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THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the Fishery Data Centre and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

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Issued on the occasion of the Seminar on "the Role of small-scale fisheries and coastal aquaculture in integrated rural development".

Cover photo: Festival look at a fish landing centre in the mud bank fishery at Alleppey.

PREFACE

A pre-requisite for planning developmental programmes in the marine fisheries sector is the information base on the potentialities of man power involvement, the magnitude of facilities such as fishing crafts, gears and other infrastructure available and extent of the resource exploited at present. In India where marine fishes are landed at about 1300 landing centres spread all along the coastline of 6100 km at almost all hours round the year, collection of basic data by complete enumeration is rendered difficult. With the establishment of the Central Marine Fisheries Research Institute in 1947 an attempt to organise a system of planned survey for the estimation of marine fish catch and other related factors on an all India basis was initiated. For the first time the pilot survey conducted in 1948-49 brought to light village-wise data on the areas actually exploited, the number of persons actively engaged in marine fishing, number of boats and nets, type of fish caught and the number of fish landing centres. Since then with the addition of more staff properly trained for field data collection, a survey system for accurate estimation of marine fish landings has been evolved.

To understand the potentialities of the traditional small scale fisheries sector in the changing pattern of fishing industry, quinquennial frame surveys were conducted in 1957-58 and 1961-62. This brought forth a picture of fishing activities and potentialities, giving census of the fishing villages, fishermen population, fishing crafts and fishing gears. In order to make it upto date, a fresh frame survey was initiated in 1973, but due to unforeseen reasons it had to be of a protracted nature. The major part of the survey information was collected during 1975-76 during the mid-term of the Fifth Five Year Plan period. The results of the frame survey are embodied in the first part of this issue of MFIS.

The frame survey was conducted with the active co-operation of the field staff of the Fishery Resources Assessment Division, especially:

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It is hoped that the data presented in this report would be useful to assess the present status of the potential resources available in terms of man power and other infrastructural facilities needed for the proper development of the marine fisheries sector.

During 1977-78 techno-economic feasibility of culture of prawns in different eco-systems in the Cochin area were tried out with success. These efforts have led on to trials in the farmer's field as well as commercial scale operations. The results of some of these observations are given in this issue of MFIS.

Information on the resources available for coastal aquaculture in the different maritime States particularly the area, seed resources, cultivable species and so on are also given in a tabulated statement in this issue.

In the context of the Seminar that is being organised by the Institute on "The Role of Small-scale Fisheries and Coastal Aquaculture in Integrated Rural Development" at Madras from 6-9 December, 1978, the information contained in this issue of MFIS should be of special interest to our readers.

E. G. Silas
Director

ALL INDIA MARINE FISHERIES CENSUS

FRAME SURVEY-1973-77

The first attempt to build up a planned survey of marine fish landings on an all India basis was made by the Central Marine Fisheries Research Institute in 1948-49. The pilot survey conducted by this Institute brought forth a realistic picture of the fishing activities which are so essential for planning a suitable sampling design for the estimation of marine fish production and fishing effort in India. Village-wise data on the total fishermen population, number of active fishermen, fishing units of different types, varieties of fish caught and fishing season were collected at that time. With the expansion of the fishery resources survey scheme during the successive plan periods periodic surveys of fishing villages were undertaken during 1957-58 and 1961-62.

The surveys conducted during later years brought additional information such as number of fish landing centres, approach to fishing villages and landing centres, jetty facilities available for the landings of mechanised fishing boats and other infrastructure facilities available

such as number of cold storages, freezing plants, canning plants etc. at important landing centres. A similar survey was conducted during 1973-77 covering detailed information on the number of mechanised boats, different category of indigenous fishing crafts and gears etc. in each maritime State of India the highlights of which are given here. For this survey covering the marine sector fisherman is defined as one who is engaged in fishing activities, the active fisherman as one who is engaged in actual fishing, the fishermen population as the members belonging to a fisherman family including himself, the fishing village as the village where the fishermen population reside and the landing centre as the place where the fishing units land their catches.

All India (Tables 1 & 2)

1. The total number of marine fishing villages in India (excluding Andamans and Lakshadweep) increased to 1913 during 1973-77 as compared to 1797 in 1961-62 showing an increase of 116 villages.

Table 1. Census on Marine Fishing Villages, Fishermen Population and Fishing Crafts (1961-62) in India

Sl. No.	Name of State	Number of fishing villages	Total Marine fishermen population	Number of active fishermen	Number of fishing crafts	Average annual fish landings (1961-65) (in tonnes)
1.	West Bengal and Orissa	182	35,941	9,434	2,894	10,180
2.	Andhra Pradesh	321	136,893	47,700	19,772	65,391
3.	Tamil Nadu (including Pondicherry)	363	214,868	56,586	29,661	116,248
4.	Kerala	279	333,822	74,241	20,667	262,648
5.	Karnataka	131	51,636	8,963	6,357	52,919
6.	Maharashtra	265	103,535	20,698	7,894	123,458
7.	Gujarat	256	82,242	11,732	3,179	92,834
TOTAL		1,797	958,937	229,354	90,424	723,678

(Excluding Goa, Andamans & Laccadives)

2. There are 1,365 landing centres.

3. The total marine fishermen population and the active fishermen in India increased to 14.35 lakhs and 3.23 lakhs respectively, the percentage increase being 49.66% and 40.63% respectively. Kerala ranks first in having maximum number of fishermen population, closely followed by Tamil Nadu, Andhra Pradesh, Maharashtra and Gujarat (excluding Kutch).

4. The total number of fishing crafts (both mechanised and non-mechanised) during 1973-77 increased by 24,142 (26.70%) to 1,14,566. Tamil Nadu has the maximum number of fishing crafts followed by Andhra Pradesh, Kerala and Maharashtra. In respect of mechanised fishing crafts, Maharashtra ranks first, Gujarat, Tamil Nadu, Karnataka and Kerala coming next in the order.

Table 2. Census on Marine Fishermen Population, Crafts, Gears etc. in India-(1973-77)

