

Fig.7b. Absolute yields of trawlers as a function of effort in Orissa.

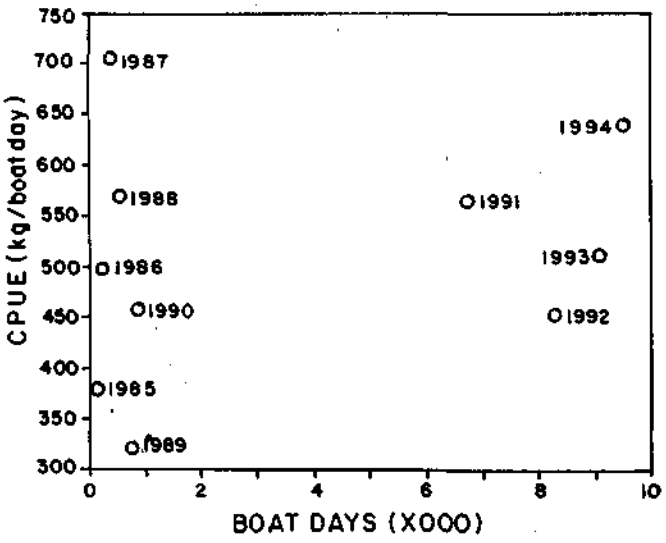

Fig. 8a. Relative yields of trawlers as a function of effort in West Bengal.

annual return (32.6-38.2%) of the capital investment. The high annual return is one of the major factors for increase in effort in the inshore areas.

Suggested management measures

It is clear from the vital statistics of the east coast fisheries that the inshore area (< 50m depth) is intensively exploited and there is considerable scope for intensifying the effort in the offshore area (>50m depth). The following fishery management measures are suggested for all the maritime states/UT in the east coast.

i. As the present trawl effort is limited to a depth below 70m, larger trawlers (>50' OAL) may be introduced to fish in the 70-200m depth zone. The fish hold capacity in these vessels should be large enough (>10 t) to store all the bycatches.

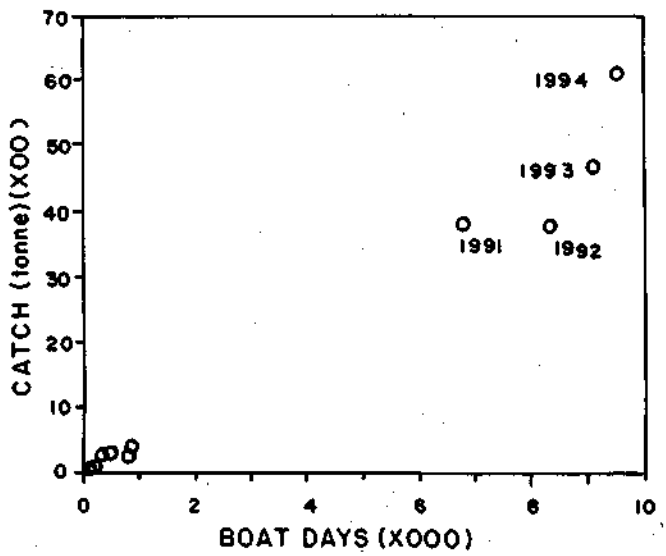

Fig. 8b. Absolute yields of trawlers as a function of effort in West Bengal.

TABLE 5. *Economics of trawlers operated along the east coast during 1993'94; the values are in terms of Rs in lakhs*

Parameters	Tamil Nadu	Andhra Pradesh		Orissa		West Bengal
	*	*	**	*	**	*
Capital investment	5.20	4.85	7.70	4.85	11.00	4.20
Operating cost/year	8.29	6.75		4.57	15.00	3.90
Fixed cost	1.56	1.46		1.35	2.75	1.26
Annual catch (tonnes/unit)	99.60	51.00		40.00	22.00	34.00
Value of catch	10.71	9.10		6.78	20.00	6.01
Annual net profit/year	0.76	0.89	1.79	0.86	2.25	0.85
Net operating income	2.32	2.35		2.21	5.00	2.10
Return (%)	32.60	36.40	23.30	37.10	35.00	38.20
Cost/kg fish (Rs)	9.98	16.10		14.80	80.70	15.15
Operating cost/kg fish (Rs)	8.43	13.20		11.40	68.20	11.47
Value/kg fish (Rs)	10.75	17.84		16.80	90.90	17.70

* Economics of 32-36' trawlers; ** economics of 42' trawlers

ii. The coast is rich in shark resource. Shark lining using SLR XV type vessels (32' with 26 hp Yanmar engine) should be introduced. These vessels could undertake about 3 days fishing per voyage.

iii. Operation of more number of gill nets like trammel net from motorised crafts should be encouraged throughout the coastline.

iv. Operation of hand squid jigging from motorised and mechanised boats has proved to be very successful in the Gulf of Mannar. This may be popularised in other areas by training the fishermen.

v. The concerned State Governments should promote the establishment of processing plants by extending incentives and by developing the core infrastructure like power, communication and transport.

vi. To enhance the productivity of the intensively exploited inshore areas, artificial reefs may be installed by involving the fishermen co-operative societies in selected coastal fishing villages. The expertise of the CMFRI and the NGOs already engaged in fabrication and

installation of the artificial reefs may be availed.

vii. The fisherfolks could be guided to take up small scale coastal aquaculture and mariculture as an additional/alternative employment (as suggested in Section II).

viii. The fishermen require awareness on the need for fishery management, ill effects of large scale exploitation of juveniles, mesh size regulation, fishing diversification and benefits of installation of artificial reefs. Due to the low literacy rate prevailing among the fisherfolk, mass communication may be made through TV, video, films, radio etc. The services of National Literacy Mission may be utilized.

In addition to the above measures, each state may have to consider individual issues and take up appropriate steps.

Tamil Nadu & Pondicherry

i. As there is no scope for increasing the effort in the inshore waters, restriction and management of trawling effort in depths below 50m is vital.

ii. At present there is no fishing regualtion in the northern part of Tamil Nadu and Pondicherry. The existing long voyage trawlers in Madras, Pondicherry and Cuddalore should be persuaded to undertake only one 5 day cruise in a period of 10 days. The daily fishing trawlers may be permitted to fish only on 3 fixed days in a week.

Andhra pradesh

As there is a production gap of 38.4% in the inshore and 75.9% in the offshore areas, there is scope for augmenting marine fish landings. The following measures are suggested.

i. Motorisation of Kakinada *Navas* and other indigenous fishing crafts.

ii. Introduction of mini trawlers (26' OAL) by converting and improvising the suitable artisanal crafts, as in Kerala.

iii. Introduction of high opening bottom trawling and midwater trawling.

iv. Deployment of the state owned 30' boats in Kakinada for experimental trawling/gill netting, squid jigging etc.

v. Deployment of sona boats of Visakhapatnam Fisheries Harbour currently fishing in the Sandheads to exploit the offshore grounds of the Andhra coast.

vi. Several thousand tonnes of bycatches are discarded in the Sandheads area by the fishing vessels from Andhra Pradesh due to various constraints. The following measures would facilitate the landing of the bycatches:

- By restricting the fishing operation to 3 days per voyage of sona boats and motivating the fishermen to land at Diamond Harbour, Roy Chowk and Paradeep, which are nearer to the Sandheads.
- By suitably increasing the storage capacity of the vessels in accordance with their length to accommodate the entire bycatch.
- By salt curing the bycatches on board and landing it by carrier boats at regular intervals together with iced bycatches.
- By processing the bycatches to produce value added products and development of market for these products.
- By processing the bycatches to produce quality fish meal and fish oil.
- By setting up bycatch processing plants at the major fishing ports by availing experitse from the IFP, CIFT and MPEDA.

Orissa

i. As the relative yield of the trawlers has significantly reduced with increasing effort, trawling in the inshore areas could not be further increased. However, offshore fishing in the 100-200m depth zone could be encouraged by inducting larger trawlers (>50' OAL) for operation from Paradeep and Puri fisheries harbours.

ii. Diversified fishing like gill netting and long lining vital for Orissa.

iii. The codend mesh size of the trawl net may be increased to 25mm by invoking the Marine Fisheries Regulation Act, 1992. This would reduce exploitation of juveniles.

iv. The bycatch discard has to be reduced following the measures suggested for Andhra Pradesh.

West Bengal

The marine fishing activity of West Bengal has increased many times and there is further scope for expansion. The production gap is 77.7% in the inshore and 89.3% in the offshore areas. The suggestions for further development are:

i. The state should induct more small and large mechanised vessels at Diamond Harbour and Roy Chowk.

ii. Berthing facilities should be provided at Diamond Harbour and Roy Chowk for a fixed number of fishing vessels from Andhra Pradesh.

iii. Motorisation of the existing non-mechanised boats in 24 Parganas and Midnapore districts.

iv. Infrastructure facilities such as approach roads, freezing plants, dry fish platforms, market outlets etc. should be provided in the major fish landing centres and fishing harbours.

II COASTAL AQUACULTURE MANAGEMENT

The east coast of India is endowed with an extensive area of coastal fallow lands, sheltered bays, lagoons, estuaries and backwaters and a large variety of cultivable marine organisms of nutritional, therapeutic, ornamental and industrial values. Despite the rich biodiversity and aquaculture potential at present, only shrimp farming has taken roots in the states bordering the east coast of India. Most of the existing aquafarms are owned by non-fishermen communities. A host of social and environmental issues have recently been raised against shrimp farming. These issues could well be overcome by adoption of eco-friendly culture practices, by the introduction of biculture and polyculture techniques with compatible species of finfishes, crustaceans, molluscs and seaweeds and by the active involvement of the coastal fishermen. Empowering the coastal fishermen communities in small scale aquaculture by providing training and technical and financial support would enable them to develop alternate avenues of livelihood, as the limited coastal capture fisheries resources of the Indian east coast cannot sustain the fast growing fisherfolk population. As the literacy rate among the fishing communities is very low, a massive awareness building campaign has to be launched to educate them on the socio-economic benefits of small scale coastal aquaculture and mariculture.

Survey to identify areas suitable for coastal aquaculture

The total area surveyed and identified as potential for coastal aquaculture in the Bay of Bengal coastal zone is about 6,43,000 ha. This does not include the suitable sites in the nearshore areas of the sea, as well as onshore areas contiguous to the coast, backwaters, lagoons and estuaries. Thus the potential would be far greater than the areas already surveyed and identified. Therefore, there is a need for reassessment of the coastal areas to identify suitable sites for coastal farming of cultivable marine species in various coastal ecosystems.

Remote sensing data and satellite imageries available with the National Remote Sensing Agency should be utilised for identification of sites in all the four states.

Detailed macro- and micro-level survey should be conducted in the states to gather information on the geophysical, hydrobiological and meteorological conditions. Information on the land use pattern and land based activities should be generated for the identified sites. Based on the above information, specific technologies suitable for the area would be suggested by the CMFRI.

Technologies for immediate application

There are several economically viable small scale technological packages readily available with the ICAR institutions. Depending upon the suitablility of the sites, these technological packages can be effectively translated for the benefit of the coastal fishermen communities by utilising the coastal water and the land resources. Some of the proven technologies are:

1. Pearl culture (sea and onshore) **2.** mussel culture (sea and onshore, along with shrimp/fish), **3.** shrimp culture, **4.** shrimp broodstock bank, **5.** shrimp backyard hatchery, **6.** shrimp seed bank, **7.** fresh water prawn backyard hatchery, **8.** polyculture of shrimp with other compatible species such as seaweeds, clams, mussels, finfish etc. depending on the suitability of the sites, **9.** cottage shrimp feed industry, **10.** crab fattening, **11.** lobster fattening, **12.** seaweed culture, **13.** raft and line culture of pearl oyster integrated with artificial reefs and **14.** raft and line culture of mussel integrated with artificial reefs. Depending on the demand for seed, hatcheries could also be set up for mussels, clams and pearl oysters. The ICAR Institutes (CMFRI, CIBA and CIFE) would provide the expertise for setting up such small scale units by individual fisherman or by fishermen co-operative units.

As a pilot programme, the grant of Rs 5 lakhs provided by the Union Agriculture Ministry to three of the four states (excluding West Bengal) may be utilized to establish model culture units for mussel, clam, edible oyster, pearl oyster and seaweeds and to train the fishermen.

Alternatively, the above grant of Rs 5 lakhs may be utilised for raft culture of mussels and pearl oysters integrated with the artificial reef programme suggested for each of the states under

the earlier section on coastal fisheries management.

