ANNUAL REPORT FOR 1974

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN-18

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

C O N T E N T S

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INTRODUCTION

Total marine fish production in India during 1974 was provisionally estimated by the Institute at 1.20 million tonnes as against 1.22 million tonnes during 1973. While the total marine fish catch increased on the east coast, the landings declined in all the maritime states of the west coast. A significant increase in the landings of prawns was seen on the east coast, but on the west coast all the maritime states recorded poor catches principally due to the delayed commencement of the season in the last quarter, resulting in the decline in the all-India landings of prawns. The landings of oil-sardine, mackerel and Bombay duck continued to be poor during 1974 also. The catch per unit effort also declined in spite of higher fishing effort expended at all-India level.

The Institute made further progress in the field of mariculture. The ad hoc schemes on pearl culture at Tuticorin and on marine prawn culture and propagation at Narakkal were started during the year. The Institute identified a hitherto unknown resource of the young ones (spats) of pearl-oysters in the Vizhinjam Bay near Trivandrum. Spats collected by means of improvised devices were cultured in cages in the Vizhinjam Bay. This finding is important since young pearl-oysters required for pearl culture could be obtained without having to undertake diving operations. The oysters so cultured at Vizhinjam were implanted with nuclei and lustrous pearls of good quality obtained within 55 d ays. This success augurs well for the establishment of a pearl-culture industry in Kerala. Anothersignificant achievement was the discovery of abundant source of mussel spat on groynes put up in the sea over a coastal stretch of 40 km between Pattanakkad (near Alleppey) and Cochin as part of anti-sea erosion work. The importance of the discovery was that this area could be expected to provide an abundant supply of seed requirements for mussel culture. The Institute discovered large-scale occurrence of the post-larvae of marine prawns at Narakkal (near Cochin). Regular stocking and rearing of these (prawn seeds had commenced. In future the seed requirements for) prawn culture, specially in pilot projects, could be met from such collections. The culture work on sea-weeds also made good progress.

The elvers of the eel Anguilla bicolor were cultured in running water; these attained an average marketable size of 35 cm in length and 106 g in weight at the end of the first year. Elvers and cultured eels are in great demand in Japan and other foreign countries, and the present work opens up the possibility of the establishment of an export-oriented eel culture industry in this country.

A study by the Institute, of the coral reef of the Gulf of Mannar along the Ramanathapuram Coast (Tamil Nadu) revealed considerable damage caused to the reefs and associated animal communities as a result of quarrying of the reefs in this region. Recolonisation of corals, particularly of the massive type, and development of a reef are remote possibilities. Even if recolonization takes place, it may take several scores of years. A matter of great concern is that there are clear signs of sea erosion on the shore of the small islands as a result of higher wave action due to the removal of the reefs which fringed the shores. In eesence, the destruction done to the reef is irrepairable.

This Institute took a leading part in the investigation of oil-pollution at Kiltan island (Lakshadweep) consequent on the running a ground of the Americal oil tanker 'Trans Huron' near the islands. As a result of the oil spillage, large-scale mortality of coral fishes, lobsters, crabs and inter-tidal fauna occurred along the affected areas of the island. However, no immediate danger to the sub-soil drinking water and the coconut plantation in the island was noticed.

Objectives of the Institute

The main objectives of the Institute are:

i) to estimate the catches of the marine fishes and other animals from the seas around India throughout the year by different types of vessels and gears.

ii) to conduct researches on marine fisheries resources in order to step up their production to the maximum possible extent.

iii) to locate new fishing grounds, to conduct environmental studies in relation to fisheries; and to generate additional resources by mariculture, and

iv) to recommend measures for the rational exploitation of the various resources.

Organisational structure and changes

During 1974, the Institute has undertaken 33 research projects and an all-round progress was maintained in these projects at the headquarter and the outstations. The scientific work has been carried out by the three divisions of the Institute namely:

1. Fishery Survey and Statistics
2. Fishery Biology
3. Marine Biology and Oceanography

The works of the three divisions have been given in the various sections under 'Progress of Research'. The progress in the other activities of the Institute was as follows:

Library

During the year, CMFRI Bulletin No.25 entitled 'Commercial Molluscs of India' was published. The Report on the Group discussion on Pearl Culture held at Tuticorin in January 1974 was issued as a special publication.

About 300 books and 500 new numbers of periodicals were added to the library. As usual the library continued its services of loaning books and periodicals to different Universities, Institutes, States Departments and other interested organisations. Many visitors from Colleges and Universities made use of the library consistently throughout the year.

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List of distinguished visitors

1. Dr.M.S.Swaminathan, F.R.S. Director General, ICAR visited the Central Marine Fisheries Research Sub-station, Madras on 22-1-74, Regional Centre at Mandapam Camp on 23-1-74 and Sub-station at Tuticorin on 24-1-74.

2. Study Group II of the Parlimentary Committee on the Welfare of Scheduled Caste and Scheduled Tribes visited the Institute on 27-6-74 and the Sub-station at Mangalore on 3-7-74.

3. The headquarters of the Institute was visited also by the following:

   i) Dr.Abu Hakim (Director, Foreign Aid), Dr.R.S.Crocker and Dr. J.Scharfe, Members of FAO/Govt. of India Mid-term Appraisal Mission of the Pelagic Fishery Project on 31-1-74.

   ii) Dr.N.K.Panikkar, Chairman, Achievement Audit Committee on CMFRI on 5-2-74.

   iii) Shri M.S.Pawar, Vice Chancellor of the Mahatma Phule Krishi Vidyapeeth, Rahuni on 14-2-74.

   iv) Shri S.K.Mukherji, Assistant Director General (Education ICAR visited on 27-2-74.

   v) Shri Abu Abraham, Member of Parliament on 1-4-74

   vi) Mr. W.P.Applyard, Dr.Armin Lindquist, Dr. Lara Augustinson, Capt. Bertil Johnson and Mr. Jan-Olof Traung (all from FAO/SIDA) visited on 7-5-74.

   vii) Shri C.N.Raghavan, IAS, Secretary for Forest and Fisheries Departments, Govt. of Tamil Nadu and Shri K.Shanmuganathan Conservator of Forests, Tamil Nady visited on 16-7-74.

   viii) Shri T.D.Sunder Raj, IAS, Director of Fisheries, Tamil Nadu visited the Institute on 18-7-74 and 27-11-74.

   ix) Dr.V.Chandrasekahar, Scientific Attache, USSR embassy, New Delhi - on 12-8-74

   x) Dr.G.Rangaswamy, Vice Chancellor, Tamil Nadu Agricultural University on 24-9-74.

4. The Regional Centre at Mandapam Camp was visited also by: Dr. T.V.Desikachary, Professor Botany, University of Madras on 15-10-74 and Dr. D.J.Metha, Director, CSMCRI, Bhavanagar on 20-10-74,

ADVISORY/CONSULTANCY SERVICE RECEIVED AND PROVIDED:

The Institute extended its consultancy service to various departments of the Government at the Centre and at the States, the international bodies such as the FAO, to scientific organisations, to the industries and individuals on various kinds of fisheries problems and answered hundreds of queries.

Dr. R.V. Nair, Officiating Director served as Chairman and Member Board of question paper setters and Examiners and Board of Studies in a number of Indian Universities.

Dr. K.V.Sekharan, Senior Fishery Scientist served as a member of the Board of Studies and Faculty of Marine Sciences, University of Cochin.

Fellowships and Scholarships

Eight Research Scholars underwent training in research under the Scholarships scheme instituted by the Govt. of India, Ministry of Education and Social Service.

One ICAR Senior Fellow and one CSIR Junior Fellow were also doing research at the Institute during the year.

Conferences, Symposia, seminars and exhibitions

A Group Discussion for developing Pearl Culture on Commercial scale was organised by the Director, Central Marine Fisheries Research Institute on 24-1-'74 at Tuticorin under the Chairmanship of Dr.M.S. Swaminathan, FRS, Director General of ICAR and Secretary to the Government of India. It was attended by Dr.R.R.Prasad, Assistant Director-General, ICAR, Shri K.Chockalingam, Special Secretary for Forest and Fisheries, Shri T.V.Venkataraman, Director of Fisheries, Government of Tamil Nady and the representatives from the Department of Fisheries, Government of Gujarat and of the Fishing Industry.

A Summer Institute in Coastal Aqua-culture Sponsored by the Council and organised bythe Institute was conducted from 10-6-'74 to 9-7-'74. There were 23 participants drawn from different Universities, Maritime State Fisheries Departments and Government Institutions.

Finance

The actual expenditure incurred by the Institute during '74-75 was as follows.

Plan - Rs.43.75 lakhs
Non-Plan - Rs. 8.82 lakhs

PROGRESS OF RESEARCH

FISHERY SURVEY AND STATISTIC DIVISION

The total marine fish production in the country during the year 1974 was estimated at 1217,797 tonnes as against 1220,240 tonnes during 1973. The total landings in 1974 declined marginally as compared to 1973. While in the States of Tamil Nadu, Pondicherry, Kerala, Karnataka and Maharashtra, the total fish catch declined, Andhra and Gujarat recorded comparatively higher catches. In other areas the total landings increased marginally. The state-wise marine fish production along with the distribution of total catch obtained from mechanished fishing crafts and also the night and day landings during 1974 and 1973 are shown in Table I.A and I.B.

From Table 1,A, it is seen that the total fish landings from mechanised fishing crafts in the country (excluding Goa, Andamans & Laccadives) during 1974 declined to 373,832 tonnes from 392,575 tonnes in 1973. This was due to poor mechanised fish landings in the States of Tamil Nadu, Pondicherry and Maharashtra. Non-mechanised landings, however, showed some increase mainly due to higher landings in the States of West Bengal & Orissa, Andhra, Pondicherry, Maharashtra and Gujarat. Excepting in Tamil Nadu and Gujarat, the night fish catch was poor in all the maritime States of India (Table I B). A significant increase in the landings of both mechanised and non-mechanised fishing crafts was seen in Andhra, which is also an all time record.

In West Bengal and Orissa, the total landings increased by about 3,400 tonnes (15%), due to higher input of effort during 1974. While prawns, elasmobranchs, cat fishes, Hilsa and sciaenids recorded higher landings, the catch of other sardines, other clupeids and Bombay duck was poor.

The bumper catch in Andhra during 1974 was due to comparatively higher input of fishing effort during the year. The landings of prawns, cat fishes, elasmobranchs, sciaenids, ribbon fish, other sardines, Anchovies, other clupeids and silver bellies were significantly higher as compared to 1973. The catch of pomfrets and mackerel was however, poor.

In Tamil Nadu, the total catch declined marginally, due to reduction in the input of fishing effort. While the yield of prawns, other crustaceans, elasmobranchs, cat fishes, Anchoviella and silver bellies was comparatively higher, other sardines, other clupeids, sciaenids,

ribbon fish, carangids, mackerel and seer fish recorded poor catch.

The total fish catch as well as the input of fishing effort during 1974 continued to decline in Pondicherry. The landings of Anchovies, sciaenids, ribbon fish, silver bellies, mackerel and elasmobranchs were comparatively poor. Other sardines and carangids, however, recorded higher catches.

In Kerala, the total yield declined by about 28,000 tonnes inspite of higher input of fishing effort during the year. The major fisheries of Kerala, namely oil sardines, mackerel and prawns suffered a set back. The catch of ribbon fish, soles, elasmobranchs, cat fishes and Anchoviella, however, was comparatively higher.

The total catch in Karnataka during 1974 declined by about 15,000 tonnes. The landings of mackerel declined sharply. The catch of prawns, oil sardines and elasmobranchs, however, showed significant increase.

In Maharashtra, the total fish catch as well as the total input of fishing effort declined sharply during the years. While the catch of prawns, elasmobranchs, cat fishes, Bombay duck, other clupeids and ribbon fish declined, the landings of sciaenids and mackerel were comparatively better.

The total landings in Gujarat during 1974 increased by about 23,300 tonnes (19%). The total input of fishing effort during the year also increased. The fisheries of elasmobranchs, Bombay duck, other clupeids, cat fishes, pomfrets and eels were comparatively better, but sciaenids and prawns recorded poor landings.

VARIETY COMPOSITION

The marine fisheries of India consisting of more than 200 different species have been grouped and presented in Table 2 for the years 1973 and 1974.

Table 2 shows that the principal fisheries of India namely oil sardines, mackerel, Harpodon nehereus and prawns together contributed about 32% of the total marine fish production during 1974 as against 40% during 1973. The sharp reduction in the percentage was due to the failure of all those fisheries during 1974. As regards other fi[illegible]

while the landings of elasmobranchs, cat fishes and ribbon fish increased significantly, those of other sardines, sciaenids and carangids were comparatively poor. The main features in respect of the major marine fisheries of India are given below.

(a) Oil sardine

Table 3 gives the state-wise landings of oil sardine in India.

Table 3 Landings of Oil sardine during the years 1973 and 1974. (In tonnes)

Year	Kerala	Karnataka	Other States	Total
1973	122,783	15,495	6,117	144,395
1974	102,135	20,784	3,757	126,676
Average (1965 to 1974)	176,042	28,864	2,713	207,619
Percentage (1965 to 1974)	84.79	13.90	1.31	100.00

From Table 3 it is seen that about 85% of the oil sardine landings come from Kerala. This is based on the average landings for the 10 year period 1965-1974. The share of Karnataka is about 14%. Both Kerala and Karnataka together contribute about 99% of the total oil sardine landings in India, while the oil sardine catch continued to decline in Kerala, Karnataka contributed substantial landings during 1974. The all India oil sardine yield during the year further declined to 126,676 tonnes which is far below the average for the 10 year period 1965-1974.

(b) Mackerel

The mackerel fishery of India is based on a single species, Rastrelliger canagurta and is mainly confined to coastal waters of the west coast, between Quilon (Kerala) and Ratnagiri (Maharashtra). Table 4 gives the State-wise

landings of mackerel for the years 1973 and 1974 along with the average landings for the ten year period 1965-1974.

Table.4 Landings of mackerel during the years 1973 and 1974 (In tonnes)

Year	Kerala	Karnataka	Other States	Total
1973	19,780	35,468	24,175	79,423
1974	10,335	9,696	17,431	37,462
Average (1965-1974)	28,133	24,706	25,929	78,768
Percentage (1965-1974)	35.72	31.37	32.91	100.00

Next to oil sardine, the mackerel fishery is equally important in the States of Kerala and Karnataka. The annual landings of mackerel show wide fluctuation. During 1974, the mackerel fishery suffered a set back both in Kerala and Karnataka and the all India catch dwindled to 37,462 tonnes. Kerala and Karnataka together contributed about 67% of the total mackerel production in India.

(c) Bombay duck

The Bombay duck fishery is based on a single species, Harpodon nehereus and is mainly confined to the coasts of Maharashtra and Gujarat. Substantial catches are also record in the States of West Bengal, Orissa and Andhra. Table 5 shows the landings of Bombay duck during the years 1973 and 1974 and also the average catch for the ten year period 1965-1974.

During 1974, the total Bombay duck landings in India declined by about 3,000 tonnes as compared to 1973. While in Maharashtra, the catch declined by about 4,000 tonnes in Gujarat it showed some marginal increase. Maharashtra and Gujarat together contributed about 98% of the total all India Bombay duck production. The catch during 1974 [illegible]

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Table.5 Landings of Bombay duck during the years 1973 and 1974. (In tonnes)

Year	Maharashtra	Gujarat	Other States	Total
1973	34,179	27,664	2,502	64,345
1974	29,989	29,675	1,474	61,138
Average (1965-1974)	28,692	40,870	1,636	71,198
Percentage (1965-1974)	40.30	57.40	2.30	100.00

(d) Penaeid prawns

On the west coast of India, the penaeid prawns are landed mostly in Kerala, Karnataka and Maharashtra States. Substantial catch of penaeid prawns are also recorded in the States of West Bengal, Orissa, Andhra and Tamil Nadu on the east coast of India. Penaeid prawns formed about 62% of the total crustacean landings in India during 1974. Table 6 shows the landings of penaeid prawns during the years 1973 and 1974 and the average landings for the ten year period 1965-1974.

Table. 6 Landings of penaeid prawns during the years 1973 & 1974 (In tonnes)

Year	Kerala	Maharashtra	Karnataka	Other States	Total
1973	84,770	16,894	8,235	26,615	136,514
1974	59,815	14,712	12,695	27,712	114,934
Average (1965-1974)	37,798	15,331	5,408	20,559	79,096
Percentage (1965-1974)	47.79	19.38	6.83	26.00	100.00

From Table 6, it is seen that Kerala, Maharashtra and Karnataka contribute about 74% of the total all India catch of penaeid prawns. While in Kerala and Maharashtra, the catch declined during 1974, Karnataka recorded higher landings during the year. Eventhough total all India catch of penaeid prawns declined during the year, the landings were much higher than the average catch for the 10 year period 1965-'74.

(e) Non-penaeid prawns

The non-penaeid prawns are mostly landed in Maharashtra State. These formed about 30% of the total crustacean landings in India during 1974. Table 7 shows the landings of non-penaeid prawns during the years 1973 and 1974 and the average landings for the ten year period 1965-1974.

Table 7 Landings of Non-penaeid prawns during the years 1973 and 1974 (In tonnes)

Year	Maharashtra	Other States	Total
1973	63,455	3,500	66,955
1974	50,025	5,219	55,244
Average (1965-1974)	46,414	2,530	48,944
Percentage (1965-1974)	94.83	5.17	100.00

Table 7 shows that Maharashtra contribute about 95% of the total non-penaeid prawns catch of India. During 1974, the catch declined by about 13,400 tonnes in Maharashtra, but the landings were comparatively higher than the average for the 10 year period 1965-1974. The same trend is seen in the all India landings of non-penaeid prawns.