Sl. No.	Items	West* Bengal & Orissa	Andhra Pradesh	Tamil nadu	Pondi- cherry	Kerala	Karna- taka	Goa	Maha- rashtra	Gujarat**	Total
1.	Coastal length (in km.)	1,080	970	960		600	270	110	600	1,500	6,090
2.	No. of fishing villages	179	408	374	21	268	145	40	299	179	1,913
3.	No. of landing centres	51	280	371	24	223	95	40	173	108	1,365
4.	Marine fishermen population:-										
	Male	17,769	75,558	93,718	4,676	125,217	30,064	6,191	47,803	29,788	430,784
	Female	17,284	72,235	91,172	4,781	124,864	30,403	5,088	50,046	31,060	426,933
	Children	26,029	89,677	103,696	6,957	141,819	38,365	3,586	103,574	63,738	577,441
	Total	61,082	237,470	288,586	16,414	391,900	98,832	14,865	201,423	124,586	14,35,158
	Active	15,076	64,592	68,317	3,785	80,898	21,740	4,067	41,539	22,518	322,532
	% of active to total population	24.7	27.2	23.7	23.1	20.6	22.0	27.4	20.6	18.1	22.5
5.	Fishing Crafts:-										
	Mechanised	58	418	1,533	47	1,026	1,044	192	2,034	1,734	8,086
	Non-mechanised	6,667	25,976	30,501	1,767	21,718	6,248	1,118	8,288	4,197	106,480
	Total	6,725	26,394	32,034	1,814	22,744	7,292	1,310	10,322	5,931	114,566
6.	Fishing Gears:-										
	Rampani	—	—	—	—	—	164	112	—	—	276
	Shore seine	375	1,471	1,920	34	1,739	493	53	16,300	—	22,385
	Nylon gill net	1,427	16,676	3,232	—	3,044	4,478	—	136,596	10,491	175,944
	Bottom set gill net	—	1,481	5,955	—	246	844	—	—	—	8,526
	Gill net	5,048	18,541	111,023	1,301	7,763	9,219	1,345	8,410	118,172	280,822
	Drift net	323	1,889	7,966	359	6,763	1,945	—	—	5,329	24,574
	Drag net	2,466	5,729	3,678	298	—	936	58	12,635	1,341	27,141
	Bag net	1,034	159	1,855	458	534	13	—	20,503	17,031	41,587
	Purse seine	—	—	—	—	—	124	22	—	—	146
	Trawl net	—	—	—	13	269	246	144	1,966	167	2,805
	Boat seine	1,561	6,480	4,875	—	9,027	—	—	—	—	21,943
	Encircling net	—	—	—	—	279	—	—	—	—	279
	Hooks & lines	48	2,587	6,107	43	2,887	696	177	—	1,598	14,143
	Others	28,478	11,267	12,644	271	845	5,908	652	52,693	5,655	118,413
	TOTAL	40,760	66,280	159,255	2,777	33,396	25,066	2,563	249,103	159,784	738,984

* Census covers only Contai coast of Midnapur district.

** Excluding Kutch region

5. There are 7,38,984 fishing gears in the country.

West Bengal and Orissa (Table 3)

1. The number of fishing villages decreased to 179 from 182 recorded during 1961-62.

2. The total fishermen population and the active fishermen increased by 25,141 and 5,642 reaching 61,082 and 15,076 respectively.

3. An increase of 3,831 in respect of fishing crafts was seen during 1973-77 survey.

4. There are 40,760 fishing gears consisting of shore seine, nylon gillnet, gill net, drift net, drag net, bag net, boat seine, hooks and lines and others.

Andhra Pradesh (Table 4)

1. The total number of fishing villages increased to 408. Srikakulam district has the maximum number of fishing villages while West Godavari district accounts for the minimum.

2. Both the total marine fishermen population and the active fishermen showed an increase of 100,577 (73.47%) and 16,892 (35.41%) respectively. In respect of total marine fishermen population Srikakulam district has the maximum number, West Godavari district accounting for the minimum number. But in respect of active fishermen population Vishakapatnam district records the highest number, West Godavari district having the lowest number.

3. The total number of fishing crafts increased by 6,222 (33.49%) to 26,394. While Srikakulam district has the maximum number of fishing crafts, West Godavari district possesses the minimum number.

4. There are 66,280 fishing gears comprising of shore-seine, nylon gill net, bottom set gill net, gill net, drift net, drag net, bag net, boat seine, hooks and lines and others.

Tamil Nadu (Including Pondicherry)

Since the estimates of marine fish production in Tamil Nadu and Pondicherry were combined until 1964,

the frame survey data collected during 1961-62 do not have separate information for these two states. During 1973-77, however, separate information is available for these two states. From Table 1, and Table 2 it is seen that in Tamil Nadu (including Pondicherry) the total

number of fishing villages, the total number of fishermen population, the active fishermen and the number of fishing crafts during 1973-77 showed an increase of 32; 90, 132; 15,516 and 4,187 respectively as compared to 1961-62.

Table 3 Census on Marine Fishing Villages, Fishermen Population, Fishing Crafts and Gears (1973-77) in Different States

Sl. No.	Items	West Bengal	Pondicherry	Karnataka		Total	Goa
		& Orissa		South Kanara	North Kanara		
1.	No. of fishing villages	179	21	72	73	145	40
2.	No. of landing centres	51	24	47	48	95	40
3.	No. of marine fishermen:-						
	Male	17,769	4,676	17,990	12,074	30,064	6,191
	Female	17,284	4,781	19,228	11,175	30,403	5,088
	Children	26,029	6,957	24,936	13,429	38,365	3,586
	TOTAL	61,082	16,414	62,154	36,678	98,832	14,865
	Active	15,076	3,785	12,426	9,314	21,740	4,067
	% of active to total population	24.7	23.1	20.0	25.4	22.0	27.4
4.	Fishing crafts:-						
	Chot	300	—	—	—	—	—
	Pankhya	371	—	—	—	—	—
	Patia	162	—	—	—	—	—
	Carvel built boat	48	—	—	—	—	—
	Nava	522	—	—	—	—	—
	Masula padava	345	—	—	—	—	—
	Catamaran	4,342	1,670	—	—	—	—
	Dungi	60	—	—	—	—	—
	Dungo	517	—	—	—	—	—
	Padagu	—	53	—	—	—	—
	Dugout canoe	—	44	1,188	784	1,972	—
	Dhoni	—	—	1,250	1,091	2,341	—
	Rampani bandi	—	—	54	—	54	—
	Kairampani	—	—	18	—	18	—
	Plank built boat	—	—	297	1,487	1,784	—
	Pandi	—	—	26	53	79	—
	Out rigger plank built hodi	—	—	—	—	—	820
	Out rigger panale hodi	—	—	—	—	—	258
	Panale vallam	—	—	—	—	—	40
	TOTAL	6,667	1,767	2,833	3,415	6,248	1,118
5.	Fishing gears						
	Purse seine	—	—	112	12	124	22
	Shore seine	375	34	161	332	493	53
	Drift net	323	359	346	1,599	1,945	—
	Bag net	1,034	458	—	13	13	—
	Drag net	2,466	298	—	936	936	58
	Hooks & lines	48	43	136	560	696	177
	Nylon gill net	1,427	—	1,058	3,420	4,478	—
	Boat seine	1,561	—	—	—	—	—
	Gill net	5,048	1,301	1,290	7,929	9,219	1,345
	Bottom set gill net	—	—	20	824	844	—
	Trawl net	—	13	216	30	246	144
	Rampani	—	—	83	81	164	112
	Others	28,478	271	1,960	3,948	5,908	652
	TOTAL	40,760	2,777	5,382	19,684	25,066	2,563

Tamil Nadu (Table 5)

1. There are 374 fishing villages in Tamil Nadu alone. The Tanjore district has the maximum number of fishing villages, Madras district having the minimum.

2. The total marine fishermen population and the active fishermen during 1973-77 were 288,586 and 68,317 respectively. Kanyakumari district has the maximum

number of both total marine fishermen population and the active fishermen while Pudukottai district accounts for the lowest number of both total marine fishermen population and active fishermen.

3. There are 32,034 fishing crafts in Tamil Nadu, the maximum being in Kanyakumari district and the minimum in Pudukottai district.