Model farms and facilities

At present shrimp is the only group preferred for farming as there is little awareness among the farming communities about the culture potential of other species. Shrimp farming witnessed spectacular growth during the past five years. But the outbreak of disease and certain social and environmental issues during the past two years, by and large, have decreased the pace of growth. Hence there is a need for diversification of culture techniques by introducing biculture and polyculture techniques and using marine species compatible with shrimp farming. Mussels, clams, oysters, seaweed and certain finfish could be the candidate species. These species have the potential to substantially reduce the nutrient load and plankton density from aquaculture wastes and yield additional biomass from the culture systems. Besides, sustainable aquafarming depends on optimum utilisation of inputs such as seed, feed, fertilizers, chemicals and water, and treatment of wastewater through the application of ecofriendly techniques. Therefore, there is an urgent need to create model farms with adequate facilities for aquafarm waste treatment systems in each of the maritime districts of the east coast states to demonstrate sustainable monoculture and polyculture techniques.

Disease management in aquafarms requires immediate attention. A network of disease diagnosis laboratories has to be set up along the coast. Initially the existing facilities of CMFRI at Madras, Tuticorin, Mandapam and Visakhapatnam, CIBA at Madras, Puri and Kakdwip and the CIFE at Kakinada may be strengthened for intensification of research and training.

Common irrigation, drainage and other essential infrastructure facilities must be made available by the state governments for undertaking small scale mariculture by the fisherfolk.

Research needs

In order to circumvent the socio-economic and environmental issues relating to aquaculture, time-bound research programmes may be taken up on the following priority areas.

- Studies on the carrying capacity for optimum utilization of coastal land and water resources for aquaculture;
- Impact of aquafarm wastes on the nursery grounds and inshore waters;
- Economic performance of farms adopting different culture (extensive, improved extensive and semi-intensive) practices;
- Economic performance of monoculture and polyculture techniques;
- Impact of shrimp culture on shrimp nursery grounds and shrimp fishery in the inshore waters;
- Sea ranching of crustaceans and assessment of its impact in the inshore waters. Management strategies for onfarm waste reduction;
- Diseases in the culture systems, nursery grounds and inshore waters and evolving disease management strategies;
- Socio-economic analysis of integration of artificial reefs with raft or line culture of mussels and pearl oysters.

Training needs

Lack of adequately trained personnel in sustainable culture techniques and diversification of culture practices are one of the major constraints for coastal aquaculture development. A massive training programme has to be launched by designing appropriate curriculum and training strategies to effectively implement the small-scale coastal aquaculture in all the states in the east coast with the following objectives:

- Training the fisherfolk to take up alternative employment like small scale mariculture;
- Training the farmers, trainers, extension and development personnel on sustainable coastal aquafarming techniques including disease diagnosis, prevention and control;
- Development of training aids including video films and manuals.

Awareness building needs

A massive awareness building campaign is essential through mass media on the benefits of sustainable coastal aquaculture highlighting the following aspects;

- Shrimp seed bycatch conservation;
- Management of inputs (water, seed, feed, fertilizers) and disease in farms;
- Ecofriendly coastal aquaculture involving shrimp, seaweed fish and bivalves considering the suitability of the site;
- Socio-economic benefits of small scale coastal aquaculture as an alternative or part time avocation for the coastal fishermen communities.

PRESENT STATUS OF TRAWL FISHERY AT COLACHEL

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Introduction

Colachel (Lat. 8°10'N, Long. 77°15'E), about 35 km northwest of Kanyakumari in the southwest coast, lies within the Kanyakumari District of Tamil Nadu. Presently a municipal town, it has been an important fishing centre for traditional as well as mechanised fishery sectors, the latter being relatively recent. Trawlers operate from here during monsoon months in numbers varying from 20 to 250 per day depending on the catch trend. (Fig. 1). Absence of a fishing harbour is a major constraint, and demand for one is gaining

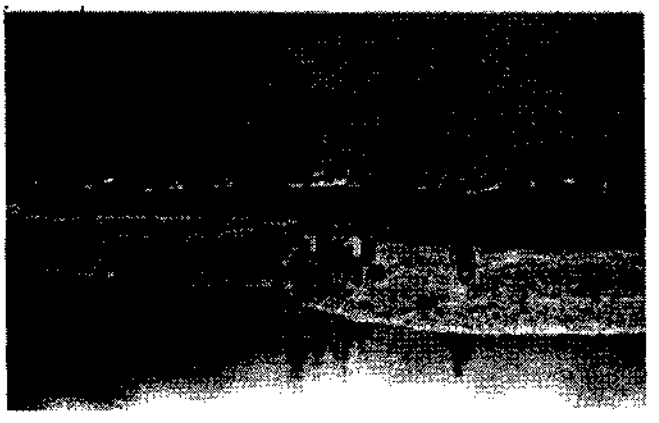

Fig. 1. Trawlers after a day's fishing.

Scope of the study

Large quantities of finfish, cuttlefish, squid, prawn and sand lobster are landed here in a period of 3 to 5 months of trawl operation every year. An yearly average of 5,903 t (1990-'94) of marine fish worth Rs. 125.4 million is landed here of which 62.58% is realised from cephalopods alone. Besides cephalopods and crustaceans, varieties of finfish and, during some years, gorgonids were also exported. During 1990-'93 a major portion of the catch comprising of low grade fishes was sent to fishmeal plants in north Tamil Nadu. Unlike other centres where trawling is mainly done for prawns, Colachel is cephalopod oriented and prawn catch is low in this area (0.44% of the annual average trawl landings). Hence, usually the presence of either cuttlefish or squid in the fishing grounds triggers the trawl operations except on rare occasions when other items are spotted in plenty.

The mechanised fishing operations at Colachel for a 3 month period in 1989 with economics of its operation, catch and distribution have been reported by Sathiadhas and Benjamin (*Seafood Export Journal*, **28**(1), January 1991). The present account deals with the trawl landings, the revenue realised and some related aspects for a period of 5 years from 1990 to 1994 at Colachel.

Data source

Catch and price statistics collected from the centre for the Fishery Resources Assessment Division of the Central Marine Fisheries Research Institute form the major source of data of the present report. The price of fish reported here is the price at the fish landing centre.

Craft and gear used

Mechanised boats operating from here are in the OAL range of 11 to 15 m fitted with Ashok Leyland engines of varying horse power, namely, ALM/370 - 68 HP, ALM/400 - 98 HP, ALM/402 and 411 - 106 HP and ALM/412-110 HP. Hulls of about 75% of the boats are made of wood sheeted with aluminium, 20% of wood coated with fibreglass and the rest of steel. About a third of the fleet is in the lower length range and is fast getting replaced by bigger boats.

The type of trawl operated is locally termed *mixture madi* of about 50 m length having bigger meshes than the ordinary trawl. Beginning with 160 mm mesh at the wings and ending at 40 mm

at the cod end, the portion in between has sections of mesh sizes 120, 80 and 60 mm towards the tapering side. Throughout the entire length of the net the lower belly (lower half) is of thicker High Density Poly Ethelene twine (HDPE twine No. 2.5 or 2) to withstand the rough bottom operation while the upper belly which does not come in contact with the sea floor is of less thicker twine (HDPE twine No. 1.5). The net is supported by Poly Propylene rope (PP rope Nos. 6 to 8) and thus the net is also called *rope madi*.

Details of operation

Normally the boats with a crew of 5-8 leave the base at 0500 hrs, make 2 or 3 hauls at conducive grounds and return to shore between 1200 and 1700 hrs. The direction and distance from the base depend on the type of catch intended for and stocks available. The usual area covered is anywhere between Kanyakumari in the southeast and Vizhinjam in the northwest at distances ranging from 5 to 35 km and at 25-70 m depth.

During 1990 the trawl operations lasted for 4 months from August to November; in 1991 from August to October; in 1992 from July to September and in 1993 and 1994 from June to October. Thus the trawling operations were carried out only for 20 months totally during the above 5 year period.

Effort distribution

A fishing trip made by a boat on a day was taken as a unit of effort. Ranging from 5,980 in 1991 to 12,547 in 1994 an yearly average of 8,908 trips was made during 1990-1994. August and September were the months of peak trawl fishing and landings, when, on an average, 63.1% of the total units was operated bringing 70.1% of the annual catch with the exception of 1993 when 67.8% of the total units was operated during July and August landing 76.8% of the total catch (Table 1).

Catch per effort

The monthly average catch per trip varied from 144 to 1,390 kg. The highest rate (1,390 kg) was in August 1990 due to heavy landings of *Odonus niger* and *Decapterus* spp. and the next (1,114 kg) was in September 1991 due to good catch of

TABLE . 1. *Monthly catch in tonnes (C) effort (E), and catch per effort in kg (C/E) of the trawl operations at Colachel during 1990'94*

Year	Parameters	Months						
		June	July	August	September	October	November	Total
1990	E	-	-	2,631	2,016	1,475	350	6,472
	C	-	-	3,654	1,452	445	105	5,656
	C/E	-	-	1,390	720	301	297	874
1991	E	-	-	2,224	2,965	791	-	5,980
	C	-	-	1,963	3,302	125	-	5,390
	C/E	-	-	883	1,114	155	-	901
1992	E	-	1,858	3,175	3,300	-	-	8,333
	C	-	907	2,100	1,959	-	-	4,966
	C/E	-	488	661	594	-	-	596
1993	E	1,020	3,213	4,390	1,112	1,475	-	11,210
	C	853	2,231	1,956	161	251	-	5,452
	C/E	836	694	446	144	170	-	486
1994	E	1,440	2,463	3,036	3,256	2,352	-	12,547
	C	1,407	1,820	1,323	2,804	696	-	8,050
	C/E	977	739	435	861	296	-	642
Average effort		492	1,507	3,091	2,530	1,219	70	8,908
Average catch		452	992	2,199	1,934	301	21	5,903
Catch per effort		919	658	711	765	249	300	663

Saurida spp. (Table 1). The daily average catch per trip was occasionally above 1,000 kg during the months of peak landings (August, September) and it touched the highest peak of 1,705 kg on 29-8-1990 due to the abundance of *Decapterus* spp., *Odonus niger* and *Saurida* spp. On 19-9-1994 three trawlers landed an unprecedented total quantity of 5,200 kg at the rate of 1,900 kg each by two and 1,400 kg by the other (details elsewhere in this report).

Trend in catch

The annual catch ranged from 4,966 (1992) to 8,050 t (1994). The average yearly catch was 5,903 t and 70.1% of it was caught in August and September. But, as an exception, the peak landings during 1993 (76.8%) were in July - August (Table 1). Eventhough different groups dominated during the years of observation on an average, cephalopods was the most abundant constituent (22.4%) followed by lizard fishes (21.5%), balistids (14.7%), carangids (13.0%), serranids (6.5%), threadfin breams (6.3%) and barracudas (5.4%). These together contributed 89.8% to the total landings. Others which accounted for the remaining 10.2% were crustaceans, gorgonids, pomfrets, tunas and species of *Arius, Holocentrus, Kathala, Lethrinus, Plectorhynchus, Priacanthus, Scolopsis* and *Upeneus*, and the miscellaneous varieties comprised of crabs, eels, flatfishes, rays, sharks and species of *Fistularia, Lutjanus, Megalaspis, Parupeneus* and *Trichiurus*. Fig. 2 gives the yearwise effort, catch and catch per effort, and Fig. 3, the monthly averages for the same parameters. Relative abundance of catch components for the years is presented in Fig. 4A.

Catch composition

Catch details of seven groups in the order of abundance on an annual average basis and two groups of topical importance namely, crustaceans and gorgonids are given below. Some groups were landed only for one or two years showing irregular fishery. Among them those found commercially important are dealt with under the subtitle 'others'.