(f) Elasmobranchs

The landings of elasmobranchs during 1974 increased by about 21,000 tonnes. Excepting in Pondicherry and

Maharashtra, the catch of elasmobranchs was significantly higher in all the maritime States of India.

(g) Cat fishes

The catch of cat fishes during the year showed an increase of about 24,000 tonnes mainly due to higher landings in all the maritime States of India barring Pondicherry, Karnataka and Maharashtra.

(h) Ribbon fish

An increase of about 10,000 tonnes in the landings of ribbon fish was seen during the year 1974. Andhra, Kerala, Karnataka, Goa and Gujarat accounted for the increase in the all India landings of ribbon fish.

(i) Other sardines

The landings of other sardines during 1974 declined by about 25,000 tonnes. Excepting in Andhra and Pondicherry, the catch declined in all the maritime States of India.

(j) Sciaenids

A decrease of about 8,000 tonnes in the catch of sciaenids was noticed during the year. This was due to the sharp decline in the landings in Gujarat State during the year.

(k) Carangids

The landings of carangids were comparatively poor during the year due to reduced catch in the States of West Bengal & Orissa, Tamil Nadu, Kerala and Karnataka.

SEASONAL VARIATION

Table 8 shows the seasonal variations in the total fish landings in the different maritime States of India.

Table 8 Quarterly marine fish landings in different States of India during 1974 (In tonnes)

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State	I Quarter	II Quarter	III Quarter	IV Quarter	Total
1.West Bengal & Orissa	7,381	1,193	3,667	13,851	26,092
2.Andhra	50,992	43,872	28,994	34,960	158,818
3.Tamil Nadu	51,925	31,805	46,845	45,138	175,713
4.Pondicherry	3,132	1,606	1,646	1,314	7,698
5.Kerala	61,447	77,183	144,298	137,329	420,257
6.Karnataka	40,342	7,674	7,979	20,268	76,263
7.Goa	3,102	1,493	2,074	12,865	19,534
8.Maharashtra	50,515	58,637	14,683	61,126	184,961
9.Gujarat	47,756	15,674	16,400	65,479	145,309
10. Andamans	178	249	259	234	920
11. Lakshadweep	907	366	241	718	2,232
Total	317,677	239,752	267,086	393,282	1217,797
Percentage	26.09	19.69	21.93	32.29	100.00

From Table 8, it is seen that the bulk of the marine fish landings takes place during the IV Quarter, when about 32% of the total fish catch are recorded. During 1974 the maximum landings took place in IV quarter in the maritime States of Goa, Maharashtra and Gujarat on the west coast of India, while in Kerala and Karnataka the maximum catch was recorded in the third and first quarters respectively, on the east coast of India, however, the maximum yield was recorded in the first quarter excepting in West Bengal & Orissa, when it was during the fourth quarter.

IN PUT OF EFFORT

Table.9 shows the total fishing effort in terms of man hours expended in each maritime State by both mechanised and non-mechanised indigenous fishing unit, and the catch per unit effort (Kg) during the year 1974. The corresponding figures for 1973 have also been given for comparison.

T a b l e.9 Fishing effort in man hours and catch per unit effort in Kg.

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	Effort in 1000 man hours.		Catch per unit effort (Kg)	
	1974	1973	1974	1973
1. West Bengal & Orissa	21,582	15,590	1.17	1.38
2. Andhra	42,556	38,424	3.61	2.50
3. Tamil Nadu	49,037	53,936	3.58	3.38
4. Pondicherry	2,122	2,445	3.63	3.55
5. Kerala	86,711	69,748	4.68	6.28
6. Karnataka	10,915	9,360	5.18	7.78
7. Maharashtra	21,817	27,451	8.47	8.25
8. Gujarat	28,161	17,695	5.16	6.89
Total	262,901	234,649	4.43	4.98

From Table 9 it is seen that while the total all India fishing effort (excluding Goa, Andamans and Laccadives) during 1974 have increased, the catch per unit effort has declined marginally. Excepting Tamil Nadu, Pondicherry and Maharashtra, all the maritime States of India expended higher input of effort during the year. The catch per unit effort decreased in the States of West Bengal & Orissa, Kerala, Karnataka and Gujarat. An increase in the catch per unit effort was, however, noticed in the States of Andhra, Tamil Nadu, Ponlicherry and Maharashtra.

2. Effort in terms of number of operations of unit gear

The unit 'man hour' is useful from the economic point of view especially to show whether the number of man-hours spent in fishing over the year has increased or decreased and also to work out the corresponding increase or decrease in the catch per unit effort. The effort in terms of number of operations of unit gear is essential in fishery biology studies especially to study the instantaneous rate of fishing mortality. Table 10 shows the effort in terms of number of operations of unit gear in different maritime States of India during the year 1974.

Table.10 Fishing effort in terms of number of operations of unit gear in different maritime States of India during 1974.

State	I Quarter	II Quarter	III Quarter	IV Quarter	Total
1. West Bengal & Orissa	241,799	91,448	132,449	243,438	709,134
2. Andhra	713,361	605,683	560,136	601,681	2480,861
3. Tamil Nadu	1052,509	728,504	772,557	915,363	3468,933
4. Pondicherry	65,726	31,757	43,284	28,216	168,983
5. Kerala	742,030	767,052	992,838	891,445	3393,365
6. Karnataka	72,398	77,526	82,275	92,496	324,695
7. Maharashtra	139,865	114,684	72,746	136,088	463,383
8. Gujarat	207,701	153,373	165,752	288,706	815,532
Total	3235,389	2570,027	2822,037	3197,433	11824,886
Percentage	27.36	21.73	23.87	27.04	100.00

From Table 10 it is seen that Tamil Nadu recorded the highest effort during 1974 along the east coast of India, closely followed by Kerala on the west coast of India. Karnataka recorded the lowest effort during the year on the west coast of India, while Pondicherry recorded the lowest effort on the east coast of India. The maximum effort was expended during the first and fourth quarters at all India level.

Table I.A. State-wise Marine Fish Landings in India by mechanised and non-mechanised units during 1973 and 1974. (In tonnes)

State/Union Territory	By non-mechanised units		By mechanised units		Total	
	1974	1973	1974	1973	1974	1973
1. West Bengal & Orissa	21,639	20,457	4,453	2,279	26,092	22,736
2. Andhra	151,404	94,868	7,414	4,676	158,818	99,544
3. Tamil Nadu	144,416	149,447	31,297	32,972	175,713	182,419
4. Pondicherry	7,252	6,766	446	1,916	7,698	8,682
5. Kerala	318,845	354,610	101,412	93,659	420,257	448,269
6. Karnataka	44,539	68,578	31,724	22,906	76,263	91,484
7. Maharashtra	59,176	43,738	125,785	182,958	184,961*	226,696
8. Gujarat	74,008	70,754	71,301	51,209	145,309**	121,963
Total	821,279	809,218	373,832	392,575	1195,111	1201,793
9. Goa					19,534	15,740
10. Andamans					920	854
11. Lakshadweep					2,232	1,853
Grand Total					1217,797	1220,240

* Provisional. ** Exclusive of the catches by the Gujarat boats landed at Satpati, Maharashtra.

Table.I B. State-wise Marine Fish landings in India during Day and Night(In tonnes)

State/Union Territory	Day		Night		Total	
	1974	1973	1974	1973	1974	1973
1.West Bengal & Orissa	23,465	17,484	2,627	5,252	26,092	22,736
2.Andhra	158,643	99,206	175	338	158,818	99,544
3.Tamil Nadu	162,935	179,279	12,778	3,140	175,713	182,419
4.Pondicherry	7,691	8,669	7	13	7,698	8,682
5.Kerala	403,406	430,861	16,851	17,408	420,257	448,269
6.Karnataka	75,127	87,708	1,136	3,776	76,263	91,484
7.Maharashtra	131,967	163,087	52,994	63,609	184,961*	226,696
8.Gujarat	109,162	95,757	36,147	26,206	145,309**	121,963
Total	1072,396	1082,051	122,715	119,742	1195,111	1201,793
9.Goa					19,534	15,740
10.Andamans					920	854
11.Lakshadweep					2,232	1,853
Grand Total					1217,797	1220,240

*Provisional. ** Exclusive of the catches by the Gujarat boats landed at Satpati, Maharashtra.

T a b l e.2. The composition of total marine fish landings in India during 1973 and 1974

(In tonnes)

Sl.No.	Name of fish	1974	1973
1.	Elasmobranchs	66054	44917
2.	Eels	4011	3869
3.	Cat fishes	76196	52642
4.	Chirocentrus	9026	11090
5.(a)	Oil sardines	126676	144395
(b)	Other sardines	83921	108523
(c)	Hilsa ilisha	4248	404
(d)	Other Hilsa	7541	11918
(e)	Anchoviella	41507	25394
(f)	Thrissocles	11433	13194
(g)	Other clupeids	43226	35350
6.(a)	Harpodon nehereus	61138	64345
(b)	Saurida and Saurus	12520	4049
7.	Hemirhamphus and Belone	4574	1110
8.	Flying fish	1012	6388
9.	Perches	36837	21513
10.	Red mullets	7009	3925
11.	Polynemids	10637	9248
12.	Sciaenids	79261	87682
13.	Ribbon fish	63029	53106
14.(a)	Caranx	19316	25298
(b)	Chorinemus	3797	2827
(c)	Trachynotus	122	189
(d)	Other carangids	91	129

Sl.No.		Name of fish	1974	1973
	(e)	Coryphaena	286	228
	(f)	Elacate	229	529
15	(a)	Leiognathus	50902	48127
	(b)	Gazza	338	41
16		Lactarius	8913	13912
17		Pomfrets	22421	22052
18		Mackerel	37462	79423
19		Seer fish	19841	19700
20		Tunnies	10839	5678
21		Sphyraena	4862	3415
22		Mugil	4497	3138
23		Eregmaceros	1872	4213
24		Soles	18917	14642
25	(a)	Penaeid prawns	114934	136514
	(b)	Non-Penaeid prawns	55244	66955
	(c)	Other crustaceans	16663	12508
26		Cephalopods	3677	1394
27		Miscellaneous	72718	56266
		T O T A L	1217797	1220240

FISHERY BIOLOGY DIVISION

Chief findings

The Fishery Biology Division laid increased emphasis during this year, on the development of techniques for culturing suitable species of marine fishes, crustaceans and molluscs. A very important advance in this field was the discovery of an abundant resource of pearl oyster spat near Trivandrum and the production of the cultured pearl from oyster spat neared to the required size there. At the same time due emphasis was given to the research on the major exploited fish stocks as also to the work of exploring new resources and new grounds. The following are the salient features of the work done by the Division.

An abundant resource of pearl oyster spat has been found in the Vizhinjam Bay near Trivandrum. Except for records of isolated specimens, the abundance of pearl oyster has not been known before along the west coast, south of Gujarat. The oyster spat were cultured in cages in the Vizhinjam Bay, and these were later implanted with nuclei. Cultured pearls of good quality were obtained within about 2 months. The possibility of establishing a pearl culture industry near Trivandrum is indicated by the studies. A very abundant resource of mussel spat has been found on groynes laid out in the sea at regular intervals over a 40 km stretch of the coast between Pattankkad (near Alleppy) and Cochin. These could serve as seed for large scale commercial culture mussel. Windowpane oyster above 90 mm in size contain small pearls which although not useful in jewllery find good use in other fields. About 25 percent of the population contains such pearls. Field experiments have shown that the prawn Penaeus indicus could be cultured to marketable size in estuarine ponds at Mangalore. The seed for this are also available locally. Commercial prawn culture has started in the Godavari estuary (near Kakinada) and the Institute is providing suitable technical assistance in this field. Field experiments have shown the feasibility of culturing the priced fish, Sillago sihama, in estuarine ponds near Mangalore. The catches of oil sardine, mackerel and prawns declined in 1974 compared to 1973. In Karnataka the availability of oil sardine shoals was greater, in 1974 than in 1973, the reverse being true in Kerala. In regard to the mackerel shoals the decrease was more marked in Karnataka than in Kerala. The Bombay duck catch improved in Gujarat, but not in Maharashtra during this year; moreover, in the Bombay region the average size of the fish landed was the lowest one on the record. For the first time in recent years the silver belly catch has declined in the Mandapam area. However there was no noticeable change in the modal size of the fish landed.

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Researches in Hand

Studies on the oil sardine resources of the Indian Seas (FB/MV/1)

The oil sardine catch of this year was about 12% less than that of the last year. The fall was however confined to Kerala where 81% of the catch was landed as against 85% in 1973, the share of Karnataka having increased to 16% from 11% in 1973. The data of the catch per operated unit of gear at the important observation centres indicated that in the Cochin-Mangalore area, there was greater availability of the fish in the first half of the year than during the second half whereas in the area north of Mangalore, the availability was greater during the second half. Moreover in the region north of Mangalore the availability of fish was greater in 1974 than in 1973, the reverse being the case for most of the centres in Kerala.

The fish which had the modal sizes at 140/150 mm in Kerala and 150/160 mm in Karnataka in January had grown to 170/175 mm by July in Kerala and 175/180mm by September in Karnataka. The recruits belonging to the 1974 brood occurred in two major groups, one at the modal size of 95 mm in July which shifted to 140 mm by December and another at the modal size of 80-95 mm which grew to 115-130 mm by December. Compared to 1973 the recruit strength (of fish less than 140 mm in length) was lower in Kerala in 1974 leading to the fall in catch, but was higher in Karnataka, leading to the rise in yield. The scale studies showed that in the third quarter (the spawing period) the modal sizes of one-year-old and of two year-old fish were 150-155 mm and 160-190 mm respectively. These as well as the length frequency studies show a faster growth of the fish during this year than in 1973.

The percentage of fish (in numbers) less than 140 mm in length (1974 year class) was 69 at Cochin, 48 in boat seine catch, and 99 in gill net catch at Calicut 54 in the Rampan and cast net and in the gill net catch at Mangalore and 25 in the Rampan catch at Karwar.

Fish in the pre-spawining stage (v) were recorded in May-June at Cochin, Calicut and Karwar, and August at Mangalore, spawning stage (VI) in June at Karwar, and partly spent and spent ($VIII_a$ and VII_b) stages in July at Cochin, June-July and September at Calicut. August-November at Mangalore and April, June, August and November at Karwar. The occurrence of spent specimens at Karwar in April was an important feature.

Males were more more numerous than females during April-June at Karwar, March-April at Mangalore, June-September at Calicut and July at Cochin. During the other months the females were more numerous.

Studies on raciation were continued. A preliminary analysis of the vetebral numbers conducted at Karwar indicated the existence of different stocks in the population. Similarly electrophoretic study of the blood serum and eye lens proteins carried out Mangalore, indicate the existence of at least three sub-populations of the fish.

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The mackerel landings have been declining since 1971 when a record catch of 2 lakh tonnes was taken. The 1974 catch (37,280 tonnes) was only about 47% of that in 1973 (79,430 tonnes) the fall being more marked in Karnataka (catch only 26% of that in 1973) than in Kerala (catch 48% of that in 1973). The data of catch per unit of gear given below indicates the extent of the reduction in the availability of the fish at important observation centres.

Table: Catch per unit of gear in respect of mackerel at important centres

Centre.	Important gear	Catch per unit (kg) 1974	1973	Month of highest catch per unit of important gear 1974	1973
Vizhinjam	Boat seine	0.59	0.43	July	January
	Drift net	0.24	1.28	November	May and November
Cochin	Thanguvala	0.8	8.1	December	August
Calicut	Pattenkollivala	51	165	November	September
Mangalore Ullal	Pattabala	0	93		September
Baikampady	Rampan	601	527	January	December
Karwar	Rampan	4780	13,980	January	November

In Kerala the second half of the year was more productive than the first half as in normal years, but the first half was more productive in Karnataka; the steeper fall in the catch in Karnataka is related to this. The catch per unit of gear in number was 11 at Cochin (Thanugvala) 409 at Calicut (Pattenkollivala), 1186 at Ullal (Pattabala), 6021 at Baikampady (Rampan) and 41866 at Karwar (Rampan). In Kerala the catches were supported mainly by the recruit year class (mainly one year olds, with modal size range 140-225mm) throughout the second half of the year but it appeared in abundance, in Karnataka only from October. This together with the fact that in September-December the usual period of good catches, the modal size range was 135-225 in Kerala than off Karnataka. But even in Kerala, the abundance of the recruit year class was felt later than usual resulting in the peak of the season getting delayed. The landings of the first half were supported by the year-class carried over from 1973. An important feature noted was that the fish grew in length compraratively faster than usual especially in the ground off Kerala. This was seen not only from length frequency but also from scale study. Small fish less than 75 mm were available only at Vizhinjam (35 mm at Vizhinjam in May) and Karwar (52 mm in September). A south to

north time lag in the appearance of young fish off Kerala, was evident as in previous years, the modal size groups being 105-109 mm in May and August at Vizhinjam, 130-134 mm in June and 135-139 mm in August at Cochin and 110-114 mm and 135-139 mm in July at Calicut, while it was 70-74 mm in September at Karwar.

Scale studies showed that there were only two growth rings even in September at Karwar, of the lragest size group (270-274 mm) at Calicut. A majority of the fish were without rings in the scale and were less than 2 years of age. For the year as a whole fish more than 160 mm in length formed 61% of the catch at Cochin, 98% of the fish catch at Calicut, 100% of the catch at Mangalore and 97% of the catch at Karwar.

Specimens in the pre-spawning (V) and spent (VII) stages were recorded mainly in two periods, namely March-April and September-November at the observation centres except Cochin and Calicut where no fish of stage higher than IV, was recorded. The recruit year-class of the year (one year old) was immature. There was no predominance of either sex at the observation centres.