4. There are 159,255 fishing gears consisting of shore-seine, nylon gill net, bottom set gill net, gill net, drift net, drag net, bag net, boat seine, hooks and lines and others.

Pondicherry (Table 3)

1. There are 21 fishing villages in Pondicherry.

2. The total marine fishermen population and the number of active fishermen are 16,414 and 3,785 respectively.

3. There are 1,814 fishing crafts consisting of 47 mechanised boats and 1,767 non-mechanised boats.

4. The total number of fishing gears are 2,777 comprising of shore-seine, gill net, drift net, drag net, bag net, boat seine, hooks and lines and others.

Kerala (Table 6)

1. The total number of fishing villages declined by 11 to 268. This was due to closure of some fishing villages and shifting of fishing activities to the neighbouring villages. Cannanore and Trivandrum districts have the maximum number of villages with 52 and 51 numbers respectively while Ernakulam district has the minimum number with 18 fishing villages.

Table 4 Census on Marine Fishing Villages, Fishermen Population, Fishing Crafts and Gears (1973-77) in Andhra Pradesh

Sl. No.	Items	Districts								Total
		Srikakulam	Visakhapatnam	East Godavari	West Godavari	Krishna	Guntur	Prakasam	Nellore	
1.	No. of fishing villages	109	74	72	9	29	16	45	54	408
2.	No. of landing centres	55	52	42	10	25	8	40	48	280
3.	No. of marine fishermen:-									
	Male	17,676	16,437	14,828	2,733	4,546	5,585	6,869	6,884	75,558
	Female	18,942	16,355	12,172	2,606	4,095	5,137	6,332	6,596	72,235
	Children	20,569	20,825	12,957	2,701	6,055	8,830	8,901	8,839	89,677
	TOTAL	57,187	53,617	39,957	8,040	14,696	19,552	22,102	22,319	237,470
	Active	13,972	15,998	11,657	1,160	4,413	5,493	6,182	5,717	64,592
	% of active to total population	24.4	29.8	29.2	14.4	30.0	28.1	28.0	25.6	27.2
4.	Fishing crafts:-									
	Nava	26	—	1,096	—	43	—	—	—	1,165
	Catamaran	6,990	3,802	1,754	—	—	362	2,502	2,722	18,132
	Padava	1,146	1,952	70	—	—	839	89	88	4,184
	Palmryah dhoni	—	—	168	58	—	—	—	—	226
	Big sail boat	—	—	56	53	—	—	—	—	109
	Small sail boat	—	—	420	252	—	—	—	—	672
	Dhoni	—	—	555	25	20	398	18	—	1,016
	Dinghi	—	—	—	—	472	—	—	—	472
	TOTAL	8,162	5,754	4,119	388	535	1,599	2,609	2,810	25,976
5.	Fishing gears:-									
	Shore seine	741	399	146	22	15	—	—	148	1,471
	Boat seine	2,129	1,984	895	—	—	42	728	702	6,480
	Nylon gill net	4,237	2,505	2,471	174	—	4,145	953	2,191	16,676
	Gill net	10,002	4,707	654	20	—	1,223	1,547	388	18,541
	Drag net	—	888	1,299	1,136	—	840	1,406	160	5,729
	Drift net	—	57	160	128	1,544	—	—	—	1,889
	Bag net	—	159	—	—	—	—	—	—	159
	Hooks & lines	765	1,493	294	25	10	—	—	—	2,587
	Bottomset gill net	—	1,481	—	—	—	—	—	—	1,481
	Others	205	—	4,056	2,828	2,921	1,188	23	46	11,267
	TOTAL	18,079	13,673	9,975	4,333	4,490	7,438	4,657	3,635	66,280

2. The total number of marine fishermen population increased by 58,078 (17.39%) reaching 391,900. The number of active fishermen also showed an increase of 6,657 (8.97%). While Trivandrum district has the maximum fishermen population and active fishermen, Ernakulam district possesses the minimum number of total fishermen and Trichur district the minimum number of active fishermen.

3. An increase of 2,077 in the number of fishing crafts is seen during the 1973-77 survey bringing the total number to 22,744. The maximum and minimum number of fishing crafts are found in the districts of Trivandrum and Ernakulam respectively.

4. There are 33,396 fishing gears comprising of shore-seine, nylon gill net, bottom set gill net, gill net,

drift net, drag net, bag net, trawl net, boat seine, encircling net, hooks and lines and others.

and active fishermen, North Kanara district having the minimum.

Karnataka (Table 3)

1. An increase of 14 numbers is noticed in the total number of fishing villages. While North Kanara district has 73 numbers, South Kanara district has 72 numbers.

2. The total marine fishermen population showed an increase of 47,186 (47.75%) to 98,832. The number of active fishermen also increased by 12,777. South Kanara district has the maximum number of both total

3. An increase of 935 in respect of total number of fishing crafts is seen bringing the number to 7,292. North Kanara district possesses the maximum number of fishing crafts, the minimum number being in South Kanara district.

4. There are 25,066 fishing gears consisting of Rampani, shore-seine, nylon gill net, bottom set gill net, gill net, drift net, drag net bag net, purse-seine, trawl net, hooks and lines and others.

Table 5 Census on Marine Fishing Villages, Fishermen Population, Fishing Crafts and Gears (1973-77) in Tamil Nadu

Sl. No.	Items	Districts								Total
		Chengal-pattu	Madras	South Arcot	Tanjore	Pudukottai	Ramanathapuram	Thirunelveli	Kanyakumari	
1.	No. of fishing villages	63	15	51	93	17	67	26	42	374
2.	No. of landing centres	67	12	42	75	15	72	26	62	371
3.	No. of uariner fishermen:-									
	Male	8,709	5,750	9,533	17,534	1,471	10,187	10,623	29,911	93,718
	Female	8,326	6,003	9,158	17,201	1,544	9,604	10,425	28,911	91,172
	Children	9,994	4,816	11,981	21,643	2,362	14,004	9,443	29,453	103,696
	Total	27,029	16,569	30,672	56,378	5,377	33,795	30,491	88,275	288,586
	Active	7,278	3,393	7,081	15,028	1,242	8,348	5,834	20,113	68,317
	% of active to total population	26.9	20.5	23.1	26.6	23.1	24.7	19.1	22.8	23.7
4.	Fishing crafts:-									
	Catamaran	4,421	1,494	1,068	4,258	—	155	2,345	10,817	24,558
	Plank built boat	252	35	64	668	385	—	140	—	1,544
	Masula boat	—	—	180	140	—	—	—	—	320
	Canoe	—	—	1,410	159	—	—	—	163	1,732
	Vathai	—	—	—	—	—	881	3	—	884
	Thoni	—	—	—	183	51	303	5	—	542
	Vallam	—	—	—	—	—	189	424	308	921
	TOTAL	4,673	1,529	2,722	5,408	436	1,528	2,917	11,288	30,501
5.	Fishing gears:-									
	Boat seine	431	427	—	885	—	—	1,033	2,099	4,875
	Gillnet	2,972	737	4,050	39,447	2,656	24,306	23,513	13,342	111,023
	Shore seine	262	63	13	565	57	373	10	577	1,920
	Hooks & lines	785	123	203	876	217	615	354	2,934	6,107
	Bag net	871	7	965	—	—	12	—	—	1,855
	Nylon gill net	998	—	—	1,452	782	—	—	—	3,232
	Drift net	—	—	—	2,168	240	1,041	3716	801	7,966
	Bottom set gill net	—	—	—	2,544	665	65	905	1,776	5,955
	Drag net	—	310	243	109	—	3,016	—	—	3,678
	Others	999	—	22	8,980	98	2,261	23	261	12,644
	TOTAL	7,318	1,667	5,496	57,026	4,715	31,689	29,554	21,790	159,255