Cephalopods : This group constituted by cuttlefishes and squids, was the most dominant one in the landings and was fished mainly off Muttom, Colachal and Vizhinjam. It plays a vital role in sustaining the trawl operations accounting

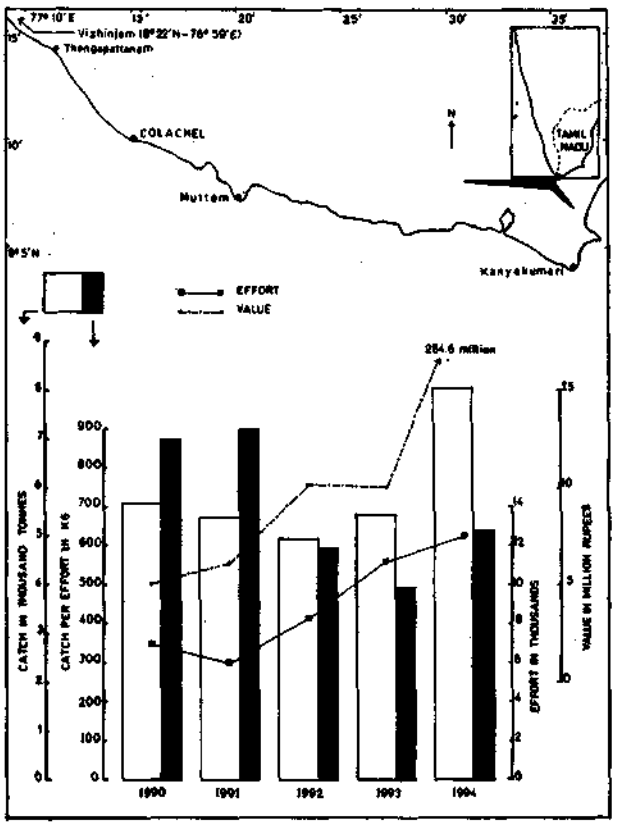

Fig. 2. Annual effort, catch, catch per unit effort and value realised of trawl fishery at Colachel during 1990-'94

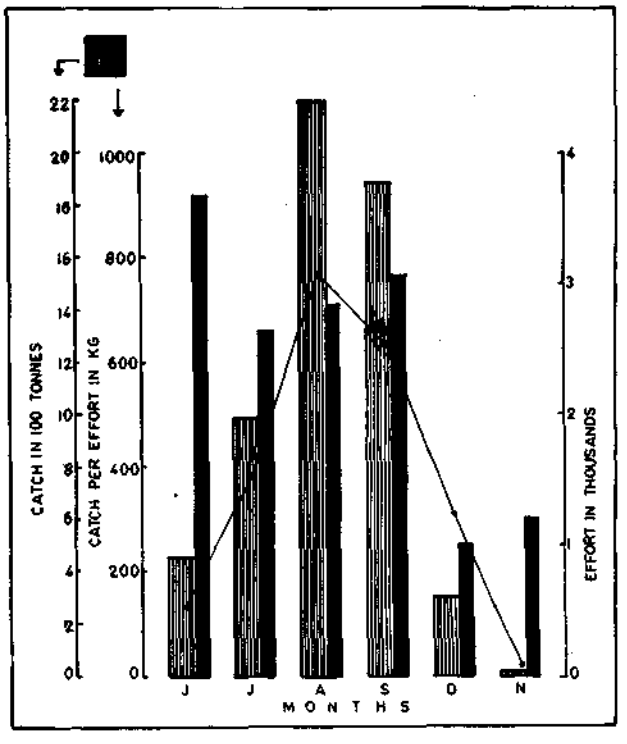

Fig. 3. Average monthly trends of trawl landings, effort and catch per unit effort at Colachel during 1990-'94.

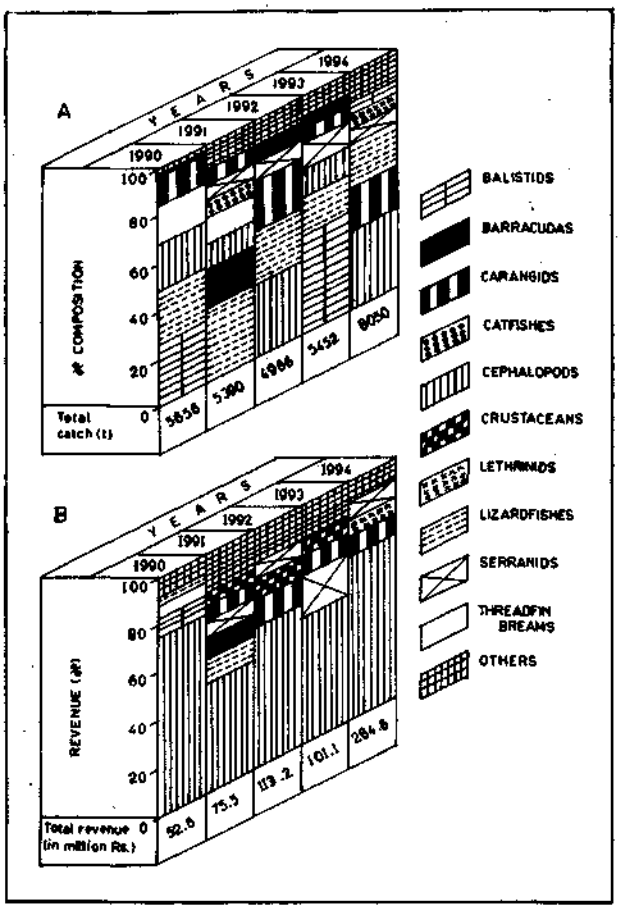

Fig. 4. A. Percentage composition of different groups of trawl fishery at Colachel. B. Value realised (%) of different groups of trawl fishery at Colachel. (In both the figures only those which contributed 4% and above are independently projected; the rest clubbed under 'others').

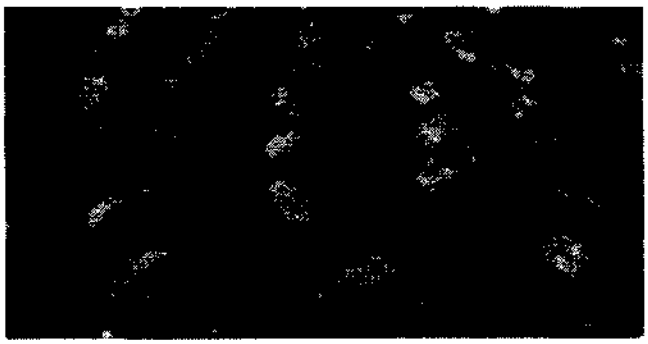

Fig. 5. Cuttlefish (*Sepia pharaonis*) – the target of trawlers – being paraded to tempt traders.

to 22.4% of the annual average catch with 1321 t ranking the first in the total revenue realised (Fig. 5). Monthly average catch of cephalopods ranged from 7 t in November to 747 t in September and the catch per effort from 26 kg in June to 295 kg in September. Monthwise catch of cuttlefish and squid with catch per effort for the

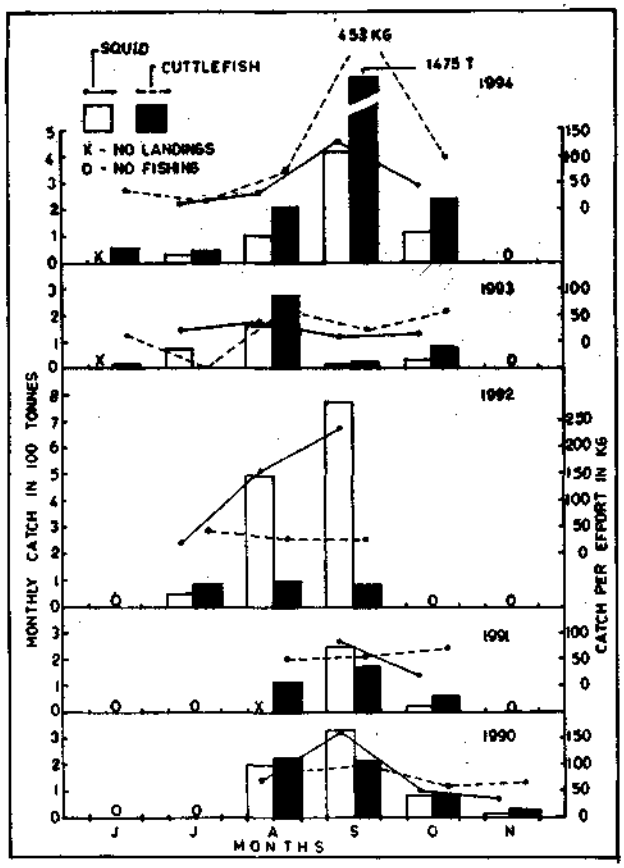

Fig. 6. Monthly trend of catch and catch rate of squid and cuttlefish at Colachel during 1990-'94.

5 years is presented in Fig. 6. The species of cuttlefish landed were *Sepia aculeata, S. pharaonis* and *Sepiella inermis* and those of squid were *Doryteuthis sibogae, D. singhalensis* and *Loligoduvauceli*. But in the case of cuttlefish *S. pharaonis* was the most dominant species whereas *S. aculeata* was landed in considerable quantity only occasionally. Availability of the third species was meager. All the afore said species of squids occurred in good quantities either on the same or different occasions. *S. pharaonis, D. singhalensis* and *L. duvauceli* ramained the much valued species. The price of cuttlefish ranged from Rs. 45 to 100 per kg and that of squid Rs. 7 to 80. Annual average quantity of cuttlefish landed was 703 t worth Rs. 55.2 million and the same of squid was 618 t valued at Rs. 23.3 million. Cuttlefish as a single item, contributed to 44.0% of the total revenue and squids came second with 18.6%. This group was responsible for as much as 31.2% of the total landings in 1992 and 33.1% in 1994.

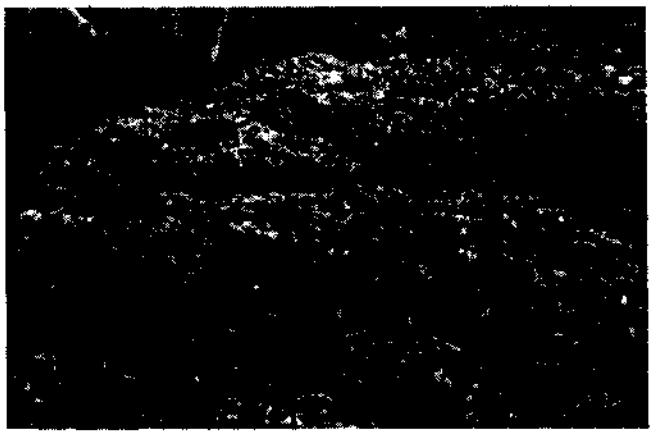

Fig. 7. The lizardfishes to be despatched to fishmeal plants.

Lizard fishess : This group formed the second most abundant component of the trawl fishery contributing to 21.5% (1270 t) of the average yearly landings (Fig. 7). Represented by *Saurida tumbil, S. undosquamis, Synodus jaculum* and *S. indicus*, 92% of their landings was accounted during July to September eventhough they were available during all the months of the trawl operation. These were the most abundant items of landings in 1991 forming 31.5%. During this period the daily average catch per trip has gone upto 864 kg. With the price range of Rs. 0.50 to 8.00 per kg over the 5 years, the major portion of the landings was diverted to fishmeal plants during 1990-'93 excluding a small quantity of larger individuals usually *S. tumbil*, for local markets.

Balistids : Landings composed exclusively of two species, viz, *Odonus niger* and *Sufflamen fraenatus* (= *S. capistratus*). They were present throughout the trawling season. But their occurrence during July - August was heavy reaching a maximum daily average of 961 kg per unit. Almost the entire bulk was sent to fishmeal plants during 1990-'93. They contributed to 14.7% (865 t) of the total landings, but being low - priced (Rs. 2.50 to 6.00/ kg) fetched only 1.8% of the total revenue. *O. niger* was the most prominent catch in 1990 forming 26.2% of the landings. So was *S. fraenatus* in 1993 which contributed 40.9% to the total landings. The landings of the two species were inversely proportional during the reported years. It may be interesting to note that while either of these two species continued to land here in bulk quantities, in the other nearby areas of the southern coast where it was once a major artisanal seasonal fishery, the catches are becoming negligibly low for more than a decade now.

Carangids : Species of this group accounted for 13.0% (765 t) of the total catch on an yearly average. *Decepaterus* (*D. russelli* and *D. macrosoma*) were responsible for 8.5% of the total carangid catch. Being low priced (Rs. 2 to 8 per kg) the average yearly revenue realised from *Decapterus* spp. was only 3.3% (Rs. 4.1million) whereas the rest of the carangids (the common of which were *Carangoides ferdau, C. praeustus, Caranx melampygus, Seriolina nigrofasciata* and *Uraspis helvola*), which had better landings in July-September, accounted for 4.6% of the revenue amounting to Rs. 5.8 million at Rs. 12 to 40/ kg. A good quantity of these species was exported while a major portion of *Decapterus* spp., which was more in June-August was sent to fishmeal plants during 1990-'93.

Serranids : The contribution of this group to the annual average was 6.5% (384 t); but they fetched relatively better revenue (8.0% amounting to Rs. 5.6 million) as price was ever on the increase ranging from Rs. 13 to 45 per kg due to heavy export demand. (Fig. 8). Among the many species landed mostly during August - September, the following 10 species were common: *Cephalopholis argus, C. sexamaculata, C. sonnerati, Epinephelus bleekeri, E. diacanthus, E. malabaricus, E. merra, E. rivulatus, E. tauvina* and *E. undulosus*.