Work on delineation of unit stocks of mackerel were contined. Morphometric and meristic studies were undertaken at Cochin and samples from various centres along the west coast have been collected. Vertebral characteristics are bing investigated at Karwar.

At Port Blair the estimated landings of both the species of mackerel (R. kanagurta and R. brachysoma) were about 45% of that in 1973. The catch of R. kanagurta (2920 kg) was nearly equal to that in 1973 but that of R.brachysoma (560 kg) was only about 13%. The peak in the landings of the former was in May; the period March-July recorded about 75% of the annual catch. The size range was 110-320 with more than 50% of the catch consisting of fish above 250 mm. Small fish of size range 120-150 mm were recorded in July and spent specimens were observed in June and August. The size range of R. brachysoma was 140-260 mm with 45% of the fish above 190 mm in size. Young fish of the size rahge 140-170 mm were recorded in July. Fish of maturity stages above IV were not available.

Forecast

From the analysis of the catch trend it appears probable that the catch would improve in the first half of 1975. The fish seem to have had better growth conditions and if environmental conditions are favourabl there would appear to be possibilities of better spawning success and a larger catch in the 1975-76 season than in the 1974-75 season.

Studies on the prawn resources of Indian Seas (FB/MF/3)

The Crustacean landings in India, during 1974, experienced a heavy decline when compared with that of previous year when unusually heavy catches were landed. Of the total catch of 1.83 lakhs tonnes, the penaeid prawns contributed 61.1% while the non-panaeid prawns and other Crustaceans accounted for 31.12 and 8.7% respectively. The state-wise figure of the Crustacean landings are given in Table. Except for a relatively heavy catch in Tamil Nadu and for a marginal increase in Pondicherry and Goa, all the other states recorded decreased landings of penaeid prawns. In the case of non-penaeid prawns [illegible]

Orissa, Andhra, Kerala and Gujarat registered increase in the landings, while the remaining maritime states recorded lesser catch particularly in Maharashtra which is the principal area for non-penaeid prawns. Landings of other Crustaceans (consisting of Lobsters and Crabs) showed over 30% increase this year and this increase was noticed in all the states except Gujarat and West Bengal region.

The mud bank prawn fishery of Kerala during monsoon months was a total failure in 1974.

The catch details of prawns from different environmental regions of 11 observations centres along the coastal line are given in Table II. At Cochin the prawn fishery experienced a heavy decline which was more apparent in the inshore regions. The catch/hour from the small mechanised trawlers operating in offshore regions of Cochin was 15.3 kg ag against 28.2 kg of 1973. In Mangalore the offshore prawn fishery remained active throughtut the season and better catches were realised. In some of the east coast centres like Madras and Kakinada, the fishery was relatively better and the catch rate showed increase.

The dominant speices landed by mechanised vessels at Cochin was M. dobsoni in the first half of the year and P. stylifera in the second half. However, in Cochin-Mangalore region, M. dobsoni was dominant species landed by trawlers. At Karwar, P. stylifera was the principal species. M. affinis and P. stylifera were the dominant species of Bombay while at Goa, P. stylifera was most abundant species. At Tuticorin on the east coast Penaeus indicus was the principal species, where as at Mandapam P. semisulcatus exclusively formed the fishery. At Madras, M. dobsoni and P. indicus dominated the fishery. M. monoceros and M. dobsoni were the major species at Kakinada.

The prawn catch from the backwaters of Cochin exhibited more or less the same trend as that of 1973; the estimated catch being 1550 tonnes as against 1540 tonnes of the previous year. A notable feature of the fishery was the unusual heavy catches of juvenile prawns in the last quarter of the year. The percentage composition of M. dobsoni showed increase, while that of P. indicus and M. monoceros showed slight decrease. The catch of the Caridean prawn Macrobrachium idella increased by over 100% and they were caught only the second half of the year. Juveniles of P. stylifera, which were never observed to be a common component of the stake net catches, was found in accountable quantities in the last two months of the year. No significant change in the size composition of commercial species of prawns was noticed in the current year. The average catch rate of prawns in the stake nets of Thevara (Cochin backwaters) showed an increase.

Try net collections were continued to be taken from Cochin backwaters to study the abundance of juvenile penaeid prawns which enter and leave the nursery area. Incursion of juveniles into the estuary was more in number during the current year. The juveniles of genus Metapenaeus contributed 97% of the try net catches. Intensive immigration of M. dobsoni was noticed in May, September and October, while that of M. affinis was in March-June period. The emigration of juveniles from the backwaters was continuous with a peak in October.

BIOLOGICAL DETAILS

Penaeus indicus:

At Veraval-Mangalore area, the fishery for this species was completely absent though stray catches was recorded in the trawl landings of Karwar. At Calicut P. indicus supported a sizable fishery in the trawl and gill net catches. In the estuarine catches, P. indicus was the chief component at Calicut in the first half of 1974. They were generally less than 110 mm in length except in May and June, when bigger specimens of 116-130 mm size range was observed. Bigger prawns within a modal size of 153 and 173 mm were dominant in the offshore catches at Cochin. In the Manakkudy estuary at Colachel, the species accounted for 70% of the prawn catch and the modal size was found falling between 81 and 95 mm. In the offshore catches at Tuticorin, the first half of the year recorded mostly immature prawns within a size range of 108-200 mm; while during the second half mature specimens of 111-220 mm size range dominated the fishery. The gill net fishery for this species was conducted only during March-May, when P. indicus formed the bulk of the catches. At Madras, 0-year and 1-year class dominated the fishery. Larger prawns modal size of 190 mm were common in the last two months of the year. At Kakinada, heavy catches of the species was recorded in April-July period. At Puri, P. indicus was the second largest constituent of the inshore prawn catch while the estuarine catch was dominated by this species. The inshore fishery was composed of 1-year and 2-year old whereas, the estuarine catch was supported by 0-year class.

P. merguiensis:

In the commercial catches, the species was recorded only from Goa-Karwar region of west coast and Kakinada-Puri region of east coast. At Goa, the size of the species in the trawl catch ranged between 95 and 200 mm and that in the gill net catches between 110-200 mm. At Karwar they were caught in trawl nets, shore seines and gill nets. The modal size range between 118-163 mm in the trawl catches, while the shore seine catch was dominated by juveniles of 108 to 123 mm modal size. At some of the southern centres of Karwar, the gill net catches of the species was found falling between 146 to 160 mm in modal size. At Kakinada, the period April-July witnessed better landings of the species in the off-shore fishery. In the estuarine catches, P. merguiensis contributed only 1.8% of the total prawn catch. At Puri, the species accounted for 52.4% of the prawn catch and was supported by adults with a size range 131-210 mm. Peak breeding was observed during November-December and February-March.

P. semisulcatus:

At Madras, the species formed 12.8% of the trawl net catches, whereas at Mandapam, this species exclusively formed the fishery. The modal size for males ranged between 96 to 125 mm and for females, 101 to 165 mm. The species was available in the trawl catches of Cochin and Veraval in the West coast in small quantities. During the month of March, P. semisulcatus was available in the stake net catches of Cochin backwaters also.

At Goa, the species was the major component in the 'Dol' net catches and trawl catches accounting for 33% and 84% respectively. The size ranged between 45 to 130 mm. Spent females were present throughout the year with two peak occurrences in February and September indicating the spawning time. At Karwar M.dobsoni ranked third in order of abundance in the trawl catches. The modal size for females ranged between 85 to 118 mm whereas for males it ranged between 68 to 98 mm. The stake net catches of Kagal estuary near Karwar showed slight improvement and juveniles with modal size between 45 to 65 mm were predominant. The landings in respect of the species at Mangalore was heavy contributing 53.1% of the prawn catch. The modal size seen at 73 mm for males in January progressed to 193mm in October and for females from 93 mm in January to 123 mm in November. In the whole of west coast, the catches of this species was the highest in Mangalore this year. At Ullal and Baikampady, the cast net catches was dominated by the species. At Calicut, M.dobsoni was the dominant group in the trawl and boat-seine catches. The trawl catches consisted mainly of 0-year group. The mean size for the year was found to be 87.05 mm for females and 75.3 mm for males. At Cochin this species was the Chief Constituent of the trawl catch. The modal size during the first half of the year was found to be between 73 and 83 mm for females and between 73 and 88 mm for males. Bigger specimens (females 113 mm and male 93 mm modal size) was found occurring in the October catches. In the trawler catches of Tuticorin, the species was caught in lesser quantities throughout the period. At Rayapuram (Madras) M.dobsoni accounted for 31.8% of the total prawn catch. At Kakinada, the species was the second important prawn in the trawl catches, As in the previous year, monthly variation in the size composition was negligible and spent females were found throughout the year with a peak in October-December. Juveniles below 70 mm size contributed the estuarine catch which was quite significant in the Cochin backwaters system.

M. affinis:

On the west coast, the species was present in the commercial landings from Veravel to Cochin and on the east coast from Madras to Puri. At Bombay, there was a three-fold increase in its catches. At Goa, two peak breeding periods of the species (one in May and the other in October-December) were observed. Juveniles were recruited twice a year into the fishery during May and November. There was a sharp decline in the catches of the species at Karwar. But the fishery showed considerable improvement at Mangalore when modal size of 103 mm in females in February progressed to 118 mm in April. At Kakinada M. affinis formed 5.8% of the total prawn catch in the trawl nets. At Puri the fishery for the species was from January to March. The juveniles of the species was observed in the estuarine catches of Mangalore, Cochin, and Kakinada.

M. monoceros:

In the commercial catches, the species was observed at Karwar-Cochin area in the west coast and Madras-Kakinada area in the east coast. At Karwar, the modal size of females stood 128 mm in January and March and 138 mm in February. In the case of males 108, 113 and

modes were seen in January, February and March respectively. In the estuarine catches of Kagal, the species with modal size falling between 41 to 85 mm contributed the fishery. At Cochin, bigger prawns with modal size between 148 and 163 mm for females and 108 and 123 mm for males were seen during the first quarter of the year. In the estuarine catch juveniles were available throughout the year except in April. There has been an increase in the catches of M.monoceros at Madras and they were more abundant in the second and third quarter of the year. At Kakinada, the species dominated the trawl catch and the maximum catch was observed in the first quarter. Bigger prawns (females of 133 mm and males of 125 mm in modal size) dominated the fishery in the peak season. In the estuarine fishery also, the species dominated the catch and the peak landings was noticed in August-December.

M. brevicornis:

This species was commercially exploited only at Kakinada. Though there was an improvement in the catches (128 tonnes) the percentage composition came down from 12 to 9 during the year. The fishery was mainly supported by females in 105-120 mm and males in 75-85 in the modal sizes. Spent and mature females were present throughout the year indicating the protracted spawning of the species, but the peak spawning activity was during October-December. In the backwater fishery, the species was poorly represented in the catches from different centres of the Godavary estuary.

P. stylifera:

The species was most common from Veraval to Cochin in the west coast and Tuticorin in the east coast. The catches showed an increase of over 200% at Bombay. At Goa, recruitment of the species in to the fishery was observed during April and November, and in these months, the catches were dominated by 65-70 mm and 70-75 size groups respectively. At Karwar, the species accounted for 82 tonnes compared to 105 tonnes of the previous year. The modal size ranged from 88 to 93 mm for males and 88 to 118 mm for females. At Mangalore, the trend of the fishery was more or less the same as that of Karwar. P. stylifera was the second dominant species at Calicut and females with modal size at 78 mm found in January progressed to 98mm in March. Juveniles of the species was caught from Korapuzha estuary of Calicut during December in considerable quantities. At Cochin modal size of the species in the commercial catches was found falling between 73 to 103 mm for females and 73 to 88 mm for males. Both at Calicut and Cochin the juveniles of the species was fairly well represented in the estuarine catches. This tendency of their occurrence in the estuarine catches is a noteworthy feature as the species is generally well recognised as a truly marine form among the littoral of the Indian coast.

Acetes indicus and Palaemon tenuipes:

At Madh (Bombay) Acetes indicus accounted for 56.2% of the 'Dol' net prawn catch. The contribution of P.tenuipes was extremely poor. The fishery for A.indicus was mainly supported by 21-28 mm size groups and mature females were more abundant in March. At Versova also, the species, ranked first in order of abundance forming about 50% of the 'Dol' net catch. During the current year, recruitment of juveniles (15-30 mm size group) into the fishery was a failure though it has been a regular phenomenon during November-December months of the previous

Larval and juveniles stages of prawns:

Plankton collections were continued to be taken from the inshore sea and backwaters to study the rate of recruitment of larval and post larval stages of penaeid prawns. In both these environments, larval recruitment was found relatively more. Larval forms of M.dobsoni was dominant throughout the year and the highest concentration was observed in December. The average larval count in the inshore area rose to 59.1 per haul during the current year as against 44 of the previous year. In the backwater area larval count for haul was 23.9 which is about 25% more than that of the previous year. The increase in the larval count was more perceptible in November-December period.

In the Korapuzha estuary at Calicut, the recruitment of larval forms was compraratively bettwer especially during the last quarter. Post larvae M.dobsoni were the main constituent and the maximum migration was observed in November-December. The peak recruitment of post larvae of other species like P. indicus and M.monoceros in the estuary was in May and April-June respectively. At Ennore estuary (Madras) post larvae of P. indicus, M.Monoceros and M. dobsoni were encountered in May, June and September respectively.

Larval rearing in the Laboratory

Larval history of Leptocarpus potamiscus and Leandrites colebensis were studied exhaustively by rearing them in the laboratory.
A series of experiments conducted to study the salinity tolerance of the larvae of M. idella showed that the maximum survival rate in all ten zonal stages of the species was noticed when reared in water having a salinity of 15‰. Ten percent of zoea of M.equidens successfully completed the larval history when reared in water having a salinity range of 23-25‰.

Prawn culture in Paddy fields:

Studies on the prawn culture practices were extended to the seasonal and perennial fields lying adjacent to Vembanad Lake in the northern section of Alleppey District. The average catch rate in these fields was found to be 662 and 554 kg/ha respectively. M. dobsoni dominated in both the fields though the percentage composition was found to differ. P. indicus and P.monddon showed a preference to seasonal field judging from the catch and catch rate. The fishery for M.monoceros was of minor importance in both fields. In the perennial fields, M. idella was available during the second half of the year and berried females were found more abundant in October-November months.

Forecast

The increase of larval recruitment noticed during the year is suggestive of the better prawn fishery in the coming year. But since the increase was noticed towards the end of the year the possibility of a better monsson for prawns is indicated. The high preponderance of M.dobsoni in the larval recruitment noticed in the last months of the year is also likely to be reflected in the monsoon catches of the coming year.

Table-II

State-wise landings of Crustaceans (Tonnes)

States	Penaeid prawns		Non-Penaeid prawns		Other Crustaceans	
	1974	1973	1974	1973	1974	1973
West Bengal & Orissa	2403	2565	1165	486	45	60
Andhra Pradesh	9857	8170	2842	669	934	364
Tamil Nadu	8060	4504	46	1285	9752	7719
Pondicherry	27	33	2	8	201	194
Kerala	59893	84770	1014	981	2886	1781
Karnataka	12695	8235	1	1	860	934
Goa	785	785	-	-	20	20
Maharashtra	14712	16894	50025	63455	973	687
Gujarat	3420	10550	149	70	211	749
Andamans	8	8	-	-	-	-
Laccadives	-	-	-	-	-	-
Total:-	111860	136514	55244	66955	15882	12508

Table - III

Particulars regarding the prawn fishing at different centres during 1974.

	Bombay	Goa	Karwar	Mangalore	Calicut	Cochin	Tuticorin
OFFSHORE PRAWN CATCH							
Catch (tonnes)	-	4.6	243.0	3259.0	430	3830	469.0
Catch/effort(kg/hr)	-	-	-	-	-	15.3	-
Important species*	2,9,1	9,6	9,3,1,6	1,9,2	1,9,5,2	1,9,5,3	5,9,8,1
Peak fishing season**	-	6,7	4,11,5,3	1,2,3	3,1,2,12	12,5,4,3	7,10,9,8

	Mandapam	Madras	Kakinada	Puri
Catch (tonnes)	220.1	390.0	1432.0	-
Catch/effort(kg/hr)	-	3.56	8.09	-
Important species*	8	1,5,8,3	3,1,4,2	-
Peak fishing season***	4,9,12,3	10,11,12	2,3,4,7	-

	Bombay	Goa	Karwar	Mangalore	Calicut	Cochin	Tuticorin
INSHORE PRAWN CATCH							
Catch (tonnes)	974.0	375.4	6.0	25.7	269.0	1.4	13.2
Catch/effort(kg/hr)	-	-	-	-	-	-	-
Important species*	16,15,13,12	1,9,2,3	9,6,1,2	1	1,9,5,2	5,1,9	5,8
Peak fishing season**	4,12,3,1	10.1.2.4	8,9,10,6	8,9	8,10,9.3	5,6,7	12,7,19,4

	Mandapam	Madras	Kakinada	Puri
	-	32.8	-	454.8
	-	-	-	0.57
-do-	-	1,5	-	6,5,7
	-	10,11,12	-	1,11,12

ESRUARINE PRAWN CATCH	Bombay	Goa	Karwar	Mangalore	Calicut	Cochin	Tuticorin
Catch (tonnes)	-	1-7	4-2	-	59.4	1550	-
Catch/effort(kg/hr)	-	-	-	-	-	-	-
Important species*	-	3,1,4,7	3-1	1,3,5,2	1,5,3,7	1,3,5,2	-
Peak fishing season**	-	3,11	11,1,2,6	4,12,11	2,1,3	12,4,3,11	-

	Mandapam	Madras	Kakinada	Puri
-do-	-	13.8	382	15.14
	-	-	-	0.81
	-	5,3,7	3,5,7	5,6,3
	-	7,8,9	11,10,12	5,6,7

** Months of the year
* Species numbered

1. Metapenaeus dobsoni
2. M. affinis
3. M. monoceros
4. M. brevicornis
5. Penaeus indicus
6. P.merguiensis
7. P. monodon
8. P.semisulcatus
9. Parapenaeopsis stylifera
10. P. hardwickii
11. P.sculptilis
12. Solenocera indica
13. Hippolysmata endirostris
14. Palaemon styliferus
15. P. tenuipes
16. Acetes indicus

Personnel

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STUDIES ON COMMERCIALLY IMPORTANT ELASMOBRANCH RESOURCES (FB/OF/1)

About 33 tonnes of sharks were landed at Pamban, which was poor compared to the catches of the last three years, the reason for the fall being the reduction in fishing for the group. The catch of rays at Mandapam amounted to about 104 tonnes; the first quarter was the most productive, followed by the fourth quarter. At Porto Novo, the elasmobranch fishery was good in the second quarter but poor in the fourth. At Tuticorin the catches were good in the first quarter.