Goa (Table 3)

For the first time frame survey was conducted in the Union territory of Goa during 1973-77. The salient features are:-

1. There are 40 fishing villages in this State.

2. The total marine fishermen population and the active fishermen are 14,865 and 4,067 respectively.

3. The total number of fishing crafts is 1,310.

4. There are 2,563 fishing gears consisting of Rampani, shore-seine, gill net, drag net, purse-seine, trawl net, hooks and lines and others.

Maharashtra (Table 7)

1. The total number of marine fishing villages increased by 34. While Ratnagiri district has the maxi-

imum number of fishing villages, Greater Bombay district possesses the minimum number.

2. An increase of 97,888 (94.55%) and 20,841 (100.69%) is seen in respect of total and active fishermen bringing their totals to 201,423 and 41,539 respectively. The maximum and minimum number in these two categories are seen in Ratnagiri and Greater Bombay districts respectively.

3. The total number of fishing crafts is 10,322 showing an increase of 2,428. The maximum number of fishing crafts is seen in Ratnagiri district and the minimum in Thane district.

4. There are 249,103 fishing gears consisting of shore-seine, nylon gill net, gill net, drag net, trawl net, bag net and others.

Table 6 Census on Marine Fishing Villages, Fishermen Population, Fishing Crafts and Gears (1973-77) in Kerala

Sl. No.	Items	Districts								Total
		Trivandrum	Quilon	Alleppey	Erna- ulam	Trichur	Mala- puram	Kozhi- kode	Canan- nore	
1.	No. of fishing villages	51	28	34	18	19	24	42	52	268
2.	No. of landing centres	51	32	34	14	17	12	26	37	223
3.	No. of marine fishermen:-									
	Male	32,168	15,960	17,506	9,538	13,642	9,966	12,925	13,512	125,217
	Female	31,660	15,427	15,189	9,578	14,088	10,475	13,379	15,068	124,864
	Children	34,530	15,245	17,120	10,190	13,380	14,466	20,955	15,933	141,819
	Total	98,358	46,632	49,815	29,306	41,110	34,907	47,259	44,513	391,900
	Active	21,210	8,669	12,982	6,376	6,073	7,314	10,232	8,042	80,898
	% of active to total population	21.6	18.6	26.1	21.8	14.8	21.0	21.6	18.1	20.6
4.	Fishing Crafts:-									
	Catamaran	8,643	1,047	—	—	—	—	—	—	9,690
	Plank built boat	960	684	86	57	1,024	984	42	—	3,837
	Dug out canoe	432	628	1,604	826	254	692	2,242	1,513	8,191
	Total	10,035	2,359	1,690	883	1,278	1,676	2,284	1,513	21,718
5.	Fishing Gears:-									
	Shore seine	1,005	256	384	33	16	—	18	27	1,739
	Boat seine	2,468	464	271	126	284	3,047	1,493	874	9,027
	Drift net	3,754	845	79	356	326	383	593	427	6,763
	Gill net	4,846	1,468	324	524	550	207	1,732	1,156	10,807
	Trawl net	—	96	—	—	45	—	24	104	269
	Bag net	—	—	534	—	—	—	—	—	534
	Encircling net	—	—	97	182	—	—	—	—	279
	Hooks & lines	2,171	61	90	28	13	121	282	121	2,887
	Bottom set gill net	83	163	—	—	—	—	—	—	246
	Others	17	38	23	115	44	—	549	59	845
	TOTAL	14,344	3,391	1,802	1,364	1,278	3,758	4,691	2,768	33,396

Gujarat (Table 8)

1. The total number of fishing villages in Gujarat (excluding Kutch) was 179.

2. The total marine fishermen population and the number of active fishermen are 124,586 and 22,518 respectively. Bulsar district has the maximum number of fishermen population as well as active fishermen. While Bhavanagar district accounts for minimum number of the same.

3. There are 5,931 fishing crafts in this State, Bulsar district accounting for the maximum and Bhavanagar district having the minimum.

4. As many as 159,784 fishing gears comprising of nylon gill net, gill net, drift net, drag net, bag net, trawl net, hooks and lines and others are recorded in this State.

Fish processing (Table 9)

1. There are 264 freezing plants, 64 canning plants 131 ice making plants, 83 peeling sheds, 31 fish meal plants and 319 cold storages in the country. The figure do not include the number of minor and temporary peeling sheds.

2. Kerala has the maximum number of fish processing plants with 103 freezing plants, 39 canning plants, 50 ice making plants, 46 peeling sheds, 3 fish meal plants and 131 cold storages. Tamil Nadu ranks next with 43 freezing plants, 4 canning plants, 32 ice making plants, 4 peeling sheds, 5 fish meal plants and 57 cold storages. The details of fish processing plants in other maritime States of India are shown in Table 9.

Fisheries Co-operatives (Table 10)

1. There are 2,759 primary fisheries co-operative societies in the country of which only 748 function

efficiently showing profit, forming about 27% of the total number of fisheries co-operative societies.

2. Kerala ranks first in the total number of primary co-operative societies, but only 13.2% of them are showing profit.

3. There are 381 co-operative societies in Maharashtra, ranking first in running them efficiently. 47.5% of the total number of co-operative societies are running with profit.

Table 7 Census on Marine Fishing Villages, Fishermen Population, Fishing Crafts and Gears (1973-77) in Maharashtra

Sl. No.	Items	Districts				Total
		Rantnagiri	Kolaba	Greater Bombay	Thane	
1.	No. of fishing villages	134	75	20	70	299
2.	No. of landing centres	72	40	21	40	173
3.	No. of marine fishermen					
	Male	14,752	11,370	7,861	13,820	47,803
	Female	16,441	12,167	7,815	13,623	50,046
	Children	31,614	21,794	16,279	33,887	1,03,574
	Total	62,807	45,331	31,955	61,330	201,423
	Active	14,634	11,184	3,471	12,250	41,539
	% of active to total population	23.3	24.7	10.9	20.0	20.6
4.	Fishing crafts:-					
	Beach seine boat	193	—	—	—	193
	Plank built boat	1,124	769	425	298	2,616
	Dug out canoe	2,860	948	933	690	5,431
	Others	—	—	—	48	48
	TOTAL	4,177	1,717	1,358	1,036	8,288
5.	Fishing gears:-					
	Drag net	979	4,819	1,118	5,719	12,635
	Gill net	6,468	827	969	146	8,410
	Nylon gill net	35,262	38,513	25,874	36,947	136,596
	Trawl net	1,521	282	148	15	1,966
	Shore seine	16,300	—	—	—	16,300
	Bag net	8,275	3,612	5,393	3,223	20,503
	Others	13,244	20,331	4,413	14,705	52,693
	TOTAL	82,049	68,384	37,915	60,755	249,103