Threadfin breams : *Nemipterus bleekeri* and *N. japonicus* constituted the species which were largely landed in August and September. Larger specimens were sent to local as well as outside

Fig. 8. Serranids meet the increasing demand from export industry.

markets and smaller ones, while landed in plenty, were pooled with those sent for fishmeal plants during 1990-'93. Its price varied from Rs. 2.50 to 8.00 per kg. Contributing to 6.3% (374 t) the annual average total landings, its share in the total revenue was only 1.4% (Rs. 1.8 million).

Barracudas : These were represented by *Sphyraena forsteri, S. jello* and *S. obtusata.* Mostly medium sized specimens contributed the fishery. Small numbers of larger ones were sorted out for export (Fig. 9). Forming an yearly average

Fig. 9. Barracudas – undersized, and hence spared for local consumption.

of 322 t (5.4%) in the total landings and being available mostly during July-September, its contribution towards revenue was 2.8% (Rs. 3.6 million). Price ranged from Rs. 7 to 35 a kg.

Crustaceans : Prawns, sand lobsters and crabs (the last included under miscellaneous) were the common crustaceans encountered. *Penaeus japonicus* and *P. indicus* were the prawns landed; the former was recorded during 1990, 1991 and 1994 with a total of 21 t worth Rs. 3.5 million. The latter was recorded during 1991, 1992 and 1993 with a total of 68 t

Fig. 10. Gorgonids – their varieties, size and shape on display immediately on landing.

generating Rs. 15.7 million. *Thenus orientalis*, the sand lobster, was recorded during all the years except 1993 with a total of 42 t valued at Rs. 4.0 million. The crustaceans contributed annually to only 0.44% (26.2t) of the total landings, but claimed 3.7% (Rs. 4.6 million) of the average annual revenue. The price of prawns ranged from Rs. 80 to 400 a kg and of sand lobster Rs. 60 to 130.

Gorgonids : Commonly known as sea-fans or horny corals, (Fig 10 & 11 and front cover photo) these anthozoans are considered important items as they have good export market. They are landed only as bycatch and were present only during 1991 and 1992 when 61 t (Rs. 1.0 million) and 16

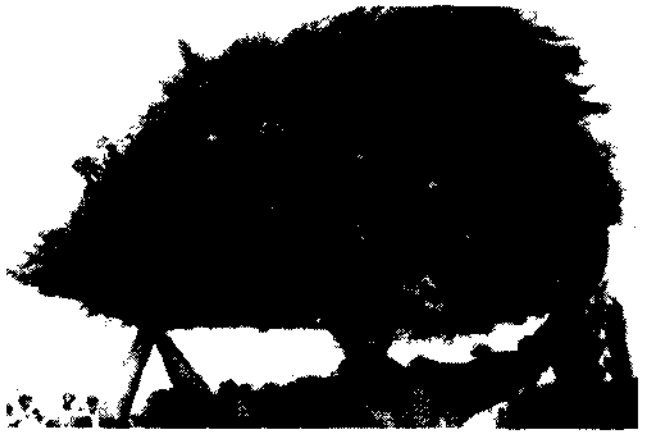

Fig. 11. A head load of gorgonids being taken to the trader.

t (Rs. 0.2 million) were landed respectively. The price ranged from Rs. 10 to 18 per kg. The seafans being displayed by spreading on the shore to attract merchants was a common scene here. Though there are many species in the catches, mainly of the 'black' and 'red' types the larger 'black type' belonging to the genera *Echinogorgia, Echinomuricea* and *Heterogorgia* are preferredfor export. These gorgonids were taken in the trawl operations made off Muttom and Thengapattinam. Export of gorgonids became scarce in some neighbouring districts also in the later years. According to the fishermen, absence of gorgonid landings in the trawl since 1992 may be due to the thoroughly depleted condition of the fishing grounds at Colachal. This view is supported by the landing of young gorgonids in small numbers in the trawl catches.

Others : Lethrinids, a good table fish having export value, were landed during 1991, 1992 and 1994 in the order of 32, 58 and 444 t respectively.

Fig. 12. Catfishes – not a regular fishery.

During 1994 its contribution to the total landings was 5.5% valued at Rs. 20.9 million with rates up to Rs. 50/kg. The common species were *Lethrinus lentjan, L. microdon, L. nebulosus* and *L. ramak.*

Haemulids, chiefly, *Diagramma pictum, Plectorhynchus griseus, P. picus* and *P. schotaf* were landed only in 1994 when 98 t of it worth Rs. 3.7 million at rates up to Rs. 45 a kg was landed, and almost the entire quantity was exported.

Landing of catfishes was recorded only in 1991 and 1993. In 1991 371 t (6.9% of the year's total landing and valued at Rs. 3.5 million) and in 1993 19 t were recorded. The catch generally made up of *Arius dussumieri, A. tenuispinis* and *A. thalassinus,* was of smaller size range and sold at local markets (Fig. 12).

Unusual catches

Catch of some species on certain days during the 5-year period of study reached exceptional dimensions. They are recorded here:

Balistids : On 7-8-1990 a total catch of 129 t was landed by 94 units at the average rate of 1376 kg per unit. *Odonus niger* alone constituted 90 t (70%) at 961 kg/unit.

Carangids : Total landing by 115 units on 29-8-1990 was 196 t at 1705 kg per boat. Of this, 91 t (46.4%) was *Decapterus* spp. the catch per unit being 796 kg.

Lizardfishes : Catch of *Saurida* spp. on 16-9-1991 was 111 t at the rate of 864 kg perunit.This was 61% of the total catch of 182 t of that day by 125 units at an average of 1418 kg a boat.(Fig. 7).

Cephalopods : One of the present authors had recorded at Colachel on 8-9-1986 a total catch of 45.8 t by 54 trawlers at 882 kg/boat, of which 27 t (60%) was cuttlefish at 519 kg per boat (CMFRI News Letter No: 33, July-September 1986). Now after eight years, the total landings at the same centre on 19-9-1994 was an unprecedented 149 t, out of which 139 t (92%) was of cephalopods (cuttlefish 64.8% and squids 27.2%) to the value of Rs. 105.5 million (87.2 and 18.3 million respectively for cuttlefish and squid). This astounding quantity and revenue for a day was achieved by 145 units landing 87 t cephalopods and 10 t finfishes at an average catch per unit of 670 kg. In addition, 3 other trawlers landed a total of 52 t almost entirely of cephalopods.

Disposal

Export market : Apart from cuttlefishes, squids, prawns and sand lobsters, varieties of finfish of a specified weight (generally around 1.5 kg) were procured and graded for export. These included carangids (other than *Decapterus*), haemulids, lethrinids, lutjanids and serranids. Gorgonids were also exported in 1991-'92.

Domestic market : Those categories which neither met export market nor regarded as trash fish were sold for consumption at local markets as well as at neighbouring districts. They included representatives of almost all groups. But however, those considered inferior in some years because of their abundance could be sold for human consumption later as explained in the ensuing paragraph.

Trash-fish market : For the first time fish from Colachel were sent to fishmeal plants in north Tamil Nadu (Periyar and Salem districts) during 1990 - 1993 when large quantities, mostly of balistids, *Decapterus* and lizardfishes, posed the problem of disposal locally. Others commonly included with them were sciaenids, small-sized threadfin breams, crabs, and species of *Fistularia,*

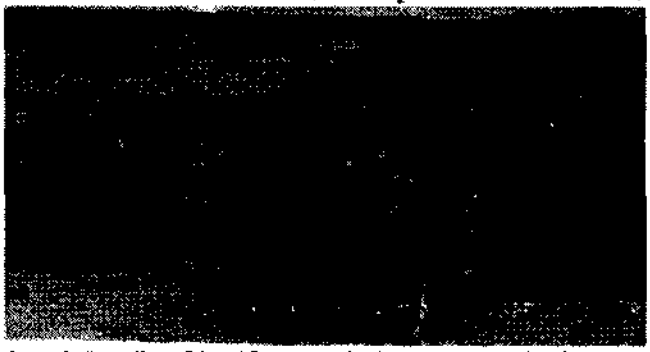

Fig. 13. Bundles of dried flutemouths (*Fistularia* spp.) to fishmeal plants.

Holocentrus, Priacanthus, Scolopsis and *Upeneus*. They were despatched in van loads of 2 t capacity in fresh as well as dried condition (Fig 13). The exact quantity of the fish despatched could not be ascertained. However, a modest estimate is 14 to 20 t per day during July - September. Since 1993 many good varieties of fish which were freely available earlier for local consumption became scarce and costly due to demand from export industry. As a consequence a major portion of the catch used for fishmeal plants were also diverted for domestic consumption. However, a small part of the catch was dried and sent to fishmeal plant occasionally.

Revenue trend

The turnover during the five years ranged from 52.6 (1990) to 284.6 million rupees (1994) with an annual average of Rs. 125.4 million. In the average annual revenue cephalopods topped with 62.6% (cuttlefish 44.0% and squid 18.6%) followed by serranids (8.0%), carangids (7.9%), lizard fishes (4.4%), crustaceans (3.7%), lethrinids (3.6%) and barracudas (2.8%). Contribution by these groups totalled to 93.0%. But however, the revenue-wise ranking varied each year depending on the quantity as well as the quality of the catch, but still the top position was retained exclusively by cephalopods. Yearly turnover from different groups is given in Fig. 4b.

General remarks

The annual average gross income per fishing trip worked out to a minimum of Rs. 8,121 in 1990 to a maximum of Rs. 22,683 in 1994. The unusual cuttlefish catch was the cause for the boost in income in 1994. Still even at its minimum the net profit (arrived at after deducting the operational and other incidental expenses) is attractive enough for the owner of the boat and net, and the crew who share it.

Boat operators claim that the bulk of the landings from *mixture madi* operations is from the grounds inaccessible to the traditional fishermen and can be caught only by trawls. The mesh size being relatively big (40 mm at the cod end) the possibility of large scale catch of young fishes is also unlikely. In fact such an occurrence has never been reported from Colachel. However, detailed population studies and catch estimates on the different species are required for a judicious management of the fishery in the coming years.

The boat operators are not without problems and constraints. Absence of a fishing harbour which is the basic infrastructure for a fleet of mechanised fishing boats is the major limiting factor. The recently constructed pier here (Fig. 14) for the purpose of shipping mineral sand to other

Fig. 14. The pier at Colachel. Would it ever be of use to trawl fishermen?

countries does not serve the purpose for which it was made due to technical reasons, and hence trawl operators wonder whether it would at any time be modified to be of use to them. The tactics employed by merchants and middlemen to lower the price of the catches have often vexed them. Occasional shortage of diesel is another nagging problem. The lurking animosity between mechanised boat operators and artisanal fishermen, which flares up at times, has become the bane of the fishermen in the district as a whole. In spite of all these odds the performance of trawl fishery during the reported five years has been satisfactory.

"The Kanyakumari District Mechanised Boat Operators Association," a registered society under which 400 boats have been registered till 1994, looks after the welfare of the trawl fishermen of the area. The society has been persuading the government for a fishing harbour here and it is hoped that the establishment of the harbour would go a long way in the development and expansion of trawl fishery in the area.

Acknowledgements

The authors are thankful to Dr. P.A. Thomas, Senior Scientist and Shri G. Gopakumar, Scientist (S.G.) for going through the manuscript and offering valuable suggestions for its improvement.

Dolphin killed by the propeller of a trawler

The dolphins occur commonly near Mandapam in the Gulf of Mannar. Several instances of their getting caught accidentally in gill nets, trawl nets and their occasional strandings in Mandapam and nearby places have been reported earlier (Table 1).

Dolphins have a tendency to follow the cod end of the fishing nets. On 10-4-1991 a male dolphin (*Delphinus delphis*) with caudal peduncle and flukes severed probably by the propeller of a trawler was washed ashore near the Indo-Norwegian project jetty at Mandapam.

Fig. 1. A common Dolphin *Delphinus delphis*, whose caudal portion was cut off by the propeller of trawler at Mandapam.

The carcass without caudal flukes had a length of 115 cm, and the total length of the present specimen should be approximately 135 cm.