Species composition

The important species were: Rhizoprinodon oligolinx and R.acutus among the sharks and Gymnura poecilura among rays at Mandapam, Carcharhinus limbatus and C.dussumieri among the sharks at Porto Novo, Loxodon macrochinum and R.acutus among sharks at Tuticorin and Scoliodon sorrakowah among sharks at Bombay.

Biological studies:

In the catch of the ray G.poecilura at Mandapam, the size range (disc width) was 206-1010 mm, three modal groups was recorded, namely 241-320, 401-481 mm and 761-840mm, the first group being found in almost all months. The females were more numerous than males in almost all months. Silver bellies formed the main food. Gravid females were found only in the first half of the year and the size of the embryos ranged between 111 and 200 mm. ~~The number of embryos per female~~ The size range of R. oligolinx at Mandapam was 211-720 mm with two prominent modes at 301-330 mm and 571-600 mm. The size range of gravid females which were available in catches only in June-September was 601-720 mm. In R. acutus the size range was 221-740 mm with modes 371-400 mm and 731-760mm. Gravid females were available during the last quarter. The size range of C.limbatus at Porto Novo was 730-1850 mm with modes 1110-1150; 1210-1250 and during first, second and third quarters respectively. The brreding season in March-May and the number of embryoes per female 6. In C. dussumieri the length range was 800-1400 mm with mode at 1050 mm. The breeding season appears to be April-May and the number of embryoes per female-4-6. In L.macrochinus at Tuticorin the size range were 500-674 mm with modes in the range 550-590 mm in different months. The females were more numerous than males in all months. During the first three quarters 75-90% of the famels were gravid. From the length frequency analysis of S.sorrakowah at Bombay the length at ages 1-8 was estimated. The estimates range from 200 mm at the end of the first year to 590 mm at the end of 8th year.

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Studies on the Resources of Tunas, Seer Fishes and Bill Fishes (FB/CF/3)

Tunas

In the Vizhinjam area, there was a considerable decline in the catch of tunas, compared to the last year. Of this ydars catch of about 300 tonnes at Vizhinjam, 59% and 41% respectively were landed by drift nets and hook and lines. On the Rameswaram Island the tuna catch amounted to 66 tonnes all from the Gulf of Mnnar, drift net being the gear used. The catch was 30% higher than in 1973. At Cochin about 1.1 tonnes of tunas were caught by purse seiners from the areas 9-75, 9-76, 10-75 and 10-76 the depth range of the grounds being 18-55 mm. At Minicoy the catch of tunas up to September 1974 was about 307 tonnes the gear used being the pole and line (with mechanised boats) and troll lines (with non-mechanised boats). Euthynnus affinis contrinuted to 80% of the tuna catch at Vizhinjam, 92% on Rameswaram Island, and almost the entire tuna catch at Cochin. Auxis spp. formed 18% of the tuna carch at Vizhinjam. On the Minicoy Island Katsuwonus pelamis dominated the tuna catch, forming 83% while Thunnus albacares, E.affinis and Gymnosarda sp. formed the rest of catch.

The size range of Euthynnus affinis at Vizhinjam was 270-819 mm, with modes in the range of 420-599 mm in drift net and 260-679 mm in hook and line catch. The maturity stages recorded were I-IV, a few specimens in spent recovering stage were recorded, in April. On the Rameswaram Island the size of this fish in the catch varied from 465-675 mm with modes at 585 mm The length range observed in the catch at Cochin was 450-600 mm.

The length of K.pelamis on the Minicoy Island varied from 250 to 650mm with modes at 480-550 and 600 mm. The fish were mainly in maturity stages IV and VII; females were more numerous than the males.

The size range of Auxis thazard at Vizhinjam was 252-475 mm, specimens in stages I-VI were recorded. With regard to A.thynnoides the length ranges was 200-329 mm with the group 260-289 mm predominating. Maturity stages III-VII were observed.

The size range of [illegible] at Vizhinjam was 252-475 mm, [illegible] were recorded.

Seer fishes

On the Rameswaram Island the catch in 1974 (470 tonnes) was equal to that in 1973. About 80% of the landings came from the Gulf of Mannar and the rest from the Palk Bay, the gear being the drift net. The catch per unit of gear was less in 1974 (9kg) than in 1973 (11 kg) in the Gulf of Mannar but equal in both years in the Palk Bay (18kg). Scomberomorus commerson, S.guttatus and S.lineolatus formed 91%, 0.6% and 8.3% of the seer fish catch from the Paly Bay and 55% 34% and 11% of the catch from the Gulf of Mnnar. The size range of the three species was 401-1050 mm, 391-690 mm and 561-880 mm respectively. The size at the end of the 1st, 2nd and 3rd years of life of S.commerson was estimated as 501-550 mm, 701-750 mm and 951-1000 mm, respectively.

Bill fishes

About 120 tonnes of billfishes (mainly Makaira spp. and Istiophorus sp) were landed on the Rameswaram Island, all from the Gulf of Mannar and 18 tonnes (mainly Makaira spp. and Tetrapturus sp.) at Vizhinjam. The food of the fish observed at Vizhinjam consisted of sardines. (Sardinella spp)

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Evaluation of the Resources of Lesser Sardines, Anchovies and other Clupeoids (FBICF/4)

Anchovies

At Vizhinjam the anchovy catch was estimated as about 360 tonnes, which was almost equal to the previous 5 years' average. Boat seines landed 85% of the catches. About 2/3rds of the catch of the year was landed in the second quarter. The first peak in the landings was observed in June as usual, but the second one was delayed and occurred only in November. Stolephorus devisi and S. bataviensis contributed to about 81% of the total anchovy catch. At Waltair the total anchovy catch was estimated as about 69 tonnes, shore seine and boat seine being the gear used. The bulk of the catch was landed by these gears in the first half. The catch per unit for shore seine was 41 kg as against 11 kg for the boat seine. The S. heterolobus was the dominant species.

At Vizhinjam S. devisi had the size range 32-97 mm with modes varying between 42 and 87 mm in different months. During the period of the peak catch in June the 50-54 mm size group was dominant and in the November peak period the 70-74 mm group was dominant. The species breeds almost throughout the year. Each female seems to spawn thrice within a period of 3-4 months. S. bataviensis had the size range 32-107 mm with modes ranging between the 42- and 87 mm in different months. The dominant size group was 70-74 mm during the period of the June Peak in catch and 75-79 in during the period of the November peak. The mature fish rarely occurred in the catch; the fish also seems to shoal separately from S. devisi. During April to June at Waltair S. heterolobus had the size range 30-99 mm; the modal size was 50-54 mm in April but 45-49 mm in May-June. In June most of the female specimens were in the IV stage of maturity.

Clupeids of Bombay

A survey of the clupeids occurring in Bombay was made. The most common species found was Coilia dussumieri and work on its biology was initiated in March, 1974. The food of the fish consisted mainly of crustaceans: occasionally fish larvae, polychaetes and diatums were also noticed.

Lesser sardine

At Tuticorin the catch was about 2850 tonnes as against 2130 tonnes in 1973, At Mandapam it was about 80 tonnes as against 165 tonnes during the least year. The fishery was good in the second half of the year, at Mandapam whereas in 1973 the catch had been greater in the first half. About 75% of the landings at Tuticorin was supported by Sardinella gibbosa, and about 10% by S. albella. The size ranges was 95-160 mm for the former with the mode at 130mm and 100-125 for the latter, with modes at 125 mm and 140 mm. The Mandapam catch was supported mainly by the 0-year class, as usual.

At Mandapam the catch of the rainbow sardine Dussumieria acuta was estimated as 4.5 tonnes and this was landed by shore seine, gillnet and trawl nets. The size range was 35-159 mm with the modes varying between 45 and 145 mm in different months in the non selective gear. Maturity studies indicates that the fish has a prolonged spawning season, extending from January-August with a peak during March-July.

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Studies on the resources of cat fishes, perches and carangids (FB/DR/1)

Cat fishes

There was improved abundance of cat fishes in the offshore grounds at Waltair as revealed by the operations of the Government of India exploratory trawlers, M.V.Meena Shodak and M.V.Meena Jawahar in 1974, than in 1973, the annual catch per hour being 20kg and the percentage in the landings of all fishes being 24 (In 1973 the c.p.h. was 7.4 kg). About 2/3rds of the cat fishes in the grounds consisted of Tachysurus tenuispinis and the rest of T. thalassinus, the annual catch per hour of the two species being 13 kg and 6.8 kg respectively. October and December were the most productive months in respect of the former, and April and July in respect of the latter. But the inshore catch at Waltair declined considerably in 1974, as compared to 1973. (catch 26 tonnes as against 72 tonnes in 1973), although the species were the same as in the offshore catches. The silk drift nets with respective catch rates of 0.8 kg and 0.6 kg for T.tenuispinia and T. thalassinus were the most effective gear in inshore fishing, the other gear wherein cat fishes were caught being hook and line and boat seine with a catch per unit of effort 0.05 kg and 0.04 kg respectively for the former species and 0.5 and 0.1 kg for the latter. Neither species was landed by shore seines. The first and thrid quarters were more productive than the other quarters in respect of both species.

The total catch of cat fishes by trawlers at Mandapam amounted to 33 tonnes. T.thalassinus and T.dussumeri contributed to 48% and 37% respectively of the cat fish catch, as against 38% and 22% respectively in 1973. An echogram trace showed that the shoals of T.dussumieri are oval in shape.

The size range of T.thalassinus was 140-379 mm and that of T.tenuispinis 120-420 mm at Waltair; one-and two year-old fish comprised the bulk of the catch. At Mandapam the modal length of the T. thalassinus in various months varied from 111 mm to 450 mm; studies on age composition of the catches there are progressing. Males with eggs in the mouth and juveniles were recorded during July-September at Mandapam.

Perches

At Madras the fishery for Lactarius lactarius was poor although stray specimens were found in the catches of commercial boats at Royapuram during the second half of the year. However catches landed by the Government of India trawlers namely M.V.Meena Sitara and Meena Gaveshak were significant. The vessels fished in the areas 12-80, 13-80, 14-80 and 15-80 in the depth ranges 14-125 meters but mostly in the range 15-45 fm and recorded catch per hour of this fish varying from 1.0 kg to 25 kg, the percentage of the fish in the catch of all fishes varying from 0.70 to 14.0. The highest yield per hour (25kg) was obtained from the area 14-80/4B in September. The catch of the commercial boats at Nayapuram consisted of juveniles ranging from 50 to 111 mm in fork length.

Carangids

At Vizhinjam the carangid fishery suffered a decline during the year as compared with that of last year. Maximum catches were obtained during July (25%), the Decapterus spp., being the main contributor. The shore-seines with a catch rate of 24.8 kg/unit were the most successful gear, followed by the drift net (9.5 kg/u), boat seines (8.5 kg/u), and the hooks and line (4.9 kg/u), A total of 25 species compased the Carangid fishery with D.dayi being the dominant (30.7%)

The fishery for M. cordyla registered a decline compared to the previous five years. The size range of the fish in the catch was 79-565 mm. Mature and maturing specimens in the first half-year; intermediate in the III quarter; and immatures and spent individuals in the last quarter were noticed. Feeding was generally poor. The range in sizes of D.dayi was from 23 to 279 mm in total length. Occurrence of spent individuals from January to December perhaps indicates a prolonged spawning. Feeding was moderate.

Personnel:

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Sciaenids

The work on the sciaenids is being continued at two centres on the West Coast (Bombay and Calicut) and two on the East Coast (Mandapam & Madras).

Seven species are being studied in detail at the various centres for age determination and feeding and breeding habits. They are, Pseudosciaena sina P. vogleri, P.aneus, P. axillaris, Johnius dussumieri, Otolithes ruber and O.argenteus.

Fishery

At Bombay the fishery was good only during the 1st and last quarters. At Calicut the estimated catch this year was 231 tonnes, as against 183 tonnes in 1973. The catch per unit of effort showed higher values for January, May, and December when compared with last year.

At Mandapam total landings of 102 tonnes of sciaenids were recorded during this year. The catch as well as the catch per unit of effort was highest during the first quarter. During the other three quarters the landings were more or less equal. At Madras (Royapuram landing centre) an estimated 128 tonnes of sciaenids were landed this year as against nearly 50 tonnes last year. The landings were high during October, November, December and January with about 1/3rd of the total landings recorded only in December. During the rest of the year there were very little landings of this species. At Waltair for the half year ending June, 1974 the two Government of India trawlers landed about 5.9 tonnes of sciaenids and the non-mechanised boats at Lawsons bay 4 tonnes. The Government of India trawler catch during this half year was 88.0% more than the corresponding period of the previous year.

Bombay:

P. sina:

The monthly average size recorded at Bombay varied from 14 to 204 mm from January to October. Females, dominated the beach in January , March, April, May, July, September and November; spent females were observed from March to July and from October-November. At Calicut the size range recorded was 35 mm to 165 mm in inshore grounds and 65 mm to 175 mm in deeper waters. In the inshore catches by paithuvala immature fishes predominated while in trawl nets from deeper waters stages IV to VI were represented. The juvenile fed on items like mysids, copepods and small prawns, and the adults on prawns, fishes, polycheates and copepods.

P. aneus:

Studies at Mandapam showed a rate of growth 120 mm. during the first year, 190 mm in the second year and 205 mm in the third year.

Maturity stages I-IV were recorded throughout the year. State V, VI and VII occurred only during February and March, indicating these months to be the peak spawning season. Fecundity varied from 8000 to 14000 eggs. Oozing individuals were seen during the first, week of March. At Madras fish in the length range of 132 to 198 mm occurred during the first quarter, 141 to 180 mm in the second quarter and 120 to 232 mm during the second half of the year. Fish in spent condition were recorded from March onwards into the second quarter. This shows a prolonged spawning period. Maturity stages of I to V were recorded the second half of the year.

P. vogleri:

At Bombay the fish in the catches had a length range of 81 mm to 30 mm. Juveniles entered the fishery during the first quarter. Males and females were in about equal numbers in February and May. Males dominated in April and October. Spawning individuals appeared during June to November. Intensive feeding was noticed in February, April, May and December. Poor feeding during the spawning season of June to November was noticed. At Madras the length/ range recorded was 95 to 222 mm. Males dominated the samples during the first quarter and females during the second quarter. From February on-wards advanced stages of maturity were noticed; during the 2nd half of the year stages I to V were recorded.

P. axillaris:

A few specimens of the fish were examined. Most of them had empty stomachs. A few had taken Squilla as the diet.

J. dussumieri:

Small quantities of this fish were recorded in March and the last quarter of the year. The size range was from 67 to 262 mm. Low feeding was noticed from September to December. Except in September and October, when females dominated the samples, in the other months the ratio of males to females was more or less equal. Advanced stage of maturity was noticed from September to December, At Calicut fish measuring 55 to 225 mm were collected and examined. Maturity stage II, III and V were recorded in almost all the months.

O. argenteus:

At Bombay the monthly average size varied from 138 to 154 mm from January to April and from 108 to 116 mm in October to November. Females dominated upto June and in the 2nd and 3rd quarters running and spent females were noticed. Feeding was lowest in February.

O. ruber:

At Madras the length of fishes examined ranged from 110 mm to 394 mm. 25% of fishes had $\frac{1}{4}$ empty 50% had $\frac{3}{4}$ empty and 25% had $\frac{1}{2}$ empty stomachs. The size range available at Calicut was from 55 to 305 mm. Most of the fishes examined were juveniles. Some spent specimens were observed in July and August.

Polynemids

At Mandapam the mechanised boats using the trawl nets landed about 1.1 tonnes of polynemids, all during the first quarter. The two 58' steel trawlers namely M.T. Mullai and M.T.Marutham, each of 200 HP, belonging to the Department of Fisheries of Tamil Nadu, conducted exploratory fishing in the Gulf of Mannar in January, February, November and December. The sub areas 8-79/6A, 9-78/1A, and 9-79/1B were fished, the depth range of operations being 18-46 m. The two trawlers together landed about 2.1 tonnes of polynemids at a catch rate of 9.1 kg each per hour. The polynemids formed 2.06% of the total catch. The catch per hour was highest in January.

The size range of Polynemus microstoma in the catches was 87-184 mm with the modes occurring in the range 125-154 mm. Juveniles were not recorded during this year. At Mandapam the females were in Maturity stages II-III in January, November and December. The hermaphrodite males were in the maturing condition during January and December. At Ervadi the females were either in maturing condition or spent conditon, while most of the hermaphrodite males were in the mature or in the spent stages. The simultaneous occurrence of mature and spent fishes in the Ervadi fishing grounds indicates the possibility of this area being the spawning ground of this species.