Source: Department of Fisheries, Govt. of Maharashtra, Bombay

Table 8 Census on Marine Fishing Villages, Fishermen Population, Fishing Crafts and Gears (1973-77) in Gujarat *

Sl. No.	Items	Districts								Total
		Bulsar	Surat	Broach	Amreli & Kaira	Junaghat	Bavanagar	Jamnagar	Rajkot	
1.	No. of fishing villages	51	38	29	4	23	12	18	4	179
2.	No. of landing centres	31	12	9	4	21	9	18	4	108
3.	No. of marine fisherman:-									
	Male	17,896	3,143	2,245	392	4,535	148	1,225	204	29,788
	Female	18,445	3,441	2,458	406	4,784	149	1,201	176	31,060
	Children	35,586	5,736	4,096	844	14,472	304	2,274	426	63,738
	Total	71,927	12,320	8,799	1,642	23,791	601	4,700	806	124,586
	Active	12,852	2,040	1,457	286	4,493	141	1,071	178	22,518
	% of actual to total population	17.9	16.6	16.6	17.4	18.9	23.5	22.8	22.1	18.1
4.	Fishing crafts:-									
	Plank built boat	1,054	442	316	58	76	—	374	100	2,420
	Dug out canoe	595	52	37	113	910	9	57	4	1,777
	Total	1,649	494	353	171	986	9	431	104	4,197
5.	Fishing gears:-									
	Trawl net	8	—	—	—	159	—	—	—	167
	Bag net	7,920	648	463	359	4,738	1137	716	1,050	17,031
	Drag net	8	—	—	177	991	165	—	—	1,341
	Hooks & lines	—	—	—	—	845	—	631	122	1,598
	Gill net	15,482	3,184	2,274	216	90,475	—	6,541	—	118,172
	Drift net	455	531	379	—	—	—	3,964	—	5,329
	Nylon gill net	3,008	3,509	2,507	—	—	—	1,141	326	10,491
	Others	1,688	1,186	847	615	666	—	653	—	5,635
	TOTAL	28,569	9,058	6,470	1,367	97,874	1,302	13,646	1,498	159,784

* Excluding Kutch region

Table 9 Distribution of Freezing Plants, Canning Plants etc. in Maritime States of India as on 31-12-1977
(Plant capacity in tonnes per day)

State	Freezing		Canning		Ice making		Peeling		Fish meal		Cold storage	
	Total No.	Total Capacity	Total No.	Total Capacity	Total No.	Total capacity	Total No.	Total Capacity	Total No.	Total Capacity	Total No.	Total Capacity
West Bengal	21	54.25	—	—	4	75.0	6	18.0	2	16.0	20	1,061.0
Orissa	10	26.00	1	1.00	3	18.0	1	5.0	—	—	10	605.0
Andhra Pradesh	12	38.50	1	0.25	19	160.3	7	15.5	—	—	15	1,046.0
Tamilnadu	43	140.04	4	5.50	32	353.5	4	8.0	5	57.0	57	3,728.5
Pondicherry	—	—	1	1.50	—	—	—	—	—	—	1	5.0
Kerala	103	486.75	39	148.70	50	561.8	46	230.2	3	62.5	131	10,986.5
Karnataka	30	121.80	9	38.00	13	172.0	13	48.5	5	150.0	29	2,462.0
Goa	8	29.50	6	41.50	1	10.0	—	—	1	12.0	6	235.0
Maharashtra	30	199.50	1	2.50	3	190.0	3	11.5	6	55.0	36	4,750.0
Gujarat	7	63.50	1	6.40	6	71.5	3	11.0	9	166.0	14	1,810.0
Laccadives	—	—	1	1.00	—	—	—	—	—	—	—	—
TOTAL	264	1,159.84	64	246.35	131	1,612.1	83	347.7	31	518.5	319	26,689.0

Source: Marine Products Export Development Authority, Cochin-16.

Table 10 Performance of Primary Fisheries Co-operatives in the the Maritime States of India

Sl. No.	Name of State	Number of primary fisheries co-operative societies	Societies showing project	Society showing loss	Societies with no profit no loss	% of societies showing profit
1.	Orissa	154	48	63	43	31.2
2.	Andhra Pradesh	597	114	363	120	19.1
3.	Tami Nadu	448	169	270	9	37.7
4.	Kerala	985	130	780	75	13.2
5.	Karnataka	121	74	30	17	61.2
6.	Goa, Daman & Diu	11	4	7	—	36.2
7.	Maharashtra	381	181	156	44	47.5
8.	Gujarat	59	25	27	7	42.4
9.	Lakhadweep	3	3	—	—	100
	TOTAL	2,759	748	1,696	315	27.1

Source: Report of the National Commission on Agriculture, 1976.

Contribution by small scale fisheries sector in total marine fish production (Tables 11 & 12)

Table 11 gives the gearwise estimates of marine fish production in various maritime States of India during 1977. The production by boats operated by outboard motors and other power driven boats particularly in Maharashtra and Gujarat States are excluded. The salient features are:-

Kerala ranks first in respect of marine fish production by the small scale fisheries sector, its share being 237,613 tonnes forming about 39% of the total all India landings by the small scale fisheries sector, closely followed by Tamil Nadu (26%) and Andhra Pradesh (12%).

At all India level boat-seine contributed to the maximum catch (29.54%), the other important gears gill net and bag net contributing 26.70% and 11.89% respectively.

Kerala occupies the first place in respect of landings by boat seine, followed by Tamil Nadu and

Andhra Pradesh.

In respect of gill net operations, Tamil Nadu takes the lead, followed by Andhra Pradesh and Kerala.

Maharashtra contributes to the maximum landings by bag net followed by Kerala and Tamil Nadu.

Details of important fishes caught, fishing season and contribution in respect of both catch and value by the small scale fisheries sector are shown in Table 12. The total value of marine fish produced by small scale fisheries sector during 1977 in India (excluding Kutch in Gujarat State, Andamans and Lakshadweep) was Rs. 10,750 lakhs forming about 46.9% of the total value of fish produced.

Kerala ranks first in respect of production in this sector, the value of which being Rs. 4,801 lakhs followed by Tamil Nadu and Andhra Pradesh. Pondicherry State accounts for the minimum catch with the value of Rs. 56 lakhs.