*** Reported by S. Krishna Pillai and Dr. A. P. Lipton, Mandapam Regional Centre of Central Marine Fisheries Research Institute, Mandapam Camp 623 520.**

TABLE 2. *Morphometric measurements (in cm) of the common dolphin* Delphinus delphis *stranded at Mandapam*

Length from tip of snout to cut off caudal portion	115
Total length (approximate)	135
Width at caudal portion, at the region of cut	12
Tip of snout to centre of anus	80
Tip of snout to blow hole	23
Tip of snout to centre of eye	24
Tip of snout to anterior insertion of flipper	34
Length of flipper from anterior insertion to tip	22
Depth of body at anal region	65
Depth of body at origin of dorsal fin	82
Depth of body at origin of flipper	72
Length of upper jaw	19
Length of lower jaw	20
Number of teeth in each jaw on one side	60

TABLE 1. *Particulars of accidental catch/stranding of dolphins in Mandapam area*

S.No.	Date of accidental catch/stranding	species	Place	Total length (cm)	Weight (kg)	sex	References *(Mar.Fish.Infor. Serv., T & E. Ser.)*
1.	12.10.1980 (by trawler)	*Tursiops aduncus*	off Krusadi Island	182.5	65	male	No.**71** : 13-16
2.	26.11.1981 (by trawler)	*Tursiops aduncus*	off Mandapam	210.5	130	female	
3.	8.12.1981 (by trawler)	*Tursiops aduncus*	off Mandapam	143	26.5	--	
4.	20.2.1982 (by gill net)	*Delphinus delphis*	Near C.M.F.R.I Jetty	145	25	male	
5.	8.12.1982 (stranded)	*Delphinus delphis*	Thonithurai	159	46	male	
6.	28.1.1985 (stranded)	*Tursiops aduncus*	Krusadi Island	150	30	male	No. **88** : 21
7.	5.2.1985 (stranded)	*Sousa chinensis*	Fish farm Palk Bay	225	--	Female	
8.	29.9.1989 (by gill net)	*Stenella longirostris*	Ayyanarkovil, Near Mandapam	150	28	Female	No. **98** : 15-16
9.	18.6.1990 (stranded)	*Sousa chinensis*	Mandapam Camp	151	50	Female	No. **110** : 11
10.	15.9.1994 (stranded)	*Sousa chinensis*	Near CMFRI Jetty	255	200	Female	No. **88** : 21
11.	15.9.1995 (stranded)	*Sousa chinensis*	Seesniappa Dharga	221	--	--	
12.	9-1-1995 (stranded)	*Tursiops aduncus*	Near CMFRI Jetty	221	125	male	

On the stranding of a young Fin whale at Kanyakumari, Tamil Nadu*

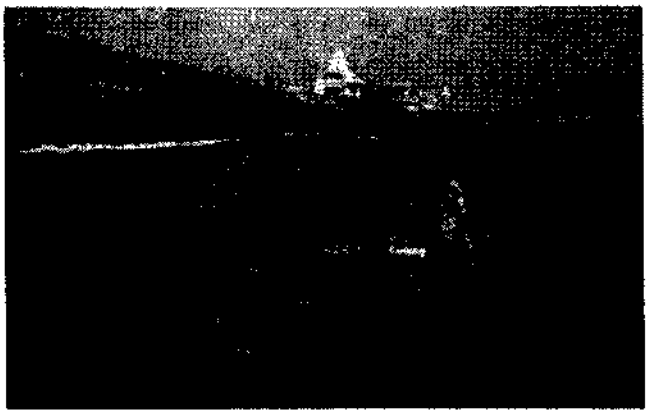

Fig. 1. The young Fin whale stranded at Kanyakumari, Tamil Nadu.

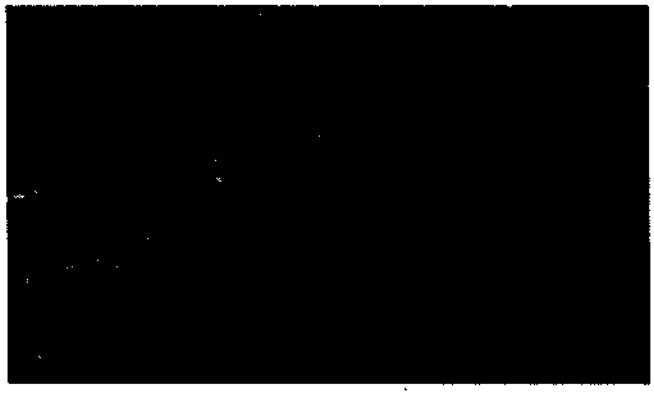

Fig. 2. A view from the front of the young Fin whale standed at Kanyakumari, Tamil Nadu.

A 6.8 m long Fin whale, *Balaenoptera physalus* (L.) commonly known as Common rorqual or Razor-back, and one among baleen whales which fall within the cetacean family Balaenopteridae (Rorquals) was stranded at Kanyakumari on 20-11-1995 at 1530 hours about 100 m away from Gandhi Mandapam at its western side. With serrations and fresh wounds on its back and lateral sides it got lodged among partially submerged rocks near the shore (intertidal) and died after an hour. Next day some fishermen towed it to the eastern side of the Mandapam in order to remove its blubber. But, later they were satisfied with removing only its dorsal fin and the flippers. As the carcass was lying amidst waves, in the evening, it started drifting to the interior waters and soon vanished from visibility.

Fin whales are known to move in schools usually and rarely singly. A newly born Fin whale, according to earlier studies, measures 6.5 m in length and its weaning starts only when it attains a length of around 12 m while an adult reaches a maximum length of 24 m. It is unlikely that the whale strayed away from its mother and the school on its own since it is a young one entirely dependent on its mother's milk for food. It is presumed that the wounds on its body may have been either due to attack of sharks or injuries caused by moving mechanised boats and that the resultant commotion could have caused the school to disperse making the young whale to go astray, become isolated and run aground.

Measurements other than its length could not be taken since it was partly immersed in water (Figs. 1 & 2) in the rock-strewn shore where there was incessant wave action.

*** Reported by Jacob Jerold Joel, Vizhinjam Research Centre of C.M.F.R.I., Vizhinjam, and I.P. Ebenezer, P. Paul Sigamony and A. Prosper, Kanyakumari Field Centre of C.M.F.R.I., Kanyakumari - 629 702.**

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Unusual landings of the prawn, *Penaeus merguiensis* by gillinetters at Jangira Murad, Maharashtra*

Unusual landings of the prawn, *Penaeus merguiensis* caught in gillnet (*disco jal*) were observed at Rajpuri, Dighi, Murad and Nadgoan landing centres during 14-9-'95 to 17-9-95. The IBM fishing units were operated at Rajara, creek backwaters of Murad-Jangira shore. Catch details collected from the centres revelaed that during the four days maximum catch of 294 kg was recorded from Rajpara followed by 173 kg from Dighi. Observations indicated that an estimated total of 620 kg of *P. merguiensis* were landed which is unusal as far as the prawn fishery of this region is concerned.

The price of *P. merguiensis at the* centres ranged between Rs. 200 and 250 per kg comprising about 22 to 30 specimens per kg.

*** Reported by D.G. Jadhav, Field Centre of CMFRI. Jangira Murad - 402 401.**

On the stranding of a Blue whale *Balaenoptera musculus* at Valappad beach, southwest coast of India*

Fig. 1. The stranded blue whale, *Balaenoptera musculus*.

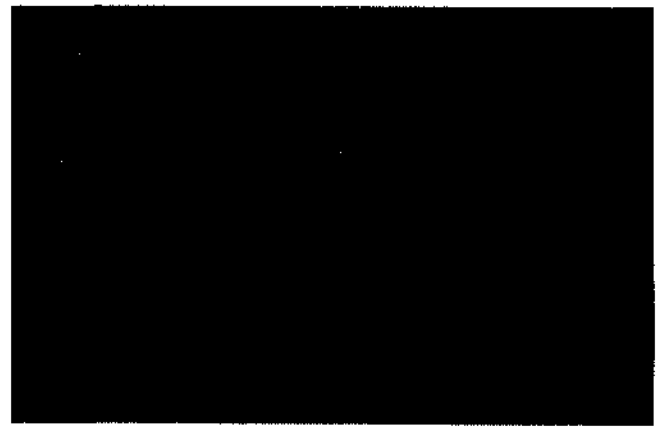

Fig. 2. Another view of the decomposed specimen.

A blue whale, *Balaenoptera musculus* (Linnaeus) was stranded at the Valappad beach, Trichur District on 29-10-'95. The whale measured 6m in total length.

* **Reported by K. G. Baby, Field Centre of CMFRI., Chavakkad 680 506.**

Turtles and Whale shark landed along Ratnagiri coast, Maharashtra*

Two turtles of the species *Lepidochelys olivacea* caught in hooks and line off Ratnagiri coast were landed at Rasiwada landing centre on 27-11-1995. One of the turtles measured 64 cm in length and 60 cm in carapace width, and had an approximate weight of 30 kg.

One whale shark of 20.75 m in total length was stranded at Madaban village near Rajapur along Ratnagiri coast on 30-9-1995.

*** Reported by B.N. Katkar, Field Centre of CMFRI, Ratnagiri - 415612.**

Devastating fire affected the fishing industry of Kasaragod Uttara Kannada District, Karnataka State*

On 12.11.1995 around 11.30 P.M. a fire occurred in the boat building yard at Kasaragod, 100 km south of Karwar in Uttara Kannada District, resulting in unprecedented devastation of property and materials. The fire damaged totally 3 boat building and repairing yards (the only ones available in the area) located on the left bank of the river Sharavati at its lower reaches in close proximity to the fish landing centre of Kasaragod. Extent of area affected by the fire is approximately 150 m. Kasaragod - Honnavar base is one of the major mechanised fishing centres of the region. The fire greatly affected the fishing industry of the area. Seventeen boats were totally burnt to ashes. Of these 15 boats were newly constructed and ready to be launched for fishing. Two boats were brought to the

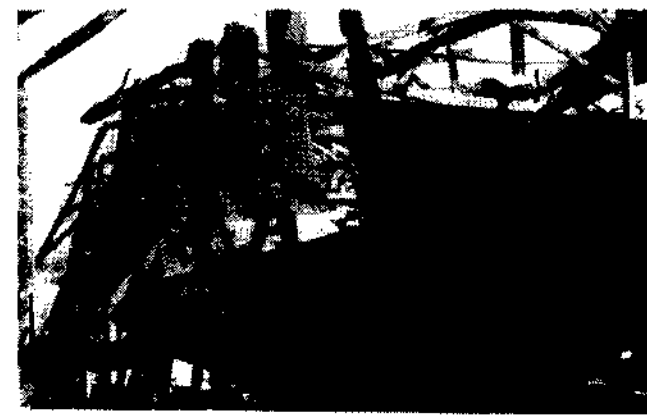

Fig. 1. One boat damaged in fire.

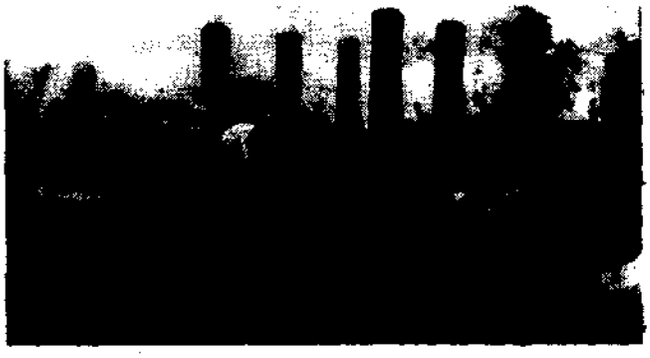

Fig. 2. One boat yard gutted in fire.

shore for repair work. Besides boats, a lot of materials utilised for building and repairing fishing crafts were also totally burnt out.