Personnel:

T.Tholasilingam, FS; S.J.Rajan, AFS; K.Dorairaj, AFS; R.S.Lal Mohan, AFS; K.V.Somasekharan Nair, RA; A.Jayaprakash, RA; C.Muthiah, RA; S.Srinivasarengan, RA

Studies on the resources of silver bellies and ribbon fishes

(FB/DR/3)

Silver bellies

Fishery:

At Royapuram (Madras) the catch of silver bellies by trawlers increased three fold in 1974 (810 tonnes), compared to 1973. (270 tonnes). The monthly catch per hour of silver bellies varied from 3.6 to 13.5 kg and the percentage in the catch of all fishes from 9 to 27, the highest values in respect of both being recorded in December. The catch was supported by 4 species, namely, Leiognathus bindus, Gazza minuta, L.dussumieri, and L.lineolatus, the first two species forming more than 90% of the landings. At Mandapam, the total landings of silver bellies from Palk Bay declined, when compared to the previous year, the respective figures being 8800 and 10,050 tonnes. The c.p.u.e. (catch per boat per day) was also lower at 463 kg. as against 571 kg. in the previous year. The total catch of silver bellies by day fishing was also less at 7775 tonnes as against 8875 tonnes in the previous year. However the total landings for the year were higher when compared with average total landings in the first four years which amounted to 6850 tonnes. As in the previous years, the catch by day fishing far exceeded that by night fishing, the respective figures being 7775 tonnes and 1025 tonnes. The landings were high in the months of May to August constituting 90 to 97 of the monthly total catch of all fishes. The total landings of silver bellies in the Gulf of Mannar were more than double those of previous year, the respective figures being 105 tonnes and 45 tonnes. Leiognathus jonesi formed the dominant species in Palk Bay and L.dussumieri in the Gulf of Mannar. The Tamil Nadu Government trawlers, 'Mullai' and 'Marutham' based at Mandapam carried out trawl operations in Gulf of Mannar in areas 8-79/6A, 9-78/1F, 9/79/1A and 9/79/1B during Jaunary-February and again in November-December at depths ranging from 18 to 46 metres. A total of 226.32 hours was spent in these areas to realise a silver bellies catch of 60-78 tonnes at the rate of 269 kg. per hour. Though there have been declines in the total catch and c.p.u.e. of silver bellies from Palk Bay as compared to the previous year, the total catch during the year was still above the average catch for the last 4 years, and for the dominant species L.bindus modes at 70-85 mm continued to be dominant in most of the months, as in the previous years. The silver belly fishery at Vizhinjam has been showing an increasing trend since 1972 and the catch of 763 tonnes recorded this year is the highest in recent years. Their contribution to the total marine fish landings rose from 5.7% in the previous year to 15.7% in the current year. The average c.p.u.e. of boat seine, the main contributing gear, rose from 8.5 kg. per unit in 1973 to 11.9 kg. per unit in 1974. Higher yields were also obtained in shore seine and chala vala. Leiognathus bindus and Secutor insidiator were the common species.

Biology:

The size range of L.bindus obtained at Madras was from 30 to 121 mm. with the modal size groups varying from 86-90 mm. to 106-110 mm. The size range of Gazza minuta, another common species caught at Madras, was from 95 to 141 mm with the modes varying from 101-105 mm. to 111-115mm. The modal values of L.jonesi obtained from Palk Bay at Mandapam varied from 35 to 95 mm. of which those in the range of 70 to 85 mm formed the dominant ones. It is seen from the length frequency studies that the fish attains an average length of 75 mm at the end of one year and 90 mm when it is one and a half year old. It is mostly fish belonging to the 0+ and 1+ year classes that contribute to the fishery. Females predominated over males and the peak spawning season was in January-April and September-November. The modes of L.dussumieri obtained from Gulf of Mannar ranged from 60 to 80 mm. and they were in stages I to III in Jaunary and November-December. At Vizhinjam, the total length of L. L.bindus was from 26 to 120 mm. with a modal variation of 56 to 100 mm. Maturing and mature individuals were more common in the second half of the year. The range in the modal size group of Secutor insidiator was from 36-40 mm. to 86-90 mm. The mode which was at 46-50 mm in June reached 81-85 mm. in November.

Ribbon fishes

Fishery:

The estimated landings of ribbon fish at Royapuram by mechanised vessels during 1974 (100 tonnes) was less than those in 1973 (154 tonnes). As in the previous year, the fishery was poor in the first half of the year but showed considerable improvement in the second half. The maximum landings were in October 1974 and ribbon fish formed 7.6% of the total catch. Highxx catch rates ranging from 1.4 kg to 3.8 kg per hour were realised in June-December period. Trichiurus lepturus was the dominant species in the local catches. As estimated, 371 tonnes of ribbon fish were landed at Kakinada, this being an additional catch of 154 tonnes as compared with that of the previous year. 2948 additional fishing units were put into operations this year compared with the previous year. A small decline in the catch per hour was noticed in 1974 when compared with that of 1973. At Bombay, Trichiurus lepturus and Lepturacanthus savala were the two most common species of ribbon fish.

Biology:

The size range of T.lepturus obtained at Madras was from 155 to 750 mm with modal groups varying from 250-300 mm. to 600-650 mm. At Kakinada a preliminary statistical analysis of data on meristic characters showed that juveniles and adults do not differ significantly in the characters studied. Generally males dominated the catches in most months and most length groups. The modes of T.lepturus examined at Bombay ranged from 280 to 480 mm in bag net, 680-880 mm, in gill net and 330 to 530 mm. in trawl net. For L.savala it ranged from 230 to 430 mm. in bag net and 280 to 430 mm in trawl net.

Personnel:- G. Venkataraman, JFS; C.R. Shanmughavelu, AFS
P.T. Meenakshisundaram, AFS; J.C. Gnanamuttu, AFS
K.Rajasekharan Nair, RA; P. Nammalwar, RA
V. Sreeramachandramurty, RA; Y. Appanna Sastry, RA.

Evaluation of demersal resources of some selected areas

(FB/DR/4)

Bombay

During the year three vessels, Meena Bharathi, Meena Avejak and Meena Anveshak, fished in the inshore waters at depths 10-110 m, while Kalyani IV joined them for a couple of months. The gear used was mainly the 24m-trawl, though the 30m- and 35m- trawls also were additionally operated sometimes. For a total fishing effort of 1257.83 hrs, a catch of 150,244 kg was realised giving an average of 119.45 kg/hr. The catch consisted of mostly miscellaneous fishes, cat-fish, elasmobranchs and Ghol

Cochin

Of the IFP vessels the larger vessels (Velameen, Tuna and Klaus Sunnana) carried out trawling in the inshore (10-50m) waters all through the year as well as in the deeper waters (90-320m) mainly during the first two quarters and in December. Medium vessels carried out inshore trawling (mainly shrimp trawls) in 5-25m depth, except in Mar-April, May and October. In addition to trawling, R.V. Varuna carried out hand line operations, mainly during the first quarter, while some of the large and medium vessels fished with purse seines more or less throughout the year in 7-58m, and with pelagic trawls in the latter half of the year, as also try nets in March and May. The EFP vessels Meena Utpadak and Meena Sangrahak fished with shrimp trawls and 20m- and 24m- fish trawls in almost all the months at 10-100m.

The summary of catch particulars are as follows:-

	Catch(kg)	Effort (hr)	C/hr	Dominant species (Numbered)
a) IFP medium vessels	8342	342.91	24.33	6,1
b) IFP layer vessels (inshore trawling)	357497	2205.15	162.16	2,5,4,6
c) IFP layer vessels (deep water trawling)	39037	471.00	82.89	6,7
d) IFP vessel handlines	6900	223.5	30.87	4
e) EFP vessel trawling	112617	1171.35	96.14	6,5,2

Species No: 1. Prawns, 2. Elasmobranchs, 3. Nemipterus, 4. Perches, 5. Catfish, 6. Miscellaneous fish, 7. Lobster.

Tuticorin

For the greater part of the year only one offshore vessel Meena Niryantak took part in exploratory surveys around Tuticorin. A second vessel Meena Saudagar joined in the surveys in December. The 24m-trawl was the gear most widely used; others operated were the 28m- and 20m-trawls, as also midwater trawls which, however, did not give encouraging results. Most of the fishing was carried out in square 8-78. Perches and rays made up the bulk of the trawl catches, the rest consisting of clupeids and miscellaneous fish.

The catch and effort details are as follows:-

	Catch(kg)	Effort(hr)	C/hr
a) 24m trawl	53991	464.55	106.1
b) 28m trawl	775.5	8.10	96.9
c) 20m trawl(i), (ii)	12126	131.00	92.56
(ii)	1345	16.25	84.00
d) midwater trawl	652	72.91	8.94

Kakinada

An estimated 5029 tonnes of fish were caught by the three types of boats - Pablo, Pomfret and Koyya, and Sorrah - operating from Kakinada fishing harbour during the year, the prawns alone comprising 1432 tonnes. This showed an annual increase of 1532 tonnes over last year's figure, the prawn catch being nearly twice that of the previous year. An additional 2948 fishing units were put into operation during the year, which resulted in the increase in total catch. The C/Hr of fish as well as prawns remained steady in spite of this. Sciaenids, ribbon-fish, Nemipterus spp., catfish, silverbellies and soles were the major categories that contributed to the fishery. The details are as follows:-

	Total catch (fish)	Total catch (prawn)	Effort (hr)	C/Hr (fish)	C/hr (fish)
a) Pablo	1117056	368912	52292	21.36	7.05
b) Pomfrets &	2142041	398456	72760	29.44	8.29
c) Sorrahs	1769773	459528	52295	33.84	8.79

Visakhapatnam

Two Govt of India trawlers, Meena Shodhak and Meena Jawhar, carried out exploratory trawling along Andhra-Orissa coasts during the year. The total estimated landings (126 tonnes and the catch rate (147.2 kg/haul) showed increase over last year's figures. The 'miscellaneous small' group of fish usually dominated (making up nearly 59% of the catch), while catfishes/rays and 'miscellaneous big' held the second and third ranks alternately. The prawns made up 0.6-1.2% of the catch. The details of catch/effort are as follows:-

	Catch(kg)	Effort(hr)	C/H
a) Meena Shodhak	56146.25	686.90	81.7
b) Meena Jawahar	69862.70	838.68	83.31

Port Blair

Trawling operations were conducted by Meena Khojini for 7 months during the year. The maximum catch/hr (312.92 kg/h) was recorded for the area 11-92/5E. The catches were mainly of elasmobranchs and misc. fish. Kalava lines were operated by Meena Khojini from August onwards but yielded rather poor results. Perches and Elagalis bipinnulatus mainly made up the catch. The boat also operated tuna long lines and trolling lines during part of the year. The details are as follows:-

	Catch(kg)	Effort(hr)	C/H
a) Trawling	16161	130.42	123.92
b) Kalaver lines	270	97.66	2.76

Personnel: C. Mukundan, JFS; B. Krishnamoorthi, JFS; K. Venkata Subbha Rao, AFS; V. Ramamohana Rao, AFS; P. Mojumder, AFS; T. Appa Rao, AFS; S. Reuben, AFS; S.S. Dan, AFS; V.M. Deshmukh, AFS; P. Sam Bennet, AFS; V.N. Bande, AFS; S. Sivalingam, SRA; P. Karunakaran Nair, RA; Y. Appanna Sastry, RA; W. Venugopal, RA.

Studies on the resources of flat fishes and pomfrets (FB/DR/5)

Flat fishes

The Malabar sole:

The estimated total landings of the Malabar sole Cynoglossus macrostomus at Vellayil (Calicut) in 1974 amounted to 362 tonnes as against 112 tonnes in 1973 and 627 tonnes in 1972. Of this year's catch about 64% were landed by mechanised boats and the rest by non mechanised boats. Neither type of craft landed the sole during June-August. The catches of both types of craft were high during March-April and October-November. The relative abundance as measured by the mechanised boats was highest in November (catch per unit 214 kg) followed by March (catch per unit 65 kg). From the study of the catch of the mechanised boats, it was apparent that the relative abundance the fish was greater in 1974 (31 kg per unit) than in 1973 (10 kg per unit). The landings were composed mainly of one year old fish, the size range of the fish for the entire year being 30-170mm. The females examined in October were in maturity stages IV-V. Juveniles of the new brood started appearing in the collections from November, indicating that spawning on a large scale had commenced a few weeks earlier.

Other flat fishes

A total of 8.9 tonnes of the tongue sole Cynoglossus dubius were landed at Vellayil (Calicut) during the year, of which about 90% were recorded by the mechanised boats using trawl nets and the rest by non mechanised boats. Nearly 97% of the catch was landed during the first half of the year. The catch was supported by fish of the size range 66 to 380 mm.

At Mandapam about 17 tonnes of Cynoglossus macrolepidotus were landed by trawl nets, the catches being good from January to April and in September. The size range of the fish was 111-430 mm with modes occurring in the range 171-310 mm. The females were dominant in the catches throughout the year except in January.

Pomfrets.

At Veraval, the pomfret Pampus argentus were landed by gill nets and trawl nets. The bulk of the catch came from the gill nets, the estimated quantity landed by this type of gear being 565 tonnes. The percentage of this fish in the landings of this type of gear varying from 2 to 60 and the monthly catch per unit from 4 kg (March) to 172 kg (October). In the trawl nets there was no catch of this fish in September, November and December. The catch per unit in other months varying from 0.5 kg (March) to 2.0 kg (January and February). The size range of the fish in the gill nets varied from 151 to 375 mm the dominant size group occurring in the range 280-330 mm. The monthly average length of the fish varied from 279 mm (September) to 300 mm in (February). There was an excess of females in the samples over males. Maturity stage above III was not recorded.

Personnel: G. Seshappa, PS; Kuber Vidyasagar, SRA;
G. Nandakumar, RA.

Studies on other crustacean resources

(FB/MISC/1)

Deep water lobster:

The exploratory fishing conducted for the deep water lobster, Puerulus sewelli by the integrated Fisheries Project, Cochin resulted in the landings of 16.2 tonnes with a catch rate of 56.3 kg/hour, showing an increase of over 21% of the catch rate of corresponding period of last year. They were mainly caught off Quilon and Cochin from a depth range of 200-250 mm. The modal size was noticed at 155 mm for females and 145 mm for males.

Shallow water lobster:

The fishery for the shallow water lobster, Panulirus homarus experienced a heavy decline in the Kanyakumari District (Tamil Nadu), the estimated number being 19,397 as against 87,889 of the previous year. The size of the lobster ranged between 88 mm and 257 mm with modal size at 175 mm for females and 205 mm for males. Another species P.ornatus was also caught during the first quarter. Around Tuticorin, P.homarus and P.ornatus were dominant during the season. The heavy decline in the lobster fishery noticed this year calls for detailed studies. Perhaps this will be possible with the implementation of the V plan where in posting of an officer for lobster studies is proposed.

Commercially important Crabs:

Scylla serrata:

This species formed 11.6% of the crabs landed at Kakinada. Crabs with 170-210 mm in carapace width contributed the fishery. At Tuticorin, the carapace width of the species ranged from 90 to 205 mm. At Cochin, 3.3 tonnescof S.serrata was landed at one observation centre. The size of the crabs ranged from 41 to 173 mm in in carapace width and the fishery was supported mainly by 85 mm size range. Berried females were found in the catches of January, February and December.

Portunus pelagicus:

An estimated catch of 30 tonnes of the species was caught by crab net at Kakinada. Females of 130-160 mm and males of 145 to 170 mm in carapace width dominated the fishery in all months. As in the previous year, berried females were noticed throughout the year. At Mandapam, the gill net and mechanised trawlers together landed 105.5 tonnes of the species. The dominant size group for the gill net and trawl catches were 130-150 mm for both the sexes. Berried females were more in February, March and November. P.pelagicus usually formed the bulk of the catches in the lobster net operation at Harbour project of Tuticorin. They ranged in carapace width 97 to 164 mm. Berried females and partly spent males were available throughout the yaar. At Cochin, the estimated catch of the species was 3 tonnes from one observation centre. Crabs belonging to 91-100 mm in carapace width dominated the fishery and berried females were common during the first quarter. At Mangalore, the mechanised trawl catch of the species was about 232 tonnes. The prominent mode varied from 83 to 113 mm and 78 to 103 mm for males and females respectively in different months.

P. sanguinolentus:

The species formed the bulk of (65.43%) of the crab landings at Mangalore, the estimated catch being 438 tonnes which was mainly landed by trawlers in the first quarter of the year. The prominent mode for the species varied from 93 to 113 mm for males and from 93 to 108 mm for females. The entry of smaller size groups into the fishery was noticed in April.

Personnel: K.H. Mohamed, FS; G. Sudhakara Rao, SRA; P. Bensam, AFS; K.M.S.Ameer Hamsa, SRA; S. Shanmugham, RA; M. Kathirvel, RA.

Studies on the resources of commercially important molluscs (FB/MISC/2)

Study of the ecology and biology of pearl oyster.

At Tuticorin:

Analysis of the data and material collected during the earlier underwater survey trips from Devi paar, Nagarai Paar, Tholayiram Paar, Kuthadiar Paar, Pasi paar and Pulipundu paar were analysed during the year.

Oyster spat settlement had been patchy and cannot be considered profuse. The size range of 15 mm - 30 mm noticed during December suggested the probability of spat fall in October - November. The data marked decrease in the density of oyster population. The mortality ranged from 72% to 88% in all areas.

Heavy Modiolus sp. settlement in the shoreward areas was evident. The average of 4000 nos/sq.m against 75 oyster spat in the same area give a fair picture of the enormity of the settlement. Modiolus sp. ranged in size from 5 mm - 8 mm suggesting recent recruitment perhaps simultaneous with oyster spat fall or immediately after. The settlement had weaved entangling threads like a mat, in the matrix of which oysters were imprisoned. No particular pattern of settlement either in the case of oysters or Modiolus could be deduced when compared with the data collected during the last three years.