Table 11 Contribution to Total Marine Fish Production in India by Small scale Fisheries Sector during 1977 (in tonnes)

Non-mechanised units	West Bengal	Orissa	Andhra Pradesh	Tamil Nadu	Pondicherry	Kerala	Karnataka	Goa	Maharashtra	Gujarat*	Total	Percentage to total small scale fisheries sector
Shore seine	477	755	12,460	7,760	675	12,922	328	—	45	—	35,422	5.86
Bag net	5,632	169	—	8,971	410	19,694	117	—	36,921	—	71,914	11.89
Drift net	478	4,824	617	16,169	1,316	11,770	9,669	—	—	779	45,622	7.54
Gill net	—	3,642	37,171	70,242	1,874	24,529	4,019	1,806	11,293	6,924	161,500	26.70
Boat seine	—	411	18,771	24,897	58	134,468	68	—	—	—	178,673	29.54
Stake net	—	1,005	1,983	—	—	—	—	—	—	423	3,411	0.56
Hooks & lines	—	28	2,492	15,482	34	8,080	857	96	884	—	27,953	4.62
Drag net	—	—	—	2,696	416	—	—	67	—	—	3,179	0.53
Scoop net	—	—	—	2,239	—	—	—	—	—	—	2,239	0.37
Encircling net	—	—	—	—	—	16,058	—	—	—	—	16,058	2.66
Rampani	—	—	—	—	—	—	31,554	4,630	1,225	—	37,409	6.18
Other types	—	43	311	6,240	—	10,092	2,940	279	1,068	541	21,514	3.55
Total for small Scale fisheries sector	6,587	10,877	73,805	154,696	4,783	237,613	49,552	6,878	51,436	8,667	604,894	100.00
Mechanised units	102	4,195	26,951	51,350	1,679	107,424	47,600	17,853	213,016	173,633	643,803	—
Total fish landed	6,689	15,072	100,756	206,046	6,462	345,037	97,152	24,731	264,452	182,300	1248,697	

* Excluding Kutch

Table 12 Details of important fishes caught, fishing season, contribution in respect of both catch and value by the small scale fisheries sector during 1977

Sl. No.	Name of State	Important fishes caught	Major fishing season	Contribution by small scale fisheries sector		Contribution by mechanised sector		TOTAL	
				Catch in tonnes	Value in lakhs rupees	Catch in tonnes	Value in lakhs rupees	Catch in tonnes	Value in lakhs rupees
1.	West Bengal	Sciaenids, <i>Harpodon nehereus</i> Anchovies and other clupeids	October to December	6,587	107	102	2	6,689	109
2.	Orissa	<i>Hilsa ilisha</i> , elasmobranchs, pomfrets, and catfishes	October to December	10,877	327	4,195	126	15,072	453
3.	Andhra Pradesh	Lesser sardines, sciaenids, Anchovies and ribbonfish	January to March	73,805	1,269	26,951	463	100,756	1,732
4.	Tamil Nadu	Lesser sardines, elasmobranchs, silver bellies and catfishes	January to March	154,696	2,255	51,350	749	206,046	3,004
5.	Pondicherry	Lesser sardines and Anchovies	January to March	4,783	56	1,679	20	6,462	76
6.	Kerala	Oil sardine, lesser sardines, mackerel and penaeid prawns	October to December	237,613	4,801	107,424	2,170	345,037	6,971
7.	Karnataka	Oil sardine and mackerel	October to December	49,552	569	47,600	546	97,152	1,115
8.	Goa	Lesser sardines and mackerel	October to December	6,878	104	17,853	269	24,731	373
9.	Maharashtra	<i>Harpodon nehereus</i> , non penaeid prawns and penaeid prawns	October to December	51,436	1,100	213,016	4,657	264,452	5,757
10.	Gujarat (Excluding Kutch)	<i>Harpodon nehereus</i> and sciaenids	October to December	8,667	162	173,633	3,250	182,300	3,412
	All India (Excluding Kutch, Andamans and Lakshadweep)		October to December	604,894	10,750	643,803	12,252	12,48,697	23,002



INTENSIVE CULTURE OF MARINE PRAWNS

Data on intensive culture of marine prawns carried out in the farmers' fields by the Central Marine Fisheries Research Institute under its demonstration programme

Information items	Demonstration number				
	I	II	III	IV	V
A. CULTURE FIELD					
1. Location of the field	Narakkal (Cochin)	Narakkal (Cochin)	Kannamaly (Cochin)	Narakkal (Cochin)	Narakkal (Cochin)
2. Name of the owner	Mr. John (Lessee of the field)	Dept. of Fisheries, Govt. of Kerala, now kept at the disposal of Co-operative Intensive Prawn Farming Project	Mr. B. M. Edward	Mr. K. P. Mani	Mr. K. P. Mani
3. Area of the field (ha)	16	1	0.23	0.4	0.39
4. Type of field	Seasonal paddy-cum-prawn filtration field	Perennial	Perennial	Canal system in the coconut grove	Canal system in the coconut grove
5. Shape and construction of the field	Rectangular; enclosed by earthen bunds	Square; enclosed by earthen bunds	Rectangular; enclosed by earthen bunds on western, northern and eastern sides and by land on southern side	Narrow man-made canals in the coconut grove	Narrow man-made canals in the coconut grove
6. Source of water supply to the field	'Iyyath' canal of Cochin Backwater	'Appangad' canal of Cochin Backwater	Open backwaters on the eastern and northern sides	Adjoining backwater canal	Adjoining backwater canal
7. No. of sluice gates provided	Four	One	Two	One	Two
8. Type and size of sluice gate	Rectangular open type, wooden; length 3.7 m. width 1.0 m. height 1.8 m	Rectangular open type, wooden; length 3.5 m, width 1.2 m; height 2m.	Concrete gates, length 4 m; width 1.25 m; height 2 m.	Rectangular open type, wooden, width 0.75 cm.	Rectangular, open type, wooden, width 0.75 m.
9. Nature of bottom of the field	Muddy with an admixture of sand	Muddy with an admixture of sand	Clayey soil	Sandy	Sandy
10. Depth of the field (m)	0.5 at minimum low tide	0.75 at minimum low tide	0.3-1.5	1	1
B. PRE-STOCKING OBSERVATIONS					
1. Salinity of the water (‰)	—	—	2.46-2.55 in October 1977	9.9	27.2
2. Temperature of the water (°C)	—	—	33.2 in October 1977	29.4	35.6
3. Dissolved oxygen (ml/l)	—	—	1.48	2.2	8.6
C. ERADICATION OF PREDATORY ORGANISMS					
	Not eradicated	By cast netting, drag netting and hooks and line operation	660 kg Mahuva oil cake and drag netting	By drag netting and cast netting	Mahuva oil cake and drag netting
D. STOCKING					
1. Source of seed	From the wild, brought in by tidal currents	From the wild, collected from adjacent canals	From the wild, collected from the canals of Pudu Vypu	From the wild, collected from Pudu Vypu	From the wild collected from Pudu Vypu
2. Species of prawn/fish seed stocked	Wild stocking of all species	<i>P. l.</i>	<i>P. l., M. d.</i>	<i>P. l., P. m., M. d.</i>	<i>P. l., P. m., M. d.,</i>