TABLE 1. *Overall length, horse power and value of boats burnt in 3 yards*

O.A.L. & H.P.	No. of boats burnt		
	yard-1	yard-2	yard-3
55 ' 110	–	1	–
50 ' 110	–	5	–
49 ' 102	2	–	–
48 ' 102	2	2	1
42 ' 95	–	3	–
32' 50	–	1	–
Loss(in Lakh Rs)	32	99	6

*** Reported by N. Chennappa Gowda, Karwar Research Centre of CMFRI, Karwar - 581 301.**

भारत के पूर्वी समुद्र तटों की मात्स्यिकी और जलकृषि प्रबंध

एम. देवराज, आर. पॉलराज, ई. विवेकानंदन, के. बालन, आर. सत्यदास, और एम. श्रीनाथ

केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान

कोचीन - 682 014

तटीय मात्स्यिकी प्रबंध

भारत के पूर्वभाग में करीब 2581 कि मी समुद्र तट और 5,61,388 वर्ग कि मी अनन्य आर्थिक मेखला है। महाद्वीपीय क्षेत्र 1,18,950 वर्ग कि मी है जिसके 56% का शोषण विविध प्रकार के यानों से किया जाता है। पिछले एक दशाब्द में देश के पूर्वी तट से मछलियों की बढती पकड मिल जा रही है। बढती 0.41 मिलियन टन से 0.69 टन (1994) है। वर्ष 1994 में उत्तरी तट में स्थित तमिलनाटु व पोन्डिचेरी, आंध्रप्रदेश, उडीसा और पश्चिम बंगाल की मछली पकड बढ गई है। कुल पकड में यहाँ से मिली पकड की प्रतिशतता यथाक्रम 59.9, 24.3, 6.9 व 8.9 है।

मत्स्यन रीतियों का विकास

1. मछुए और शक्य मत्स्यन क्षेत्र

मछुओं की संख्या में पिछले तीन दशाब्द में तिगुनी बढती हुई है। मछुओं की बढती के अनुरूप में मत्स्यन क्षेत्र का विस्तार न हो पाने के कारण मत्स्यन करने का क्षेत्र कम हो जाना स्वाभाविक है।

2. यंत्रीकरण

पिछले तीन दशाब्द में यंत्रीकृत मत्स्यन यानों की संख्या में 10 गुनी वृद्धि हुई है, जबकि अयंत्रीकृत मत्स्यन यानों में दुगुनी वृद्धि हुई है। पूर्वी अपतटों में 32'-45' के बडे यानों का परिचालन 50 मी गहराई में किया जाता है। उपतट का आकलित शक्य मछली क्षेत्र प्रति बोट पर 53 और अपतट का 4261 हेक्टयर है।

3. मछली की पकड

पिछले तीस वर्षों में यहाँ की मछली पकड में 3.4 गुनी वृद्धि हुई है। इस अवधि की तुलनात्मक वृद्धि 1,87,000 से 6,34,252 टन मछली है। प्रत्येक समुद्रवर्ती राज्यों की पकड में वृद्धि आँकी गई। पश्चिम बंगाल व उडीसा की मछली पकड में यथाक्रम 11.0 व 8.4% बढती देखी गयी। पर आंध्रप्रदेश की मछली पकड में कमी और तमिलनाटु व पोंडिचेरी की पकड में स्थिरता दिखायी पडी।

4. मछलियों की शक्य पकड और असली पकड

पूर्व तट के महासागर से करीब 1.5 मिलियन टन मछलियों की शक्य पकड अनुमानित की जाती है। 1990-94 अवधि में मिली औसत पकड इसका 42.3% था, अत: यहाँ की 57.7% मछलियाँ अब अविदोहित है । इसलिए पकड का श्रम बढाया जा सकता है, विशेषकर अपतट ससद्र में।

ट्रालरों का महत्व

पूर्व तटों से मिलनेवाली मुख्य मछलियाँ तारली, मुल्लन, सियनिड, बाँगडा, ऐंचोवी, फीतामीन, थ्रडफिन ब्रीम, पेनिआइड झींगा आदि है। मछली पकडने को बहुविध गिअरों जैसे ट्राल नेट, ड्रिफ्ट गिल जाल, बॉटम सेट गिल जाल, बैग जाल, बोट सीन, ट्रामल जाल, मोटरीकृत और अमोटरीकृत यानों से परिचालति काँटा डोर का परिचालन किया जाता है। वर्ष 1994 के आकलन के अनुसार कुल पकड का 48.8% ट्रालरों से प्राप्त होता है। ट्रालरों के ज़रिए तमिलनाटु, पोंडिचेरी, आंध्रप्रदेश व पश्चिम बंगाल की मछली पकड में वृद्धि दिखायी पडी। इसका कारण ट्रालरों की मत्स्यन क्षमता है।

मछली पकड केलिए सिफारिश

चलाए गए अध्ययनों से व्यक्त हुआ है कि यहाँ के उपतट समुद्रों का तीव्र विदोहन हो रहा है। 50 मी गहराईवाला अपतट समुद्र में विदोहन बढाना अच्छा हैं। सभी समुद्रवर्ती राज्यों द्वारा निम्नलिखित उपाय स्वीकार करने चाहिए।

(1) ट्राल प्रचालन गहराई 70 मी के नीचे सीमित करने के कारण 70-200 मी गहराई में प्रचालन केलिए बडे ट्रालरों का उपयोग किया जाए। इन ट्रालरों की मत्स्य वहन धारिता अधिक होने के कारण उपपकड समुद्र में नहीं छोडना पडेगा।

(2) तट सुरा संपदा से संपुष्ट है। यहाँ एस एल आर एक्स वी टाइप पोतों का उपयोग करना चाहिए। ये प्रति ट्रिप तीन बार मत्स्यन कर सकते हैं।

(3) यंत्रीकृत क्राफ्टों से ट्रामल जाल जैसे गिल जालों का प्रचालन केलिए प्रोत्साहन देना चाहिए।

(4) मान्नर खाडी में यंत्रीकृत पोतों से हस्त स्क्विड जिगन सफल देखा गया। इसलिए मछुआरों को इस पर प्रशिक्षण देकर अन्य क्षेत्रों में भी हस्त स्क्विड जिगन का प्रचार दिया जाए।

(5) संबंधित राज्य सरकार आवश्यक अवसंरचनात्मक सुविधा देकर संसाधन प्लान्टों की स्थापना केलिए उचित कार्रवाई की जानी जाहिए।

(6) तीव्र विदोहित क्षेत्रों की उत्पादन क्षमता बढाने केलिए फिशरमेन कोओपरेटीव सोसाइटियों की सहायता से चुने गये तटीय मत्स्यन गाँवों में सी एम एफ आर आइ आदि संस्थानों के विशेषज्ञों की सहायता से कृत्रिम भित्ति बनाए जाए।

(7) मछुआरों को छोटे पैमाने पर एक अतिरिक्त/विकल्प के रूप में तटीय जलकृषि और समुद्री संवर्धन लेने केलिए प्रेरणा दी सकती है।

(8) मछुआरों को मात्स्यिकी प्रबन्धन, किशोरों को बडे पैमाने में विदोहन करने पर होनेवाला बुरा प्रभाव, जालाक्षि आकार नियंत्रित करने की आवश्यकता और मत्स्यन विभिन्नता, कृत्रिम भित्तियों के गुण और छोटे पैमाने के समुद्री संवर्धन पर आवश्यक जानकारी प्राप्त करना अनिवार्य है। ये लोग साक्षरता में निम्न स्तर के होने के कारण रेडियो, दूरदर्शन, फिल्म आदि के द्वारा जानकारी दे सकती है।

उपर्युक्त सुझाओं के अतिरिक्त हर राज्य अपनी अपनी समस्याओं पर विचार करके उचित कार्रवाई भी करनी चाहिए। ये इस प्रकार है:-

तमिलनाटु और पोंडिचेरी

1) उपतट क्षेत्र में प्रयास बढाने का अवसर नहीं होने के कारण 50 मी से कम गहराई में ट्रालिंग का रोध और प्रबन्धन आवश्यक हैं।

2) अब तमिलनाटु और पोंडिचेरी के उत्तर भाग में मत्स्यन केलिए कोई नियंत्रण नहीं है। अत: दीर्घ दिवसीय ट्रिप केलिए जानेवाले ट्रालरों की मत्स्यन अवधि घटानी चाहिए।

आंध्रप्रदेश

यहाँ उपतट क्षेत्र में 38.4% और अपतट क्षेत्र में 75.9% उत्पादन होता है। इस अंतराल होने के कारण समुद्री मछली अवतरण बढाया जा सकता है। इसकेलिए निम्नलिखित सुझाव दिये जा सकते है।

1. काकिनाडा नवास और अन्य देशज यानों को यंत्रिकृत करना
2. मिनि ट्रालरों की प्रस्तुति करना
3. हाइओपनिंग नितलस्थ ट्रालिंग मध्यजलीय ट्रालिंग की प्रस्तुति करना
4. काकिनाडा राज्य के 30 पोतों को परीक्षणार्थ ट्रालिंग/गिल नेटिंग, स्क्विड जिगन आदि केलिए उपयोग करना।
5. विशाखपट्टनम मात्स्यिकी बंदरगाह के सोना पोतों को आन्ध्रप्रदेश के उपतटीय तल के विदोहन केलिए उपयुक्त करना
6. आन्ध्रप्रदेश में विभिन्न तकलीफों के कारण उपपकडों को छोडना पडती है। निम्नलिखित उपायों से उपपकडों का अवतरण किया जा सकता है।

सोना पोतों का प्रचालन प्रति ट्रिप तीन दिनों केलिए प्रतिबद्ध करना और डयमण्ड पोताश्रय, रोय चौक और पारादीप में अवतरण करना

पोतों की लंबाई के अनुसार भंडार क्षमता बढाना

पकडते ही उपपकडों को नमक डालकर वाहक पोतों के ज़रिए नियमित अंतराल में बर्फ डाली गयी उपपकडों के साथ अवतरण करना

उपपकडों का संसाधन करके मूल्यवान चीजें बनाकर उनकेलिए मार्केट बढाना

गुणतापूर्ण मत्स्य खाद्य और मत्स्य तेल केलिए उपपकडों का संसाधन करना

प्रमुख मत्स्यन पत्तनों में आइ एफ पी, सी आइ एफ टी और एम पी ई डी ए के विशेषज्ञों की सहायता से उपपकड संसाधन प्लान्टों का निर्माण करना

उडीसा

1. बढती प्रयास से पकड कम होने के कारण उपतट क्षेत्रों में ट्रोलिंग और नहीं बढाया जा सकता। यद्यपि 100-200 मी गहराई के क्षेत्रों में बडे ट्रालरों (750 ओ ए एल) का प्रचालन करके अपतट मत्स्यन किया जा सकता है।
2. उडीसा केलिए गिल जाल और लंबी डोर मत्स्यन उचित है।
3. समुद्री मात्स्यिकी विनिमयन अधिनियम, 1992 का अनुसरण करते हुए ट्राल जालों के कोड एन्ड जालाक्षि आकार 25 मि मी तक बढाना ताकि किशोरों का शोषण कम हो जाए ।

उप पकडों के अवतरण केलिए आन्ध्रप्रदेश को दिये गये सुझाओं का अनुसरण किया जा सकता है।

पश्चिम बंगाल

पश्चिम बंगाल की समुद्री मत्स्यन प्रक्रिया की काफी बढती हुई है, और भी विकास की साध्यताएं है। आगे के विकास केलिए सुझाव निम्नलिखित है।

1. डयमण्ड बंदरगाह और रोय चौक में अधिकाधिक छोटे और बडे यंत्रीकृत पोतों को लाना
2. डयमण्ड बंदरगाह और रोय चौक में आन्ध्रप्रदेश से आनेवाले पोतों केलिए घाट की सुविधा होनी चाहिए
3. 24 परगानास और मिडनापुर के अयंत्रीकृत पोतों को यंत्रीकृत करना
4. प्रमुख मत्स्य अवतरण केन्द्र और मत्स्यन बंदरगाहों में पहूँच रोड, हिमकारी प्लान्ट, मछली सुखाने केलिए प्लाटफोम, मार्केट आउटलेट आदि अवसंरचनात्मक सुविधाओं का प्रबंध करना चाहिए।

तटीय जल कृषि प्रबंधन

भारत के पूर्वतट तटीय परति भूमि, परिरक्षित खाडियों, लैगुन, ज्वारनदमुखियों, पश्चजल के विस्तृत क्षेत्र और कृषि करने योग्य पोषणज, चिकित्सीय, आलंकारिक, और औद्योगिक मूल्य रखनेवाले समुद्री जीवों से अनुगृहित है, फिर भी भारत के पूर्वतटों में स्थित राज्यों में मुख्य रूप से चिंगट कृषि ही हो रही है। अधिकांश एक्वाफामों के मालिक मछुआरे नहीं है। आजकल चिंगट कृषि के विरुद्ध समाजिक और पर्यावरणीय समस्याएं उभरकर आयी है। पारिस्थितिकी के अनुकूल कृषि तरीकायें अपनाना, फिनफिशस, क्रस्टेशियनों, मोलस्क और समुद्री शैवाल जैसी जातियों में बाइकल्चर और पोलकिल्चर तकनीकों का प्रयोग करना और तटीय मछुए इस में सक्रिय रूप से भाग लेने से इन समस्याओं का हल शीघ्र ही किया जा सकता है। समुद्र से मिलनेवाली सीमित संपदाओं और बढनेवाली जीवसंख्या के संदर्भ में जलकृषि की प्रासंगिकता उभर कर आती है। इसलिए जलकृषि पर उन्हें आवश्यक प्रशिक्षण और तकनीकी और आर्थिक सहायता देनी चाहिए।