The procumbent valves of oysters are covered over by the thick mat of Modiolus seriously preventing the normal flow of water into the body of the oyster eventually choking the oysters burried underneath to death. Therefore, the critical phase in the pearl oyster life history does not appear to be confined to the period of larval life alone but also extends throughout the entire ~~XNS~~ first year of its growth vis a vis Modiolus settlement.

It was noticed that oysters which had settled down on the shell valves of Pinna sp. growing in the paar area were not much affected by Modiolus formation. Marked population of Pinna was noticed in Tholayiram paar.

The estimated density of the population of oysters in the various paars preculdes the possibility of any fishery in the next three years.

Observations on the percentage composition of the various species of Pinctada occurring off Tuticorin were made. In the collections made from the areas beyond 5 fathoms the population was totally of Pinctada fucata. But in the shoreward shallower areas a few other species were also encountered. Oyster spat of P.chemnitzii, P.sugillata and P.anomioides were collected in large numbers in addition to P.fucata from granite stones embankments along the shore as well as from spat collectors laid near the shore. Peak spat settlement season of these species appear to be April - May and October - November.

Collection of more data on the season of settlement, growth and utility of the above species (other than P.fucata) in cultured pearl production appears to be necessary.

Cephalopods

At Mandapam:

At Mandapam the total catch of cephalopods landed by trawlers was estimated to be 27 tonnes which is more than four times that in the last year. The catcheswere best in the months of May, June, and October. Sepiella inermis formed the dominant cephalopod species in trawl catches in the first quarter and Sepia aculeata in the rest of the year. Loligo duvauceli was caught in good quantities in May and June and species like Sepia pharaonis, Sepia sp., and Sepioteuthis aretipinnis were obtained in small quantities throughout the year.

The biology of the cuttlefish Sepia aculeata was studied. The size range in the catch was 19-177 mm, with the mothly modes mainly in the range 51-100mm.

Mature cuttlefish were recorded throughout the year suggesting that the species breeds all round the year. Immature and maturing ones were also noticed in all months of the year. Males were the dominant sex except in June. The food of S.aculeata consisted mainly of prawns and fish; a small percentage fed on stomatopods, crabs or alpheids.

Total landings of the squid Sepioteuthis arctipinnis at Kilakarai in the year amounted to 5 tonnes, which was less than that of the last year (8 tonnes). The catches are made by shore seine and handline. The highest squid catches were caught in January, February, June and from July to September. Good catches of S.arctipinnis were obtained in shore seines at Pamikulam and moderate catches at Dargavalasai in May and June.

At Madras

The total cephalopod landings by mechanised boats at Rayapuram(Near Madras) this year amounted to 196 tonnes, as against 100 tonnes last year, the catch per unit of effort being 2 kg. The landings were high during the third quarter (42% of the annual catch) followed by the fourth quarter (24% of annual catch). Cuttle fishes formed 52%, squids 44% and Octopus 4% of the annual landings. Among the cuttle fishes, Sepiella inermis, Sepia pharaonis and S.aculeata, and among the squids Loligo duvaucelli were important. The dorsal mantle length of S.inermis ranged from 23 to 78 mm in respect of females and 33 to 58 mm in respect of males; that of L.duvaucelli ranged from 48 to 143 mm in respect of females and 44 to 131 mm in respect of males.

Mussel

At Kakinada:

The mussel in the catch varied in size from 28 to 183 mm. Analysis of growth data based on the cage culture of marked individuals indicated that the catches are composed mainly of the 1 year and 2 years old mussel. Maturity studies show a prolonged spawning period. Mussel in partly spent condition were available in January-June, and peaks spawning seems to take place in the second quarter. The percentage of edible meat in total weight was low in January-June and moderately high in July-December, showing some correlation with the reproduction cycle.

At Madras:

Investigations on the biology of the mussel were continued at Madras. In the Ennore estuary the spawning of the mussel was continuous from March to September with peaks in May and August. The peak spat fall occurred in September. In the 1973 year-class of mussel at Ennore there was an average growth of 8 mm and in the 1974 year-class about 12 mm in length per month. There was practically no growth in June and August. The majority of the mussel perish after the peak spawning period. The maximum life span of the mussel in the estuary is about 2 years. An average increase of 7 mm and 1.7 mm in length per month was observed for the 1974 and 1973 year-classes of the mussel in the Kasimode Bay. The mussel above 50 mm in length attain sexual maturity; the approximate age at first maturity being 4 months. Spawning activity is at the peak when the mussel are 80-100 mm in length range, /10-12 months in age.

Laboratory experiments showed that the mussel can tolerate

Edible Oyster

At Madras:

The length of the edible oyster, Crossostrea madrasensis varied from 11 to 156 mm, with modes at 24 mm, 64 mm and 101-109 mm during October-December. Young spat of the size group 7-13 mm were present in the samples of October-December. The gonad of female oysters of the length range 59-112 mm were in maturing condition. From laboratory studies it is seen that edible oysters can tolerate salinity as low as 7‰.

Clams

At Madras:

The clam, Meretrix meretrix in the landings varied from 25 to 54 mm in length. During January-July and October-December a mean increase in length of 6-3 mm and 3-9 mm per month, of the clam, was noted. The females of the length range 31-39 mm had maturing gonads in December. Laboratory studies show that the clam can tolerate salinity as low as 13‰.

At Porto Novo:

Studies on the clam resources of the Vellar estuary were initiated. Kaleleysia opima is the main species in the fishery. Studies are being undertaken on the growth rate of the species. Transplantation experiments are also in progress.

Personnel: K. Nagappan Nayar, JFS; S. Mahadevan, JFS; K.A, Narasimham, AFS; K. Satyanarayana Rao, AFS; R. Sarvesan, SRA; K. Ramadoss, RA; Pon. Siraimeetan, RA; P. Natarajan, RA; K.S. Sundaram, RA.

Mariculture - Culture of molluscs

(FB/MISC/5)

The mussel, Mytilus viridis

At Madras:

At Madras, studies on the suitability of estuarine coastal area for mariculture were continued. Work was carried out in the estuary at Ennore about 18 km north of Madras. At a spot 1 km from the bar mouth and 3 m deep a frame 3.3m sq. was errected with bamboo poles and adult green mussel suspended into the water with ropes. Other material such as bamboo poles, casurina poles, bricks, tiles and stones were also used to collect the spats. Mussel adapted very well to the estuarine conditions and spawned in February. Heavy spat fall was observed, the spat measuring 2-3 mm in length. Casurina pole was found to provide a good substratum for spat settlement.

The spat settle 50 cm below the low water mark to a vertical length of 50 cm, forming thick clusters. They grew to the commercially harvestable size of 80-90 mm by October. The whole weight (with shell) harvested at the end of 10 months from a single casurina pole, was 10 kg. The temperature of the surface water ranged from 25-0 to 29.5°C and salinity from 31.5 to 34.4‰. Regular observations of the surface plankton revealed all the plankton elements which are found in the adjacent coastal water. The settlement volume of plankton varied between 2 and 52 ml. An open bar throughout the year, a strong tidal flow and abundance of phytoplankton suggest that the Ennore Estuary is suitable for culturing mussels. However the shallowness of the estuary, the heavy load of silt in the water often suffocating the growing organisms, settlement of foulers on the mussel, the rapidly changing bottom configuration, and poaching are very serious handicaps.

At Mandapam Camp:

The culture of the mussel transported from Vizhinjam and transplanted to Mandapam in December 1973 was continued. The mussel which had an average length of 21 mm and average weight of 2.3 gm in December 1973 reached the average length of 54 mm and weight of 13g in October 1974. There was some natural mortality and also mortality due to attack of predatory fishes.

At Kakinada:

Work on the cage culture of the green mussel in the Kakinada Bay was continued. Mussel which measured 26-82 mm in January and grown to 75 - 103 mm and those that measured, 108-170 mm had grown to 120-174 mm by July. Four cages containing the mussel were lost due to poaching. Another sample kept in cages in October and measuring 73-153 mm showed practically no growth by December. The results so far obtained indicate that the rate of growth is fast during the first 6 months, especially during March-June, and it slackens in the latter half of the year. Also some mortality was observed in September-November. During these months salinity was low. The temperature of the water at the culture site varied from 26°C (December) to 33.5°C (April-May), the salinity from 1.45‰(October) to 31.5‰ (May), and dissolved oxygen from 3.44 ml/l (September); PH varied from 7.2 to 7.8.

At Tuticorin:

Four consignments of mussels, one from Cape Comorin, two from Colachel and one from Cuddalore were brought and stocked in the mussel farm in the Tuticorin harbour the size at the introduction stages varying from 25 to 35 mm. Mortality was high initially ranging from 10 to 15 percent. Raft construction and rope attachment techniques were standardised. For the attachment of spat nylon ropes of 10 mm thickness and 4 m length were used. The spat were attached to the rope using initially nylon closed mesh wel which could be removed after 30 days. However the increment in length in 1974 was very disappointing being only about 15 mm on the average. One main reason for the low growth rate may be the [illegible]

At Cochin: Abundance of mussel spat

A very abundant resource of mussel spat was found in October-November on the groynes laid in the sea at regular intervals over a distance of about 40 km between Pattanakad and Cochin. The numbers of the groynes is about 200. The density of spat was about 220 numbe s per 100 sq.cm. Because of certain environmental factors like the silting and deposition of sand over the boulders, the spat have only a short life span, but these could advantageously be used in large scale commercial culture.

Edible oyster, Grassostrea madrasensis

At Mandapam Camp:

Experimental culture of the edible oyster was continued in the Athankarai estuary. Additional cultch consisting of oyster shells and concrete pieces tied to nylon ropes were kept in the estuary for the setting of spat. Spat fall was fairly good although confined mostly to the first half of the year. When the young oyster attained the size of 50-60 mm, these were separated from cultch and reared in wire cages. Oysters of the 1973 year-class attained an average size of 90 mm and maximum of size of 103 mm in March, after which increase in size was negligible. The cultured oyster of the 1974 year class attained the size of 103 mm by December 1974. The studies show that it is preferable to harvest the cultured oyster at the end of one year. The temperature of the estuary was 29.5, 26.5 and 33.3°C in January, February and April 1974, and it varied between 29° and 30.6°C in March and May-November, In December 1974 the temperature dropped to 25°C. The salinity increased from 21‰ in January to 34‰ in April. In May-November it fluctuated between 31 and 36.4‰ and decreased to 29.‰ in December.

At Tuticorin:

Spat collection of edible oyster was made in April-July and these were deposited on the stone embankments and on the general bottom in one of the creeks near the harbour. Periodical observations on the rate of growth revealed that the creek is well suited for the uninhibited growth since the oyster up to 140 mm were collected from this area. Effort to set up platforms and racks to grow spat in the creek failed due to the interference by the fisher folk.

At Madras:

A raft was stationed in the Ennore estuary and cultch material consisting of oyster shell, tiles, stones etc were suspended from the raft. Spat were collected in November and these showed good growth. However before much headway could be made the raft was disturbed and further observations could not be carried out.

In the course of the culture work spat fall of the window pane oyster Placuna placenta was observed in October. Young ones measuring 15-20 mm in length were collected in November and by December these had grown to about 33 mm. Further observations were disrupted due to

Natural pearls in window pane oyster

There is an extensive bed of windowpane oyster, Placuna placenta in the Kakinada Bay. About 26% of the population contains small natural pearls which although not used in jewellery can be used for other purposes. The percentage of specimens with pearls increases from 4 in the 80-89 mm group to 59 in 150-169 mm group. The pearls are lustrous and in most case are spherical. Most of the pearls are less than 2 mm in diameter, while a few grow to 3-4 mm.

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Mariculture - Culture of Marine fishes and crustaceans

(FB/MISC/6)

Chanos culture:

The first phase of the experiments launched during 1973 on the culture of Chanos chanos in the salt pans at Tuticorin was completed. The surface water temperature in the ponds varied from 24.7 °/.. to 30.5°C, salinity from 34.5% to 38.35‰ and dissolved oxygen from 2.8 to 8 ml/h, and PH from 7.9 to 8.5. The plankton volumes were rather poor, ranging between 1 and 7 ml. Snakes identified as Cerebrus rhynchops and crabs Scylla serrata were present and efforts were made to eradicate them. The cultured Chanos were harvested in the middle of the year. Of the 2571 numbers stocked, 1140 (about 44%) survived. The production rate of Chanos in the salt pans under existing conditions works out to 857 kg/ha/yr. As part of the second phase of the experiments, steps were taken for the construction of a large production pond.

Culture of whiting, Sillago sihama

Experiments on field culture of whiting Sillago sihama was initiated. A pond 12.5 x 11.0 m adjacent to the Netravati estuary (near Mangalore) was stocked with 134 fingerlings of size range 40-94 mm in January 1974. Pipes were fixed at suitable height to ensure free tidal flow. A nylon netting of 0.3 mm mesh was tied to both ends of the pipes to prevent the entry of predators. The experiment was terminated in April as the water level was too low. During this period the temperature of the pond varied from 24.0 to 39.2°C and salinity from 23.96 to 34.27‰. The fish that were collected at the end of the experiment had the size range of 98-230 mm (modes at 127 & 172 mm) and weight range of 40-86.0 g (mean weight 24.0g). The experiment has demonstrated the feasibility of culturing this fish in estuarine ponds.

Eel culture

At Mandapam the culture of eels in running water tanks in the laboratory was taken up in November 1973. Two consignment of elvers (one in November 1973 and the other in January 1974) totalling 1200 numbers were collected, sorted out according to size and stocked in 8 fibre glass tanks at Mandapam. The elvers ranged from 70 to 190 mm in total length and from 0.3 g to 9.5 g in weight. Seven types of feed were tried in order to determine the food conversion ratio. During the year about 13% of the elvers died. The mortality in one tank was heavy due to parasitic attack, while in other tanks it was negligible. The length range of the eels in the tanks in October was 170-389 mm and the weight range 8.0-115 g.

Survey of site suitable for mariculture

At Visakhapatnam a preliminary survey was made of areas suitable for mariculture research. A 10 acre site in the Bhimle-patnam back water region was selected for detailed study and assessment of its suitability for the work. The salinity of the backwater varied from 30.3 to 30.8‰ temperature from 27°-to 32.5°C pH + from 8.0 to 8.4 and dissolved oxygen from 4.3 to 4.7 ml/l. The tidal influence was found to be great. With a seine net juveniles of Mugil spp., Therapon jarbua, Penaeus indicus, P.monodon and Metapenaeus dobsoni could be collected in good numbers which indicated the availability of seeds for culture.

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G. Sudhakara Rao, SRA; K.M.S. Ameer Hamsa, SRA;
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R. Soundararajan, RA.

RESEARCH CONTEMPLATED :

Since the idea of culture of Marine animals is catching up, it is now necessary to locate more and more areas of abundance of seeds for culture. A beginning in seed resources survey is proposed to be made in the coming year. At the same time the advance already made in culture technology will be consolidated and improvements attempted with the aim of increasing the production per hectare. The experimental culture operations will be extended to a few more areas. In the capture fisheries field monitoring programmes will be strengthened. As stated in the earlier reports, the stock monitoring programmes will have to be repetitive from year to year; a close watch will be kept on the stock changes in relation to the fishing pressure, the object being to find out whether the fishery is removing more than the maximum [illegible] could be supplied by the stocks, by the way of [illegible]

Prawn culture:

Experimental field culture of the prawn Penaeus indicus was initiated at Mangalore. A pond 12.5 m x 5 m adjacent to Netravati estuary (Mangalore) was stocked with 190 numbers of the prawn seed of size range 37-78 mm (mode 53mm) weight range 0.3 - 2.5g and (mean weight 0.6g) in February. The experiment was terminated in the last week of June with the on set of monsoon. The salinity in the pond during this period varied from 23.96 to 34.27‰ and the temperature from 24.0 to 39.2°C. The prawns which were collected at the end has the size range of 53-118mm (modal length 53 and 118 mm), weight range 0.7-10.0g and mean weight 4.5g. A high rate of decrease in numbers was noted, this may be due not only to environmental factors but also to other factors. The experiment however has demonstrated the possibility of culturing this costly variety of prawn in estuarine ponds.

At Cochin, studies on natural and artificial feeds for prawn were undertaken. Culturing of unicellular algae Synechecystes sp. Tetraselmis sp. and Chlorella sp. using Miquel's solution as well as that modified by Matsue was attempted. Ordinary Miquel's solution gave better results than the other in natural light. Experiments were also undertaken to culture the algae under artificial light (15000 lux). Cultures of the algae were prepared and maintained in large quantities.

Study of the growth of prawns using artificial feeds was continued. Three feeds (No. 11, 12 and 13) containing mainly tapioca powder, fish meal, rice bran, and agar agar were fed in pellet form to Metapenaeus affinis of the size range 21-35 mm and M. dobsoni of the size range 13.6-21.0mm. Feed No. 12 gave the best result (increase in length of 4.54 mm per month in the case of the first species, and 8.6 mm/month in the case of the other). It was found during these experiments that the juveniles do not grow well beyond 50 mm if kept in the same aquarium tank.