3. Date(s) of stocking	November to April, during every high tide	18-2-78 to 31-3-78	15th, 19th and 26th November 1977	28-12-77, 30-12-77 and 3-1-78	24-2-78, 28-2-78, 1-3-78 and 2-3-78
4. No. stocked	Not known, uncontrolled stocking	40,250	<i>P. i.</i> 20,700; <i>M. d.</i> 2,300	<i>P. i.</i> 19,000; <i>M. d.</i> 12,000; <i>P. m.</i> 20	<i>P. i.</i> 18,000; <i>P. m.</i> 52; <i>M. d.</i> 12,000
5. Average size of seed (mm)	—	55	15	<i>P. i.</i> 43; <i>M. d.</i> 33; <i>P. m.</i> 83	<i>P. i.</i> 45; <i>P. m.</i> 85; <i>M. d.</i> 35
E. CULTURE OPERATION—MONITORING OF WATER QUALITY AND GROWTH OF STOCKED PRAWNS					
1. Duration of culture	15th November to 15th April	105 days	122 days	112 days	84 days
2. Manuring	Nil	Nil	Nil	Nil	Nil
3. Artificial feed	Nil	Nil	Nil	Groundnut cake, 16 kg	Groundnut cake 12 kg
4. Salinity of Pond water(‰)	—	9.5–25.8	0.45–21.39	9.9–24.5	24.5–27.2
5. Temperature (°C)	—	28.8–36.4	32.3–34.5	29.4–34.9	32.0–37.6
6. Dissolved oxygen (ml/l)	—	5.2–9.9	2.96–8.10	2.2–8.2	3.9–11.6
7. Growth of stocked prawns					
1st month after stocking (mm)	—	30	<i>P. i.</i> 35 <i>M. d.</i> 35	<i>P. i.</i> 9	—
2nd month after stocking (mm)	—	25	5 10	—	—
3rd month after stocking (mm)	—	20	50 10	—	—
F. HARVESTING					
1. Date of harvest	During every full and new moon period from 2nd half of December	6 days from 2-6-78	28–3–1978	26-4-78	18-5-78 to 21-5-78
2. Harvesting method	Sluice net; cast netting and hand picking at the final harvest	By cast net	By drag net and cast net	By dewatering, cast netting and hand picking	Cast netting and hand picking
G. PRODUCTION					
1. Prawns:					
a. Total weight (kg)	11,754 (<i>P. i.</i> 4100; <i>P. m.</i> 67; <i>M. d.</i> 7194 <i>M. m.</i> 393)	595 (<i>P. i.</i> 521- <i>P. m.</i> 5; <i>M. d.</i> 69)	49.3 (<i>P. i.</i> 25; <i>P. m.</i> 2.2; <i>M. d.</i> 22.1)	123.4 (<i>P. i.</i> 86.8; <i>P. m.</i> 0.5; <i>M. d.</i> 36.1)	196.7 (<i>P. i.</i> 159.7; <i>P. m.</i> 2; <i>M. d.</i> 33; <i>M. m.</i> 2)
b. Total estimated No.	—	<i>P. i.</i> 30,218	<i>P. i.</i> 9,349; <i>M. d.</i> 9,672	<i>P. i.</i> 7896; <i>P. m.</i> 11; <i>M. d.</i> 17,350	<i>P. i.</i> 13,587; <i>P. m.</i> 39; <i>M. d.</i> 12,540
c. Size range (mm)	<i>P. i.</i> 41–145; <i>M. d.</i> 36–70; <i>M. m.</i> 65–75	<i>P. i.</i> 121–150	<i>P. i.</i> 62–150	—	<i>P. i.</i> 89–134; <i>P. m.</i> 123–210; <i>M. d.</i> 52–87
d. Average size (mm)	—	—	<i>P. i.</i> 96.2; <i>M. d.</i> 71.7	<i>P. i.</i> 113; <i>M. d.</i> 73; <i>P. m.</i> 174	<i>P. i.</i> 120; <i>M. d.</i> 75; <i>P. i.</i> 11.75; <i>M. d.</i> 2.6
e. Average weight of prawns (g)	<i>P. i.</i> 8; <i>M. d.</i> 2;	<i>P. i.</i> 17	<i>P. i.</i> 10.5 (large specimens) 1.8 (small specimens)	<i>P. i.</i> -11; <i>M. d.</i> 2.1; <i>P. m.</i> -45	<i>P. m.</i> 52.6

2. Fishes (kg)	Not available	55	40.5	82.5	68
3. Total production Prawn & fish (kg.)	11754+	650	89.8	205.9	284.7

H. VALUE REALISED

1. Price of prawn per kg (Rs.)	<i>P. i.</i> 20; <i>P. m.</i> 40; <i>M. d.</i> 3.25; <i>M. m.</i> 5.50	<i>P. i.</i> 26.75; <i>P. m.</i> 56; <i>M. d.</i> 3.75	Processed <i>P. i.</i> 12.50 <i>P. m.</i> 15; small Prawn-8	<i>P. i.</i> 16.47; <i>P. m.</i> 51.50 <i>M. d.</i> 6.79	<i>P. i.</i> 18; <i>P. m.</i> 40; <i>M. d.</i> and <i>M. m.</i> 5
2. Total value of prawns (Rs.)	1,10,222	14,494.18	472.90	1,657.70	3,128.05
3. Price of fishes per kg (Rs.)	NA	—	4.00	2.70	2.00
4. Total value of fishes (Rs.)	NA	—	160.00	174.80	136.20
5. Total value of the yield (Rs.)	1,10,222 (prawns alone)	14,494.18	632.90	1,832.50	3,264.25

1. ESTIMATED EXPENDITURE

80,000					
1. Lease amount (Rs.)	—	—	—	—	—
2. Eradication (Rs.)	—	300	200	20	90
3. Seed (Rs.)	—	1,285	230	152	126
4. Harvesting (Rs.)	—	1,686	100	171	171
5. Wages (Supervi- sion watch & ward duty) (Rs.)	7,300	1500	—	300	300
6. Maintenance of the field (Rs.)	11,000	2,050	—	40	86
7. Miscellaneous (Rs.)	1,500	195	—	224	276
8. Total expendi- ture (Rs.)	99,800	7,016	530	907	1,049

J. NET PROFIT (Rs.)	10,422	7,478.18	102.90	925.50	2,215.25
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K. REMARKS

During June - October paddy was cultivated. Total expenditure incurred on paddy cultivation was Rs. 25,395 yield of paddy was 32,549 kg. valued at Rs. 34,583 for paddy and Rs. 1,600 for hay, the total receipt from paddy cultivation being Rs. 36,183.

Capital expenditure on bunds, reclamation and construction building not included in the estimated expenditure.

Culture operation was hampered by unprecedented rains in November and overflow of fresh water into the field

Mr. K. P. Mani is an ex-trainee of Krishi Vigyan Kendra for Mariculture, Narakkal

P. i. *Penaeus indicus*; *P. m.* *P. monodon*; *M. d.* *Metapenaeus dobsoni*; *M. m.* *M. monoceros*

The Central Marine Fisheries Research Institute is carrying out a series of demonstrations on intensive culture of marine prawns with a view to transfer the technology developed by it to the actual farmers and to promote prawn culture on scientific lines. The results of some of these demonstrations conducted between October, 1977 and May, 1978 in different ecosystems around Cochin are presented above. Data on the prawn

culture operations carried out by the traditional method in a paddy field in Vypeen Island, near Cochin, are also included for facilitating comparison between the traditional practice and the intensive culture of selected species of fast growing prawns. Results of other demonstrations will be given in the ensuing numbers of this series. It is hoped that the information would be useful to the entrepreneurs.