तटीय जलकृषि केलिए अनुरूप क्षेत्रों को पहचानने केलिए सर्वेक्षण

सर्वेक्षण के अनुसार बंगाल खाडी की तटीय मेखला में लगभग 6,43,000 हे. क्षेत्र जलकृषि केलिए शक्य देखा गया। इनमें समुद्र के निकटवर्ती क्षेत्रों के अनुकूल स्थान और तट, पश्चजल, लैगून और ज्वारनदमुखियों के निकटस्थ अपतट क्षेत्र शामिल नहीं है। इसलिए इस पर पूनर्मूल्यांकन करना अनिवार्य है।

चार राज्यों में स्थान चयन केलिए राष्ट्रीय दूर संवेदन अभिकरण से उपलब्ध दूर संवेदन डाटा का उपयोग किया जा सकता है।

भूभौतिकीय, जलजीवीय, मौसम विज्ञान से संबंधित सूचनाओं के संग्रहण केलिए स्थूल और सूक्ष्म सर्वेक्षण करना अनिवार्य है।

पहचान किये गये राज्यों केलिए स्थान का उपयोग करने की रीति और क्षेत्र के अनुसार कार्रवाई पर सूचना तैयार करनी चाहिए। उपर्युक्त सूचनाओं के अनुसार क्षेत्र केलिए उचित तकनोलजियों का सुझाव सी एम एफ आर आइ द्वारा दिया जाएगा।

तत्काल प्रयोग की तकनोलजियाँ

भारतीय कृषि अनुसंधान परिषद में आर्थिक दृष्टि से लाभकर लघु पैमाने के कई तकनोलजिकीय पैकेजस उपलब्ध है। क्षेत्रों

के अनुकूल इन तकनोलजिकीय पैकेजों का प्रयोग तटीय जल और लैंड संपदाओं का उपयोग करके किया जा सकता है। प्रमाणित तकनोलजियों में कुछ नीचे दिये गये है।

1. मुक्ता संवर्धन (समुद्र और अपतट)
2. शंबू संवर्धन (समुद्र और अपतट, चिंगट / मछली के साथ)
3. चिंगट संवर्धन
4. चिंगट ब्रूड स्टॉक बैंक
5. चिंगट बैकयार्ड हैचरी
6. चिंगट बीज बैंक
7. अलवण जल झींगा बैकयार्ड हैचरी
8. चिंगट का पोलिकलचर
9. चिंगट खाद्य उद्योग
10. कर्कट पुष्टीकरण
11. महाचिंगट पुष्टीकरण
12. समुद्री शैवाल संवर्धन
13. कृत्रिम भित्तियों से शंबुओं का रैफ्ट और लाइन संवर्धन

बीजों की माँग के अनुसार शंबू, सीपी और मुक्ता शुक्तियों केलिए हैचरियों का निर्माण किया जा सकता है। भा कृ अनु प के अधीन कार्यरत संस्थान (सी एम एफ आर आइ, सी आइ बी ए और सी आइ एफ ई) छोटे एककों के निर्माण केलिए आवश्यक जानकारी देने में सक्षम है।

एक पुरोगामी कार्यक्रम होने के कारण कृषि मंत्रालय द्वारा पश्चिम बंगाल को छोडकर बाकी तीन राज्यों केलिए दिये गये 5 लाख रु. का अनुदान, शंबू, सीपी खाद्य शुक्ति, मुक्ता शुक्ति और समुद्री शैवालों केलिए संवर्धन एककों की स्थापना और मछुआरों के प्रशिक्षण केलिए उपयोग किया जा सकता है।

एकांतर में उपर्युक्त 5 लाख रु. का अनुदान हर राज्य केलिए प्रस्तावित समकालति कृत्रिम रैफ्ट कार्यक्रम के साथ शंबु और मुक्ता शुक्तियों के रैफ्ट संवर्धन केलिए भी उपयोग किया जा सकता है।

निदर्श फार्म और सुविधाएं

आज मत्स्य संवर्धन में लगे हुए लोगों को अन्य जातियों की संवर्धन शक्यता पर जानकारी बहुत कम है। इसलिए ये लोग केवल चिंगट संवर्धन पर रुचि रखती है। पिछले पाँच सालों में चिंगट संवर्धन में विचारणीय बढती भी देखी गयी। लेकिन पिछले दो सालों में टूट पडे रोग और कुछ सामाजिक और परिस्थितिक समस्याओं के कारण चिंगट की बढती काफी कम हो गयी। अत: बाइकल्चर और पॉलिकल्चर तकीनीकों का प्रयोग करके चिंगट संवर्धन के अनुरूप अन्य समुद्री जातियों के उपयोग से बहुविध संवर्धन करना अनिवार्य है। इसकेलिए शंबू, सीपी, मुक्ता, समुद्री शैवाल और कुछ फिनफिशों का उपयोग किया जा सकता है। इन जातियों में जलकृषि में होने वाले उपशिष्टों से पोषक भार और प्लवक सांद्रता कम कराने और अतिरिक्त जीव भार बढाने की क्षमता है। इसके अलावा जलकृषि बीज, खाद्य, ऊर्वरक, रसायन, जल और अपशिष्ट जल के उपयोग पर आश्रित है। इसलिए तट में स्थित समुद्रवर्ती जिलाओं में जलकृषि अपशिष्ट व्यवहार सुविधाओं सहित एक निदर्श फार्म का निर्माण करना अनिवार्य है।

जल कृषि में रोग प्रबंधन पर विचारणीय ध्यान देना है। इसकेलिए प्रयोगशालाओं की स्थापना करनी है। प्रारंभ में सी एम एफ आर आइ के मद्रास, टूटिकोरिन, मंडपम और विशाखपट्टणम अनुसंधान केन्द्रों और मद्रास, पुरी और काकद्वीप के सी आइ बि ए, काकिनाडा के सी आइ एफ ई की सुविधाओं का विकास करके अनुसंधान और प्रशिक्षण तीव्र किया जा सकता है।

अनुसंधान आवश्यकताएं

जलकृषि से संबंधित समाज-आर्थिक और पारिस्थितिक समस्याओं के परिगमन केलिए निम्नलिखित प्राथमिक क्षेत्रों पर समयबद्धित अनुसंधान कार्यक्रमों का आयोजन किया जाना चाहिए।

- तटीय भूमि और जल संपदाओं के अधिकतम उपयोग केलिए वहनीय क्षमता पर अध्ययन
- नर्सरी तलों और उपतट क्षेत्रों में जलकृषि अपशिष्टों का प्रभाव
- विभिन्न संवर्धन रीति अपनाने का अर्थिक निर्वाह
- मोनोकल्चर और पॉलिकल्चर तकनीकों पर आर्थिक निर्वाह
- चिंगट नर्सरी तलों और उपतट क्षेत्रों की चिंगट मात्स्यिकी पर चिंगट संवर्धन का प्रभाव
- कवच प्राणियों के समुद्र रैंचन और उपतट क्षेत्रों में इसके प्रभाव का मूल्यांकन
- कृषि क्षेत्र के अपशिष्ट काम करने की रीतियाँ
- संवर्धन प्रणालियों में रोग, नर्सरी तल और उपतट क्षेत्र और रोग प्रबंधन
- शंबू और मुक्ता शुक्तियों के रैफ्ट या लाइन संवर्धन के साथ कृत्रिम रैफ्टों के संकलन का समाज-आर्थिक विश्लेषण

प्रशिक्षण की आवश्यकताएं

तटीय जलकृषि के विकास में बाधा डालनेवाला प्रमुख घटक है प्रशिक्षित व्यक्तियों की कमी। इसलिए निम्नलिखित लक्ष्यों की दृष्टि पर मछुआ लोगों को प्रशिक्षण देना अनिवार्य है।

- एकांतर रोज़गार के रूप में छोटे पैमाने के समुद्री संवर्धन अपनाने केलिए प्रशिक्षण
- कृषकों, प्रशिक्षणार्थियों, विस्तृत और विकास कार्मिकों को वहनीय तटीय जलकृषि तकनीकों और रोग निर्णय, निवारण, और नियंत्रण पर प्रशिक्षण
- दृश्य माध्यमों, पुस्तिकाओं आदि प्रशिक्षण सामग्रियों का विकास

अवबोध जगाने के कदम

वहनीय तटीय जलकृषि की गुणताओं पर निम्नलिखित पहलुओं को प्रमुखता देती हुई जानकारी प्रदान करनी चाहिये।

- चिंगट बीजों की उपपकड के रूप में संग्रहण व संरक्षण
- जल, बीज खाद्य, ऊर्वरक आदि के प्रबंधन
- स्थान की अनुरूपता के अनुसार चिंगट, समुद्री शैवाल, मछली और द्विकपाटियों की परिस्थिति के अनुकूल तटीय जलकृषि
- एक एकांतर या अंशकालीन उपव्यवसाय के रूप में छोटे पैमाने की तटीय जलकृषि की समाज आर्थिक गुणता।

कोलचल में ट्राल मात्स्यिकी की वर्तमान स्थिति

जेकब जेरोल्ड जोएल

सी एम एफ आर आइ का विषिजम अनुसंधान केन्द्र

और

आइ. पी. इबेनेसर

सी एम एफ आर आइ का कन्याकुमारी क्षेत्र केन्द्र, कन्याकुमारी

आमुख

कोलचल तमिलनाटु राज्य के कन्याकुमारी जिला में स्थित एक शहर है। यह परंपरागत और यंत्रीकृत मत्स्यन सेक्टरों केलिए उपयुक्त मत्स्यन केन्द्र है। यहाँ से पकड के अनुसार प्रतिदिन 20 से 250 ट्रालरों का प्रचालन होता है। मत्स्यन बंदरगाह की अनुपस्थिति यहाँ की मुख्य असुविधा है।

हर साल यहाँ 3 से 5 महीनों की प्रचालन अवधि में फिनफिश, कटिल फिश, स्क्विड, झींगे और महाचिंगटों का अवतरण होता है। 125.443 मिलियन रु. के 5903 टन का वार्षिक औसत अवतरण यहाँ होता है जिसमें से 62.58% आय केवल शीर्षपादों से मिलता है। शीर्षपादों के अलावा क्रस्टेशियन, विभिन्न फिनफिश और कुछ सालों में गोरगोनिडों का भी निर्यात हुआ था। 1990-93 में पकड का मुख्य भाग निम्न स्तर मछली था जिसे तमिलनाटु मछली खाद्य प्लान्टों में भेज दिया गया। साधारणतया ट्रालिंग झींगे केलिए किया जाता है। लेकिन कोलचल में झींगा पकड कम होने के कारण ट्रालिंग का मुख्य लक्ष्य शीर्षपाद मात्स्यिकी है।

सत्यदास और बेंजमिन ने कोलचल के तीन महीने अवधि के (1989) यंत्रीकृत मत्स्यन प्रचालन की रिपोर्ट प्रचालन आर्थिकता, पकड और वितरण के आधार पर की थी। इस लेख में कोलचल में 1990 से 1994 तक के पांच वर्षों की अवधि की मात्स्यिकी पर प्रकाश डाला है।

डाटा स्रोत

केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान के मात्स्यिकी संपदा निर्धारण प्रभाग केलिए संग्रहित पकड और मूल्य सांख्यिकी, इस रिपोर्ट का प्रमुख डाटा स्रोत है।

प्रचालन ब्योरा

साधारणतया प्रात: 5 बजे पोत 5-8 लोगों के साथ मत्स्यन केलिए जाते है और दो या तीन खींच के बाद 1200 और 1700 घंटों के बीच वापस आते है। मत्स्यन की दिशा और दूर पकड की उपलब्धता के अनुसार होती है। 1990-1994 तक की अवधि में आनायन केवल 20 महीनों में हुआ था।

प्रयास

1991 के 5980 से 1994 के 12547 के साथ 1990-1994 के दौरान औसत 8908 ट्रिप चलाया था। अगस्त और सितंबर प्रचालन और पकड के ऋंगकाल थे।