At Kakinada, a study was undertaken of the recently started practice of commercial culture of prawns in salt pans. Two ponds 0.5m deep and measuring 0.61 and 0.48 ha. were selected for the study. About 4,000 numbers of seed of the prawns Penaeus indicus and P. monodon were stocked in the ponds during June-August. Although tidal flushing is possible for 7-9 days in a fortnight the operators were unable to take advantage of it due to absence of sluice gates. No artificial food was given. Mangrove twigs with leaves were planted in the pond. The fry of Chanos chanos and Mugil sp. entered the ponds along with the tide. Water temperature in the ponds varied from 29.2 to 35. °C, salinity from 21.9‰ to 47.3‰, PH from 7.6 to 8.3 and dissolved oxygen content from 4.93 to 6.3 ml/l. P. monodon stocked at a length of 47-85 m (mean 65m) grew to 160-172 mm (mean 165.4mm) and P. indicus stocked at a length of 45-85 mm (mean 66 mm) had reached the size of 129-155 mm (mean 141 mm) by December (that is in 6 months) when the crop was harvested. The production rate was 164-189 kg of prawns and 85-94 kg of fish per hectare over the six month period.

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Since the idea of culture of Marine animals is catching up, it is now necessary to locate more and more areas of abundance of seeds for culture. A beginning in seed resources survey is proposed to be made in the coming year. At the same time the advance already made in culture technology will be consolidated and improvements attempted with the aim of increasing the production per hectare. The experimental culture operations will be extended to a few more areas. In the capture fisheries field monitoring programmes will be strengthened. As stated in the earlier reports, the stock monitoring programmes will have to be repetitive from year to year; a close watch will be kept on the stock changes in relation to the fishing pressure, the object being to find out whether the fishery is removing more than the maximum quantity that could be replaced by the stocks by the way of breeding and growth. Exploration of new grounds beyond 50 mtrs. depth will receive greater attention than hitherto. Collaborative programmes with other Organisations and Institutes in various aspects of fishery biology research will be continued.

MARINE BIOLOGY & OCEANOGRAPHY DIVISION

Chief findings

An allround progress was maintained in the twelve projects undertaken by the Division. Studies on the environmental features - physical and chemical aspects were continued and routine observations were made for various hydrographic parameters from Karwar, Mangalore, Calicut, Cochin, Tuticorin, Madras and Waltair.

Investigations on the current patterns in the Maldive region brought to light the occurrence of a large cyclonic gyre between 4 and 8°N latitude within the meridians of 74° and 78°E. An anticyclonic gyre of lesser spatial extent and lesser intensity occurred along the 20°N latitude within the same meridian.

The seasonal and annual variations of currents in the region of Cochin to Cape Comorin revealed that the intensity of southward flow at surface during the monsoon period was restricted to the region south of Quilon during 1964-65. During August '65, monsoon conditions were not at all conspicuous throughout the investigational area.

Completed a study on the productivity of the mud bank at Ambalapuzha on the south-west coast. The rate of potential assimilation was found to be uniformly high in the mud bank with an average rate of 35 $mgC/m^3/hr$ with the maximum potential production during the February-May period.

Based on the phytoplankton samples, collected by R.V.Varuna for the year 1966, the distribution of phytoplankton biomass on the south-west coast of India and adjacent areas of the Arabian Sea was studied in relation to primary production. The qualitative studies made from these samples provided a basic idea on the relative abundance of the diverse group of phytoplankters especially those of Diatomaceae and Dinophyceae. It was found that the preponderance of an oceanic dinoflagellate, viz. Pyrocystis fusiformis could be used as an indicator organism connected with the incursion of oceanic waters.

Investigations in the Cochin Backwater on the phytoplankton abundance using the method of analysis of variance indicated that the spatial variation is as high as seasonal variation. The usefulness of chlorophyll a in relation to the phytoplankton counts as a measure of the phytoplankton abundance has been studied by using the correlation coefficients and it has been found from an analysis of co-variance that a common relationship holds good between phytoplankton and chlorophyll a for the estuary.

Primary production, chlorophyll a concentration and species composition of phytoplankters in relation to hydrographic conditions

in the Vembanad Lake were investigated. Total organic production in the Cochin Backwater having an area of 300 sq. km has been estimated as 100,000 tonnes of carbon.

Spatial and temporal distribution patterns of 25 species of calanoid copepods have been studied and their distribution maps prepared.

Diel variations of hydro-biological characters were studied during a complete tidal cycle at a station in the lower reaches of Cochin Backwater. The tidal oscillation and the resultant tidal surface currents were found to exert profound influence on these properties. Three broad types of distribution patterns were observed for the different groups of zooplankters depending on their relationship with the tides and diel vertical migrations. One pattern of distribution was evinced by those forms which dominate in the samples during night irrespective of the hydrographical conditions and the state of the tide. A second pattern seen was by those with a primary maximum during night and a secondary one during flood period of the day in the estuary and the third type of distribution was enriched by typically neritic marine forms, and their fluctuations were closely associated with the state of the tide, their maximum being recorded only during the flood period.

The occurrence of scombroid larvae in the Tuticorin waters in larger numbers during the colder months and sparsely from May to September, has given an indication of the spawning season of this group as December-February period.

From the offshore waters of Madras, a peculiar type of fish eggs, tentatively identified as that of myctophids were collected. This is the first time, eggs of this species have been reported from the east coast.

A new record of ribbon fish, Trichiurus auriga Klunzinger hitherto not reported from Indian Seas which was obtained during the exploratory fishing surveys carried out from the deep neritic waters and the continental slope along the west coast of India, is reported. A redescription of this species along with a detailed comparison of its morphometric and meristic characters with related species was worked out. A key to the identification of the seven known species of ribbon fishes from the Indian Seas and detailed studies on the biology of Trichiurus auriga was completed.

The occurrence of the deepwater fish, Nemipterus delagoae Smith was reported for the first time from the Indian Seas based on a single specimen of 231 mm collected from the south-west coast of India.

Detailed observations on the physical characteristics of the mud bank at Ambalapuzha during the period May 1972 to July 1973 revealed the following features:

The appearance of mud banks is associated with an increase in the constancy and force of wind towards the east. Surface currents at that time run parallel to the coast and record maximum velocity. During June and July, strong swells approach the south-west coast. Along the continental shelf, between Mangalore and Quilon, the nature of bottom

from about 3.5 to 18 m depths is largely muddy. Mud banks occur as small elevations of consolidated mud throughout the year. During the s.w. monsoon, because of wave action, the fine mud particles get churned up into a thick suspension. A semicircular periphery then develops around the suspended mud in which wave energy gets consistently absorbed. This conditions has been termed as the active stage of the mud bank. After the monsoon, the suspended mud settles and gets consolidated. This has been termed as the passive stage of the mud bank. Those mud banks which become active almost every year are persistent types of mud banks. When the mud gets into suspension by wave action, the southerly currents drive the entire floating mass slowly towards the south. If, however, the wave action is not strong enough, there will be no movement or strong swells approach from the south, either the entire suspended mass or a portion of it may exhibit northern movement. The mud bank has been defined as "an inshore region where the sea bottom generally has a small elevation of 1-2 m due to the presence of consolidated mud". The mere existence of mud in an area is not enough to form mud banks. The mud of the right texture must get consolidated at the right depth where wave action could churn it up into a thick suspension. The presence of mud bank disturbs the shore stability of that region and induces coastal erosion in adjacent areas.

During October, 1974 there was a report of oil pollution near Kiltan Island (Laccadives) from an American Tanker 'Transhuron' which was carrying 18,625 tonnes of furnace oil. A team of scientists representing various disciplines visited Kiltan and conducted extensive surveys and detailed studies on the effects of oil pollution. It was observed that considerable damage has been done to the fauna, especially crustaceans and molluscs living in the lagoon waters and shores of the island.

A detailed survey on the effects of quarrying of corals on the south-east Indian reefs around Mandapam for industrial purposes were studied. The observations revealed large scale removal of corals from the fringing reefs, almost totally destroying the reefs and associated animals as well as upsetting the ecological conditions.

A new project on mass cultures of plankters was initiated during the year. About 8 species of marine and backwater phytoplankton were cultured in the laboratory. These are used in feeding experiments for culture of prawns, molluscs and zooplankton.

Researches in hand

Environmental studies- Physical and chemical aspects (MBO/ES/1)

Karwar:

Hydrological conditions at three stations near Karwar were studied. The parameters measured were, temperature, pH, salinity, dissolved oxygen, inorganic phosphates, nitrites and silicates. The range in salinity was especially conspicuous in Karwar Bay and for nutrients near Devagad Island.

Mangalore:

Studies on hydrographic features were conducted from 4 and 8 fathom stations off Ullal. Steady increase in temperature and salinity values was observed during January and March. The range of pH was fromm 7.9 to 8.5. The oxygen content was found to be higher in January, March, October and December.

Calicut:

During the year, seawater samples were collected from surface and bottom from 5 and 10 m depths stations off West Hill. The surface temperature at the first station varied from 30.4°C in May to 25.5°C in October. At station 2, temperature varied from 29.9°C in April to 27.5°C in November. Salinity values at both these stations showed an upward trend from January to May.

Cochin:

Regular observations from six selected stations of the Cochin back waters including the Vembanad lake were carried out for temperature, salinity, dissolved oxygen, inorganic phospahtes, nitrate nitrogen, pH, primary and secondary production.

Tuticorin:

Routine hydrological observations were continued from inshore and offshore waters of Tuticorin. During the year, in the inshore area a wide range in the surface as well as atmospheric temperature was noticed. In the offshore waters both atmospheric as well as surface temperatures showed a rise from January to April. A fall in temperature was noticed in August. Salinity varied from 31.57 o/oo to 33.92 o/oo (November and March). The minimum oxygen was recorded in June and the maximum in January (7.3 ml/l). The pH values showed an increasing trend from January to June followed by a decline during July to August and again increased during October.

Madras:

Water samples collected from harbour area, fishing grounds near Ennore and Kovalam estuary were analysed for various hydrogaphic parameters.

Waltair:

Seawater samples were collected on board fishing trawlers from different fishing areas and analysed for temperature, salinity, dissolved oxygen, phosphates and silicates. Both atmospheric and water temperature shpwed an increase from February to May reaching the peak during May(32.8°C). Maximum salinity was recorded during May (33.46‰) and the minimum in February (31.25‰). Dissolved oxygen was minimum during May (3.7 ml/l) and maximum in February(4.5 ml/l).

Personnel associated with the project

A.V.S. Murty,FS; C.P. Ramamirtham, AFS; K.N.Krishna Kartha, AFS; D.Sadananda Rao, AFS; V.S.K. Chennubhotla, AFS; N.S. Radhakrishnan, AFS; G.G. Annigeri, AFS; P. Mojumdar, AFS; K.G. Girijavallabhan SRA; R. Marichamy, SRA; V. Kunjukrishna Pillai, SRA; K.J. Joseph, RA; S.Muthuswamy,RA; M.M.Meiyappan, RA; S.Krishna Pillai, RA; Pon Sirai Meetan, RA; K.V.George,RA; N.P. Kunhikrishnan, JSA; R.Vasanthakumar, JSA; P.M.Aboobaker, JSA; D.Vincent, LFA; C.M.Allikunju, LFA.

Environmental studies-Circulation and related phenomenon (MBO/ES/2)

The current patterns in the Maldive region has been studied. The salient features are occurrence of a large cyclonic gyre between 4°N and 8°N latitude within the meridians of 74°E and 76°E. An anticyclonic gyre of lesser spatial extent and lesser intensity occurred along the 2°N latitude within the same meridian. These pattern have been confirmed from isentropic studies as well.

The seasonal and annual variations of currents in the region Cochin-Cape Comorin revealed that the intensity of southward flow at surface during the monsoon period was restricted to the region south of Quilon during 1964-65. During these years, more or less the same pattern was observed at surface. More regular pattern were observed at 10 m level during 1964 and the flow was observed from Ponnani southwards and it was more conspicuous during 1965. During August 1964 although denserwaters predominated near the coast of Cochin the southward flow at 10 m level was not well developed and during August 1965, monsoon conditions were not at all conspicuous throughout investigational area. The sp.volume anomalies for nearly 200 stations were computed for the purpose of confirming the circulation pattern.

Personnel associated with the project

G.S. Sharma, JFS; A.V.S. Murty, FS; C.P. Ramamirtham, AFS; K.P. Viswanathan, LFA.

Studies on phytoplankton productivity (MBO/ES/3)

Completed a study on the productivity of the mud bank at Ambalapuzha on the south-west coast. The potential productivity using radio carbon and the standing crop in terms of Chlorophyll a and cell numbers were calculated. The rate of potential assimilation was found to be uniformly high in the mud bank with an average rate of 35 mg C/m^3/hr with the maximum potential productivity during the February-May period. This high rate is maintained by constant replenishment of nutrients from the nutrient-rich bottom. The potential productivity is translated into real productivity when conditions for light penetration are favourable. At other times the area forms a rich forage ground for the pelagic fishes and prawns which accounts for the abundant catch from this area during monsoon season.

The results of investigations conducted in the Cochin backwater, from Aroor to Fair-way-buoy for a period of one year from May 1972 to April 1973 showed two peaks of phytoplankton abundance, the diatoms playing the major role in determining the pattern of seasonal variations. An analysis of variants indicates that the spatial variation is as high as seasonal variation. The usefulness of chlorophyll a in relation to the phytoplankton counts as a measure of phytoplankton abundance has been studied by using the correlation coefficient and it has been found from an analysis of co-variance that a common relationship holds good between phytoplankton and chlorophyll a for the estuary.

Based on the net phytoplankton samples, collected by R.V. Varuna for the year 1966, consisting of 214 samples the biomass was determined in terms of displacement volume. The qualitaitive studies made from these samples provide a basic idea on the relative abundance of the diverse of group of phytoplankters, especially those of Diatomaceae and Dinophyceae. These studies reveal the occurrence of altogether 161 species of phytoplankters, 74 diatoms, 79 dinoflagellates, 5 Cyanophyceae, 2 Silicoflagellates and one Coccolithophore. It is suggested that the preponderance of an oceanic dino flagellate, Pyrocystis fusiformis could be used as an indicator organism connected with the incursion of oceanic watets.

Vembahad Lake was investigated for several parameters such as primary production, chlorophyll a concentration and species composition of phyto plankters in relation to hydrographic conditions. Monthly observations were made at 28 stations for hydrography properties including 7 station where the above mentioned parameters were studied. Carbon production was measured by ^{14}C technique, Chlorophyll a was determined using Unicam Spectrphotometer.

The standing crop as measured by chlorophyll a showed a distinct spatial variation. From a little over 2 mg/m^3 at the station which has got the highest influx of fresh water, it varies to 21 mg/m^3 at Karthedam, north of Cochin which has got the highest standing crop as well as carbon production. In terms of chlorophyll as well as rate of production station 6 is the most productive with an average daily production of 1200 mgC/m^3/day, which persists almost throughout the year, the highest single value being about 3000 mgC/m^3/day. The annual gross production ranges from about 150 g C/m^2/ day to 650 g C/m^2/ day with the maximum during the pre- and post monsoon period.

Productivity studies were carried out in the southern half of the Cochin backwater on either sides of the Thanneermukkam bund. The area was selected in view of the proposed closure of the bund which might alter the existing environmental condition and the productivity of the region. Fifty ^{14}C experiments were carried out in 6 selected stations. There was considerable seasonal and spatial variation in the primary production. During the pre monsoon, the highest production of 685 mgC/m^3/ hr was recorded at one point. Total organic production in the Cochin backwater having a total area of 300 sq.km has been estimated as 100,000 tonnes of carbon

Personnel associated with the project

P.V.Ramachandran Nair, JFS; V.S.K.Chennubhotla,AFS; Sumitra Vijayaragavan, AFS; K.G.Girijavallabhan,SRA; C.P.Gopinathan,SRA; K.J.Joseph,RA; V.K. Balachandran, JSA and others.

Studies on secondary production and related aspects (MBO/P1/1)

Bombay

Zooplankton studies of Bombay offshore waters were continued during the year. The copepods, siphonophores, salpa, sagitta, medusa, oikopluera and decopod larvae were abundant during May. Fish eggs and larvae, amphipods and mysids were poorly represented. Copepods were the most dominant group following by siphonophores.

Mangalore

Plankton samples were collected from 4 and 8 fathom stations off Ullal. Copepods were observed in moderate numbers during January and March and they were few during other months. Acartia spp., Paracalanus spp. and Temora turbinata were the most dominant copepods observed. The cladocerans Evadne tergestina and Penilia avirostris were present in very few numbers during January to May and they were abundant during October. The phytoplankton standing crop was rich in January and March.

Cochin

Spatial and temporal distribution patterns of 25 species of calanoid copepods have been studied and their distribution maps prepared. Detailed observations carried out on the morphology of the feeding appendages of different species of copepods showed that they are primarily divisible into three groups viz., Herbivores, Carnivores and Omnivores.

The quantitative distribution of cladocerans in the Cochin Backwater have been studied. Two species Evadne tergestina Claus and Penilia avirostris Dana were the species present. Distinct seasonal distribution was observed for these two species. Investigations on their T-S-P relationship reveal that the salinity and temperature conditions of the estuarine waters during the post monsoon months are most favourable for their abundance.

As part of the biological investigations of Euphausiids, studies on the egg potential of one species Thysanopoda tricuspidata were initiated. The eggs were hexagonal or polygonal in shape. Four different types of eggs were noticed in the ovary in the size range of 0.061 - 0.733 mm in diameter.

The occurrence and seasonal fluctuations of siphonophores from the Cochin Backwaters as well as from the mud bank area of Ambalapuzha were studied. Analysis of the data reveal that siphonophores were present in the estuary in the premonsoon and postmonsoon periods, except during January. It was observed that salinity is the most important environmental factor affecting their occurrence. In the mud bank area, siphonophores especially Diphyes chamissonis, Lensia subtiloides, Bassia bassensis and Abylopsis tetragona are dominant in the month of August.