प्रति प्रयास पकड

प्रति ट्रिप पकड का माहिक औसत 144 से 1390 कि.ग्रा तक विभिन्न था। अगस्त में *ओडोनस नैगर डेकाप्टीरस* एस पी पी के भारी अवतरण के कारण 1390 कि.ग्रा. उच्च दर प्राप्त हुई। अगली उच्च दर सितंबर में *सौरीडा* एस पी पी की भारी पकड के कारण प्राप्त हुई। उच्च अवतरण के समय प्रति ट्रिप की दैनिक औसत पकड 1000 कि.ग्रा से अधिक थी। *डेकाप्टीरस* एस पी पी, *ओडोनस नाइगर* और *सौरीडा* एस पी पी की प्रचुरता के कारण 29-8-1990 को पकड 1705 कि. ग्रा तक उच्च हो गयी । 19-9-1994 को तीन आनायकों के ज़रिए 5200 कि. ग्रा पकड प्राप्त हुई।

पकड झुकाव

वार्षिक पकड में 4966 (1992) से 8050 टन (1994) तक विभिन्नता दिखायी पडी। वार्षिक औसत पकड 5903 टन थी और इसके 70.1% अगस्त और सितंबर के दौरान प्राप्त हुई थी। लेकिन 1993 में जुलाई और अगस्त ऋंगकाल थे। पकड में मुख्य शीर्षपाद थे (22.4%) इसके बाद तुंबिल (21.5%), बालिसिड्स (14.7%), करैंजिड्स (13.0%), सेरानिड्स (6.5%) सूत्र पख (6.3%) और बैराकुडा (5.4%) प्राप्त हुई। पकड के 89.8% उपर्युक्त मछलियों का योगदान था। बाकी 10.2% क्रस्टेशियन, गोरगोनिड्स, पाम्फ्रेट्स, ट्यूना और आरिस, होलोसेन्ट्रस, कतला, *लेथ्रिनस लेक्टोराइनचेस, प्रियाकान्तस स्कोलोप्सिस* और *यूपीनस* जातियाँ और कर्कट, चपट मछली, शंकुश, सुरा आदि मछलियाँ और *फिस्टुलेरिया, लुटजानस, मेगालास्पिस पारुपीनियस और ट्रिचूरस* का योगदान था।

राजस्व

पाँच सालों का आय 52.6 (1990) से 284.6 मिलियन रु (1994) के रेंच में था। वार्षिक औसत 125.443 मिलियन अनुमानित किया जाता है। सबसे अधिक आय शीर्षपादों से प्राप्त हुआ था (62.6%)

सामान्य अभ्युक्तियाँ

वार्षिक औसत कुल राजस्व प्रति मत्स्यन ट्रिप 1990 के 8121 से 1994 के 22,683 रु. तक बढ गया। 1994 की इस प्रकार की बढती का कारण कटिल फिश की असाधारण पकड थी।

पोत मालिकों की मुख्य समस्या मत्स्यन बंदरगाह की कमी है। व्यापारी और मध्य वर्गीय लोग मछली का मूल्य घटाने केलिए प्रयत्न करते है। कभी कभी डीज़ल की कमी होती है। यंत्रीकृत पोत प्रचालकों और परंपरागत मछुओं के बीच की ईर्ष्या आदि कई नुक्सानों का सामना करना पडता है।

"कन्याकुमारी जिला यंत्रीकृत पोत प्रचालकों का एसोसियेशन" एक पंजीकृत सोसाइटी है जिसके अधीन 1994 तक 400 पोतों का पंजीकरण हुआ है। इस क्षेत्र के ट्राल मछुओं के कल्याण केलिए यह स्थापित है। यहाँ एक मत्स्यन बंदरगाह के निर्माण केलिए सोसाइटी ने सरकार से अनुरोध किया है। इस दिशा की ओर कार्रवाई की प्रतीक्षा है।

आनायक के प्रोपेल्लर से मारा गया डॉलफिन*

मंडपम के निकट मान्नार खाडी में डॉलफिनों को अक्सर पाया जाता है। मत्स्यन जालों का कोड एन्ड को अनुगमन करना इनका स्वभाव है। लेकिन इन पर प्रोपेलरों के ज़रिए घाव अपूर्व घटना है। 10-4-1991 को मंडपम में इन्डो-नोरवीजियन प्रोजेक्ट जेटी के निकट एक नर जाति डॉलफिन को तट पर धंस हुआ देखा। इसकी लंबाई लगभग 135 से मी थी।

सी एम एफ आर आइ के मंडपम क्षेत्रीय केन्द्र, मंडपम के एस. कृष्णपिल्लै और ए.पी. लिप्टन की रिपोर्ट

तमिलनाडु के कन्याकुमारी में धंस गया फिन तिमि

कन्याकुमारी में 20-11-1995 को गांधी मंडपम से लगभग 100 मी दूर, कोमोन रोरक्वाल या राज़र-बैक नाम से जाननेवाला एक फिन तिमि, *बालिनोप्टीरा फिसालास* धंस गया। इसकी लंबाई 6.8 मी थी। शरीर के ऊपरी और पार्श्व भागों में चोट के साथ तट में इसे देखा और एक घंटे के बाद यह तिमि मर गया। अगले दिन कुछ मछुआरों ने इसे मंडपम के पूर्वी भाग में ले जाकर इसके पृष्ठ पख और फ्लाप्पेर्स ले लिया। बाद में इसका शरीर तरंगों में पडकर पानी में गायब हुआ।

इसके धूसर रंग का ऊपरी भाग, श्वेत रंग का पेट और अधोहनु के वर्णकता ने साबित किया कि यह फिन तिमि है।

साधारणतया फिन तिमि झुण्डों में चलनेवाले है। पहले चलाये गये अध्ययन के अनुसार एक नवजात फिन तिमि की लंबाई 6.5 मी होती

है और अधिकतम 24 मी लंबाई प्राप्त करती है। इतने छोटे तिमि अपनी माँ और झुण्ड से अलग हो जाना साधारण नहीं है। ऐसा अनुमानित किया जाता है कि इसके शरीर पर देखे गये चोट सुराओं का आक्रमण या यंत्रीकृत पोतों के ज़रिए हुए होंगे।

सी एम एफ आर आइ के विषिजम अनुसंधान केन्द्र के जेकब जेराल्ड जोएल और कन्याकुमारी क्षेत्र केन्द्र के आइ पी इबेनेसर, पी. पॉल सिगामणि और ए. प्रोस्पेर द्वारा तैयार की गयी रिपोर्ट।

महाराष्ट्र के जंजिरा मुराड में गिलजालों के ज़रिए झींगे *पेनिअस मेरग्यूनसिस* का असाधारण अवतरण *

राजपारा, डिग्गी, मुराड और नडगोन अवतरण केन्द्रों में 14-9-95 से 17-9-95 तक के दौरान गिलजालों में झींगे *पेनिअस मेरग्युनसिस* का असाधारण अवतरण हुआ। उपर्युक्त 4 दिनों में राजपारा से 294 कि ग्रा की अधिकतम पकड प्राप्त हुई और डिग्गि से 173 कि ग्रा। निरीक्षण के अनुसार लगभग 620 कि ग्रा *पी. मेरग्यूनसिस* का अवतरण हुआ। इस क्षेत्र की झींगा मात्स्यिकी के संबंध में कह जाए तो यह असाधारण है। *पी. मेरग्युनसिस* का दाम अवतरण केन्द्रों में प्रति कि. ग्रा पर 200 रु. था।

***रिपोर्ट की तैयारी : डी जी. जादव, सी एम एफ आर आइ का मुरड क्षेत्र केन्द्र.**

भारत के दक्षिण पश्चिम तट के वलप्पाड पुलिन में धंस गया नील तिमि *बालिनोप्टीरा म्यूसिलस* *

त्रिच्चूर जिला के वलप्पाड पुलिन में 29-10-95 को एक नील तिमि *बालिनोप्टीरा म्यूसिलस* धंस गया था। इसकी कुल लंबाई 16 मी थी।

***सी एम एफ आर आइ के चावक्काड क्षेत्रीय केन्द्र के जी. बेबी की रिपोर्ट**

महाराष्ट्र के रत्नगिरि तट में समुद्री कछुआ और तिमि सुरा का अवतरण *

रत्नगिरि तट में काँटा डोर के ज़रिए पकडे गये *लेपिडोचेलिस ओलिवेसिया* जाति के दो समुद्री कछुओं को *रासिवाडा* अवतरण केन्द्र में 27-11-1995 को लाया गया। इनमें एक की लंबाई 64 से मी और भार लगभग 30 कि ग्रा था।

रत्नगिरी तट के राजापुर के निकट मडबान गाँव में 30-9-95 को 20.75 मी कुल लंबाई के एक तिमि सुरा का अवतरण हुआ।

***सी एम एफ आर आइ के रत्नगिरी क्षेत्र केन्द्र के बी.एन. काटकर की रिपोर्ट**

कर्नाटक राज्य के कासरगोड में मात्स्यिकी उद्योग आग से पीडित *

उत्तर कर्नाटक जिले में, कारवार से लगभग 100 कि मी दक्षिण में कासरगोड के पोत निर्माण शाला में 12-11-95 को रात के 11.30 बजे के निकट आग लग गया और भारी नष्ट हुआ। इस घटना से तीन पोत निर्माण और अनुरक्षण शालाओं का नाश हुआ। लगभग 150 मी दूर तक का क्षत्र इस घटना का शिकार बन गया। कासरगोड-होन्नावार बेस इस क्षेत्र के प्रमुख यंत्रीकृत मत्स्यन केन्द्र है। आग लगने से सबसे अधिक नष्ट यहाँ के मात्स्यिकी उद्योग को ही हुआ था। 17 पोत जल कर राख हो गये। इसके अतिरिकत पोत निर्माण और अनुरक्षण केलिए उपयुक्त अनेक वस्तुएं भी जलकर नष्ट हुई। 1.50 करोड रु. लागत की संपत्ति का नाश हुआ था। अग्निशमन सेवा दलों की सहायता से प्रात: 4 बजे तक आग बुझा दिया।

*सी एम एफ आर आइ के कारवार अनुसंधान केन्द्र के एन. चेन्नप्प गौडा की रिपोर्ट

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ANNOUNCEMENT

CONFERENCE ON

AQUACULTURE EUROPE '97

MARTINIQUE - MAY 5-10, 1997

This conference is to be jointly organized by the European Aquaculture Society (EAS), the World Aquaculture Society (WAS), the Association pour le Development de l' Aquaculture (ADA), the Caribbean Aquaculture Association (CAA) and the Association pour le Development de l'Aquaculture en Martinque (ADAM) and will take place in Les Trois Ilets.

The main theme of the conference will be "tropical and insular aquaculture" with sessions on: tropical fish culture; tilapia in marine water; invertebrate aquaculture: shrimps/prawns and molluscs; business planning, marketing and quality control, seafood technology in tropical environments; socio-economics of aquaculture in island environments; environmental impact of cage culture in shallow, tropical coral reef ecosystems; marine cage design and engineering, open sea farming, anit-hurricane technology; ornamental species. It will also be possible to address various aspects of aquaculture in the several poster sessions and discussions.

Dr. Colin Nash, former Programme Leader of the FAO Aquaculture Development and Coordination Programme will be in charge of the programme of the meeting.

Since Martinique is an overseas French region, it is a member of the European Union and as it is located in the centre of the Carribean region it is considered a bridge between Europe, North America and Latin America.

Anyone interested in aquaculture whether scientists, businessmen or adiminstrators should not miss this unique opportunity to meet people from all over the world in an exotic destination.

WORKSHOP ON

SEABASS AND SEABREAM CULTURE: PROBLEMS AND PROSPECTS

VERONA, ITALY - OCTOBER 16-18, 1996

This workshop organised by the European Aquaculture Scoeity will take place in Verona, Italy on October 16-18. The objectives are to assess the present state of seabass and seabream production, to outline its potential evolution through the lessons learnt from salmoniculture and through an analysis of the market situation and potential, and to identify strategies and research priorities which will effectively support the sector.

The main target group for this meeting are the seabass and seabream farmers of the Mediterranean area and researchers in this field in order to allow frutiful discussions which may allow to set future directions in production and research.

Dr. Beatrice Chatain (IFREMER France), Chairperson of the Programme Committee, underlines that:

"reviews that will be presented by various international authorities in the seabass and seabream sector, will form the basis for extensive discussions.

Topics of the review sessions will include:

- Evolution of marine fish production. Market situation and potential
- Sustainability of seabass and seabream production
- Improvement of performance and reduction of production costs: which research field will give hope for success?

During the last afternoon, several parallel working groups will be organized to allow for more in-depth discussions. Furthermore, the poster programme will allow the scientific community to display their current activity in the field."

Further information on this meeting from the EAS Secretariat, Coupure Rechts 168, B-9000 Gent, Tel. +32 9 2237722, Fax +32 9 2237604.