Tuticorin

Observations on the occurrence and seasonal variation of important zooplanktonic organisms were studied. Forty six plankton samples from inshore regions and eighteen samples from offshore regions were collected and analysed. Detailed investigations were carried out on the plankton samples collected during the period, February '73 to February '74. Copepods were fairly rich during August and poor during December-January. Lucifers were next in importance. Decapod larvae occur through out the year, but

most common in October. A high percentage of chaetognaths were noticed during June to October. Gastropods in large numbers were met with in November and siphonophores during April to June.

Quantitative assessment of total fish eggs and larvae in the plankton and the study of the influence of environmental factors affecting their abundance and distribution were continued. Fish eggs and larvae were abundant during February and March 1973. The occurrence of Scombroid larvae in the samples revealed certain interesting characters. They were fairly abundant in the samples collected during the colder months and very scarce from May to September, obviously indicating the spawning season of the group during December-February.

Madras

The standing crop of zooplankton reached its peak during November and December '74 and was at minimum during January. Copepods were present during most of the months and belonging to the species of Eucalanus spp., Acartia spp. and Oithona spp. During December, post larvae of different species of prawns occurred in the plankton samples and this incidently coincided with the blooming of Skeletonema costatum.

Personnel associated with the Project

E.G.Silas, SFS; K.N.Krishna Kartha, AFS; K.G.Girijavallabhan, SRA; P. Dhandapani, SRA; P.Parameswaram Pillai, SRA; K.J.Mathew, SRA; M.M.Meiyappan, RA; K.Rengarajan, RA; S.Krishna Pillai, RA; Pon Siraimeetan, RA and others.

Studies on fish eggs and larvae from the plankton (MBO/PL/2)

Madras

During the period January to June fish eggs and larvae were not common in plankton samples collected from inshore waters, but during January '74 in a sample collected from 22 fathom area on board 'Meenasetara' contained large numbers of Caranx spp. eggs and other eggs. During July few Anchoviella eggs and during September few eggs of Thrissocles spp. were met with.

During December '74 in a plankton samples collected on board 'Meenasetara' from 24 fathom line off Madras, six eggs of peculiar shape have been collected. They are spherical in shape with a single oil globule and measuring 0.8 mm - 0.9 mm. The shape of the egg is very characteristic and on the surface of the egg membrane 30-38 short appendages are visible with a prickly appearance. It resembles the eggs of Myctophids reported by Delsman and there is no published account of the same from the east coast waters of India.

Cochin

Fish eggs and larvae from 60 zooplankton samples collected from the Cochin Backwater were studied. The preliminary observations showed that eggs of gobid fishes dominate the samples.

Personnel associated with the project:

E.G.Silas, SFS; V.Kunjukrishna Pillai, SRA; K.G.Girijavallabhan, SRA; G.S.D.Selvaraj, RA; M.M.Meiyappan, RA; K.Rengarajan, RA; M.Rajagopalan, RA; P.Karuppuswamy, RA.

Survey and Culture of Economically important Seaweeds (MBO/Misc../1)

During the year the seaweed survey was carried out in February in the 3rd Section (Mookayur to Tiruchendur) and 8 stations were covered from Tuticorin harbour point to Punnakayal river mouth. Again the survey was continued in the months of November and December in the 4th Section (Tiruchendur to Cape Comorin) and 25 stations were covered from Punnakayal to Uvari. Hydrobiological data also were collected in almost all stations.

Culture of commercially important seaweeds was resumed from September onwards, as soon as calm conditions prevailed in Gulf of Mannar. A total of 5 culture frames of 2 m X 2m size interwoven with 1" and 1½"coir ropes were introduced in the inshore waters (at a depth of 1½ m) near CMFRI Jetty, out of which 4 were made of G.I.pipes while one was wood. Three G.I. pipe frames were introduced horizontally - one with Gracilaria edulis, second with G.corticata and the third with Gelidiella acerosa were fixed for culturing. One G.I. pipe frame with Gracilaria edulis was introduced in a slanting position with lower portion of the frame 20 cm above the ground and upper portion 75 cm above the ground. The wooden frame with Gracilaria edulis was suspended loosely in the submerged floating condition so that it may go vertically up and down according to the tide.

In general the growth of Gracilaria edulis was found to be good and it was more in the frame suspended in the submerged floating condition than the frame in the horizontal position. The growth of the Gracilaria edulis was more in the upper portion than the lower portion in the slating frame. This indicates that Gracilaria edulis favours the surface waters, where the sedimentation is not much. The growth rate of Gelidiella acerosa and Gracilaria corticata were also under investigation.

Studies on the seasonal spore output in the alginophytes Turbinaria conoides and T.ornata were started as a preliminary to rear them in the laboratory and transplant on to suitable substrata in the inshore waters.

Studies on the seasonal variations in growth rate, chemical constituents and fruiting cycle were made in the following alginophytes: Padina gymnospora, Turbinaria conoides and T.ornata and in the agarophytes such as Gracilaria edulis, G.corticata, G.foliifera, G.crassa and Gelidiella acerosa.

Studies on the seasonal periodicity of the different seaweeds occurring at Keelakarai and Pudumadam were carried out by putting a quadrat randomly in the intertidal region.

Seaweeds (Gracilariaceae)

Taxonomic investigations of the agar-agar yielding seaweeds of the seas around India are very limited and many of the Gracilaria species hitherto reported from the area are inadequately described. During the course of the survey conducted from the east and west coasts of India including Laccadive and Andaman islands, different species of Gracilaria and Gracilariopsis were collected.

Altogether 21 species of the family Gracilariaceae have been identified of which 3 species and 2 varieties of Gracilaria are new to science and G. cylindrica, G. millarditii, G. opuntia and Gracilariopsis

megasporia are first records from the Indian waters. Cystocarps of G. caudiculata, ~~xxxxxxx~~ anthridia of G.corticata, G. folifera, G. canaliculata, G. obtusa, G. edulis, G. cylindrica, Gracilariopsis megaspora and tetrasprangia of G. megaspora and other species were observed and these have been described here for the first time. Details regarding the habitats of these speceis and their distribution in India and other geographical areas have been studied also.

Personnel associated with the project

R.V. Nair, Director; D.Sivalingam, SRA; P.S.Kuriakose, RA N. Kaliaperumal, RA and S. Kalimuthu, JSA.

Investigations on deepwater fishes (MBO/Misc./2)

The follow up studies of the exploratory surveys from the continental shelf along the south-west coast of India were continued.

Investigations on the taxonomy and biology of the deepwater ribbon fish Trichiurus auriga Klunzinger was completed. The study was based on 112 specimens collected from the west coast of India for the period 1965-73 This species was hitherto not reported from Indian seas. A redescription of this species along with a detailed comparison of its morphometric and meristic characters with related special was worked out. A key to the identification of the seven known species of ribbon fishes from the Indian seas and detailed studies on the biology of Trichiurus auriga was completed. Upto now Trichiurus auriga has been known from only two species, one from the Red sea and the second from Timor sea. The present collections clearly indicates that the T.auriga occurs in the west coast deeper waters along the continental shelf edge and upper continental slope in shoals. Studies on the biology of Bembrops caudimacula Steindachner, Bembrops gobioidus (Goode) and Cubiceps natalensis Gilchrist and von Bonde were continued.

The occurrence of Nemipterus delagoae Smith was reported for the first time from the Indian Seas based on a single specimen of 231 mm collected from the south west coast of India.

Studies on the biology of the deepwater fish Chascanopsetta lagubris Alcock were continued and samples obtained during 1969-71 were analysed for sex ratio, morphological studies and gut contents. Males and females in the ratio of 22:10, 11:10 and 6: 3 respectively.

Personnel associated with the project

E.G.Silas, SFS, M.S.Rajagopalan, AFS; G.S.D.Selvaraj, RA; M.Rajagopalan, RA; A.Regunathan, RA; I.David Raj, RA, K.Nanda Kumar, JSA.

Investigations on the Mud Banks of Kerala coast and their influence on the fisheries (MBO/Misc./3)

The investigations on the mud banks of Ambalapuzha and Nattika were continued. The observations include primary production, phytoplankton, zooplankton, hydrography showed that it was not as calm as in the previous year. The distribution pattern of the various parameters are being analysed to correlate with the fisheries of the Ambalapuzha mud bank region. The high and low values of C^{14} uptake from the Ambalapuzha mud bank region were 53.26 mgC/m^3/hr and 0.23 mgC/m^3/hr respectively. During the second quarter there was no evidence of the blooming of the dinoflagellate, Noctiluca miliaris unlike in the previous years. Diatomaceae were found to be the dominant organisms while Dinophyceae were rare. The zooplankters, obtained

in 126 phytoplankton samples have been grouped into different categories and enumerated. Thirteen mud samples were analysed for their faunistic constitution. Foraminifers and Nematodes were found to occur in large numbers. Copepods and Ostracods represented the minor constituents of the samples.

The hydrographic features showed that the temperature, salinity and dissolved oxygen values of the waters of the mud bank region at Ambalapuzha were higher than those of the previous year 1972-73, during the monsoon months where as the nutrient contents were generally lower. The variation of these properties are given below:

Temperature	: 28.8°C to 29.7°C
Salinity	: 34.5‰ to 35.1 ‰
Dissolved oxygen	: 4.5 to 3.5 ml/l
Reactive phosphate	: 0.9 to 1.2 µg at. P/l
Reacive silicate	: 9.8 to16.5 µg at. Si/l
Nitrite nitrogen	: 0.1 to 0.4 µg at. N/l
Nitrate nitrogen	: 0.5 to 1.9 µg at. N/l

The southerly drift in the region during the monsoon months was less pronounced. In general, the mud bank region did not have the full features developed during the monsoon season and this may be due to the failure of monsoon.

Personnel associated with the project

A.V.S. Murty, FS; D. Sadananda Rao, AFS; K.J. Mathew, SRA; C.P. Gopinathan, SRA; A. Regunathan, RA & V.K. Balachandran, JSA.

Marine environmental damage (Pollution, engineering works and other man-made changes) (MBO/Misc/6)

During October 1974, a scientific team visited Kiltan Island (Laccadives) to study the effects of oil pollution from the American Tanker "Transhuron" which ran aground on Sept. 26th 1974. It was reported that "Transhuron" was carrying 18625 tonnes of furnace oil from Bahrain to Philippines.

The team of scientists representing various disciplines conducted intensive and detailed surveys on the affected areas in and around Kiltan Island. It was observed that considerable damage has been done to the fauna, especially crustaceans and molluscs living in the lagoon and shores of the Island. Two reports have already been farwarded to the Council as well to the Government of India. A detailed Report is under preparation.

Experimental studies with different hydrocarbons such as crude oil, furnace oil, high speed diesel oil, benzene, hexane and xylene on phytotoxicity were conducted. The studies using these hydrocarbons on natural populations and selected speci s of phytoplankton cultures showed that there is sudden enhancement of photosynthesis with lesser concentration of extracts. The rate of production varies with different hydrocarbons. These studies have given useful information on the tolerance of the pollutants, the relation of the photosynthetic rate and rate of recovery of the organisms.

Bacteriological investigations were carried out on two marine fishes of the west coast of India, Dussumeria hasselti and Kowala koval for detecting the presence of pathogenic forms such as Staphylococci aureus, beta Streptococci, Escherichia coli, Salmonella sp., Vibrio cholerae and Closteridium welchii. The results were negative. About 8 species were identified. Quantitatively, the aerobic bacterial loads on the average were found generally high, 5.4×10^5 and 6.3×10^4 per gram in the case of skin (with muscles) and intestines. Comparatively low (6.1×10^4 and 2.8×10^4) in the case of gills of Dussumeria hasselti and Kowala koval respectively. In general, species of Achromobacter were found to predominate.

Personnel associated with the project:

R.V.Nair, Director, E.G.Silas, SFS, P.V.R.Nair, JFS, V.S.K. Chennabhotla, AFS, M.S.Rajagopalan, AFS, V.Kunjukrishna Pillai, SRA, C.P.Gopinathan, SRA, S.Muthuswamy, RA, V.Chandrika, RA and C.Thankappan Pillai, LFA

Energy flow in some selected ecosystems (MBO/Misc./5)

The energy flow studies on Metapenaeus monoceros fed on detritus were continued and the parameters, food consumption, and growth rate were worked out.

Food consumption rate - 4.1% body weight/day in dry matter
Growth rate - 0.77% body weight/day

(size range of specimens - 17-24 mm)

A study on biochemical composition and caloric value of Metapenaeus affinis was taken up. The initial studies show that the moisture content is 83% and the caloric content is 3860 cal.g by wet oxidation method.

As part of another study Ambassis gymnocephalus were fed with Metapenaeus dobsoni. The results show that the gross growth efficiency (K_1) of Ambassis gymnocephalus ranged between 14.9 and 23.21. The assimilation efficiency is over 99%.

Organic carbon and caloric content of Ambassis gymnocephalus of different sizes and sexes were also studied. The percentage of carbon varies between 18 and 35, while the caloric value is between 2.5 K cal. and 5 K cal./g dry weight.

Personnel associated with the project:

Sumitra Vijayaraghavan, AFS, P.V.Ramachandran Nair, JFS, D.C.V. Easterson, RA, P.G. Jacob, RA, C.V.Mathew, RA and Vijayakumaran, JSA

Investigations on coral reef resources (MBO/Misc./8)

The effects of quarrying of corals on the south-east Indian reefs around Mandapam for industrial purposes were studied. The observations revealed large scale removal of corals from the fringing reefs, almost totally destroying the reefs and associated animals as well as

upsetting the ecological conditions. In some cases, as at the shores of Manali Island, there is visible erosion of the coast due to higher wave action resulted from the removal of reefs. At the former sites of reefs, where removal is total, the bottom is sandy and various algae have started growing. The possibility of recolonisation of reef corals at the landward side of some of the isalnds in Gulf of Mannar is found to be remote, since there exists hardly any hard bottom on which coral planulae settle.

A survey of the reef associated molluscs around Mandapam was conducted, for which several diversified ecological habitats like beach, mud flats, intertidal boulders, infralittoral boulders, sand stones, mangroves, sea-grass, algae and corals were examined for their associated mollusca. The molluscs were analysed both qualitatively and quantitatively. The present study shows that many species reported by earlier workers as common, especially those associated with reefs, have dwindled due to destruction of reefs in this area.

Turtle resources

Studies on the marine turtle resources of Mandapam and adjacent areas were continued. There was a fishery of turtles at Vedalai in Gulf of Mannar coast. Data collected at landing centres yielded a record of 251 turtles, their total weight being 12722 kg. Chelonia mydas, Eretmochelys imbricata and Lepidochelys olivaceae are the common species caught. Their size ranged from 30 to 90 cms.

At Tuticorin, a total of 492 specimens were recorded of which 89% was Caretta mydas. Analysis of the specimen showed that in C. mydas, 91% was females while in L. olivaceae cent percent were females. This clearly indicates a preponderance of females in the natural population.

Personnel associated with the Project:

C.S. Gopinadha Pillai, AFS, A.A.P. Mudaliar, JSA and Bastian Fernando, JSA

Mass culture of plankters (MBO/Misc./9)

A new project on mass culture of plankters was initiated during the year. In order to select suitable media and technic of isolation, preliminary cultures were made of several organisms collected from brackish and inshore regions. About ten species of phytoplankters were isolated, of which Thalassiosira subtilis, Synechocystis salina and Tetraselmis gracilis seem to hold much promise in the development of mass culture programme. Mass culture of T. gracilis and S. salina has already been started. Cultures of T. gracilis and S. salina were supplied to different sections in the Institute as feed in the rearing experiments of prawn larvae and molluscs. These two species were also supplied to Madras Sub-station where the same is used in the rearing experiments of mussel culture.

Growth constants and generation times of unialgal cultures of T. subtilis and S. salina have been studied. In T. subtilis, the highest growth constant of 0.056 was recorded on the second day and the corresponding lowest generation time was 13 hours as shown by

the cell multiplication. In S. salina the highest growth constant of 0.048 was seen on the second day with the lowest generation time of 14.6 hours.

The rate of production per unit number of cells has also been studied. T. subtilis recorded 1.34/u g C/1000 cells and S. salina gave 1.0/u gC/1000 cells.

The programme of mass culture of zooplankton has been initiated and a few groups of zooplankton are maintained (rotifers) on an experimental basis.

Personnel associated with the project

E.G. Silas, SFS, P.V.R.Nair, JFS, P.Parameswaran Pillai, SRA, K.J.Mathew, SRA, D.C.V.Easterson RA, K.J.Joseph, RA, V.K. Balachandran, JSA and M. Ayyappan Pillai, JSA

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(Names of officers equal to gazetted status are given)

Officiating Director: Dr. R.V. Nair, Deputy Director.

I. FISHERY SURVEY & STATISTICS DIVISION

1. Dr. M.S. Prabhu, FS
2. Shri C.R. Shanmughavelu, AFS
3. Shri M.G. Dayanandan, AFS
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II. FISHERY BIOLOGY DIVISION

1. Dr. K.V. Sekharan, SFS
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5. Dr. S.V. Bapat, JFS
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33. Shri K.A. Narasimham, AFS
34. Shri J.C. Gnanamuttu, AFS
35. Shri V.N. Bande, AFS

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IV. CURATOR

Shri M. Kumaran

V. JUNIOR SCIENTIFIC OFFICER

Shri K.N. Krishna Kartha

VI. ADMINISTRATION

1. Shri S. Rajagopalan, Senior Administrative Officer
2. Shri S.PL. Sethu, Administrative Officer
3. Shri A. Radhakrishnan, Accounts Officer

ABBREVIATIONS USED IN THE REPORT

SFS	- Senior Fishery Scientist	FS	- Fishery Scientist
JFS	- Junior Fishery Scientist	AFS	- Assistant Fishery Scientist
SRA	- Senior Research Assistant	RA	- Research Assistant
JSA	- Junior Scientific Assistant	LFA	- Laboratory-cum-field Assistant