* * *

Information relating to potential area available, existing practice, potential species and seasons of availability of seed for coastal aquaculture in different maritime states of India

State/Union Territories	Potential inshore area (0-18m) available for open sea-farming (million ha)	Estuarine and brackish water area (million ha)	Area utilised at present for commercial brackish water fish culture (ha)	Important commercial species encountered in the brackish water fish culture	Present yield Kg/h/ year	Species of fishes and shellfishes that could be used for intensive culture	Main Seasons of availability of seed					
							Fishes	Prawns	Mussels	Molluscs Edible oysters	Pearl oysters	Clams and cockles
Gujarat	4.752	0.376	88	2	35.5	1, 2, 3, 4, 11, 12, 18, 19, 20, 23, 24, 25, 28, 29, 30, 31, 32	All months	Feb.-Apr & Sept.	NA	Apr.-May., July-Sept.	Mar.-Jun., Oct.-Feb.	Sept.-May
Maharashtra	0.593	0.081	—	—	—	1, 2, 3, 4, 6, 7, 12, 14, 16, 17, 20, 22, 23, 25, 26, 27, 28, 30, 31, 32	Nov-June & Sept.	Oct.-Dec.	NA	Sept.-May	—	Sept.-May
Goa	0.119	0.019	NA	1, 2, 3, 4, 10, 11, 14	500	1, 2, 3, 4, 10, 11, 12, 14, 15, 16, 20, 22, 23, 28, 29, 30	Oct.-May	Oct.-Dec., Feb.-May	NA	NA	—	NA
Karnataka	0.259	0.008	4,800	2, 11, 14, 15	258	1, 2, 3, 4, 5, 10, 11, 12, 14, 15, 16, 20, 22, 23, 25, 26, 27, 28, 30, 32	All months	Oct.-Apr.	Mar.-Oct.	All months	—	All months
Kerala	0.259	0.243	5,117	1, 2, 3, 4, 8, 10, 11, 13, 14, 15, 16, 20	700	1, 2, 3, 4, 10, 11, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 27, 28, 30, 31, 32	Oct.-Dec., Apr.-Sept.	Nov.-Dec., Feb.-May	Oct.-Nov., Jun.-Aug.	Oct.-Dec., Mar. Jun.	Apr.-May., Sept.-Oct.	All months
Tamil Nadu	1.606	0.080	—	—	—	1, 2, 3, 4, 10, 11, 13, 14, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30	Apr.-Jun., Oct.-Feb.	Feb.-May., Aug.-Dec.	Mar., Jun.-Aug., Oct.-Dec.	Oct.-Dec., Mar.-Apr.	Apr.-May., Sept.-Oct.	All months
Pondicherry	0.067	840 ha	—	—	—	1, 2, 3, 10, 11, 14, 20, 22, 23	NA	Nov.-Dec.	NA	NA	NA	NA
Andhra Pradesh	0.414	0.200	—	—	—	1, 2, 3, 4, 10, 11, 12, 14, 17, 19, 20, 22, 23, 25, 26, 27, 29	Jun.-Aug., Oct.-Feb.	Sept.-Apr.	NA	All months	—	All months
Orissa	0.768	0.299	—	—	—	1, 2, 3, 4, 10, 11, 14, 16, 19, 20, 22, 23, 25, 28	May-Jun., Dec.-Feb.	Feb.-May., Aug.-Sept.	NA	All months	—	All months
West Bengal	0.078	0.405	20,000	2, 4, 10, 11, 17, 19	300	1, 2, 3, 4, 9, 10, 11, 17, 19, 20, 23	Mar.-July, Dec.-Jan.	Feb.-May., Aug.-Sept.	NA	NA	—	NA

NA— Data not available

RESOURCES AVAILABLE FOR COASTAL AQUACULTURE IN INDIA

Resources such as suitable water areas, variety of cultivable species, their seed and large number of fish farmers for immediate starting of coastal aquaculture are available in all the maritime states of India. Indigenous technology for the culture of fin fishes, prawns, mussels, pearl oysters and pearls, edible oysters and seaweeds have also been developed and is now available to the entrepreneurs. The table given above provides certain basic data pertaining to the existing practice and the potentials available in the sector for general information.

(The numbers given in the table refer to)

Fishes

1. *Chanos chanos* (Milkfish)
2. *Mugil* spp. (Mulletts)
3. *Etroplus suratensis* (Pearl spot)
4. *Lates calcarifer* (giant brackish water perch)
5. *Sillago sihama* (Lady fish or sand whiting)
6. *Polynemus indicus* (thread fin)
7. *Eleutheronema tetradactylus* (threadfin)
8. *Elops* sp.
9. *Hilsa ilisha*

Prawns

10. *Penaeus monodon* (Tiger prawn)
11. *P. indicus* (Indian white prawn)
12. *P. merguensis* (Banana Prawn)
13. *P. semisulcatus* (green tiger prawn or Pink flower prawn)

14. *Metapenaeus monoceros* (Indian prawn)
15. *M. dobsoni* (Flower-tail prawn)
16. *M. affinis* (Indian prawn)
17. *M. brevicornis* (Yellow prawn)
18. *M. kutchensis* (Kutch prawn)
19. *Macrobrachium rosenbergii* (giant fresh water prawn)

Crabs

20. *Scylla serrata* (green crab)

Lobster

21. *Panulirus homarus* (Indian spiny lobster)

Molluscs

22. *Perna* spp. (brown & green mussel)
23. *Crassostrea* spp. (edible oyster)
24. *Pinctada fucata* (Pearl oyster)
25. *Meretrix* spp. (Backwater clam)
26. *Anadara granosa* (Blood clam)
27. *Katelysia* (Backwater clam)

Seaweeds

28. *Gracilaria* sp (Red alga)
29. *Gelidiella* sp (Red alga)
30. *Sargassum* sp. (Brown alga)
31. *Enteromorpha* sp (Green alga)
32. *Ulva* sp. (Green alga)



NEWS—INDIA AND OVERSEAS

Help for West Bengal

Three countries have offered to help West Bengal develop its fish industry. The United States is willing to air lift fish daily to Calcutta from other fishery centres.

The Soviet Union is prepared to set up a fishing harbour and provide the latest methods of deep sea fishing and processing. It would also buy any surplus fish arising from these efforts.

Norway has offered to help in work on fish farming, in constructing a fishing harbour, developing deep sea fishing and supplying vessels.

India to import 76 trawlers

The Indian Government has approved the import of 76 trawlers for deep sea fishing. These will be in addition to the 30 already approved for the year 1978-79.

Of the 76 trawlers, all but two will be double rig type vessels 23 to 28 m long and capable of operating in waters down to 100 fathoms. The trawlers will come from yards in France, Japan, Holland, Singapore, Spain and the United States. One trawler/purse seiner 50 m long will be imported from Hong Kong.

Rich fish stock in Arabian Sea

At FAO's Indian Ocean Commission meeting in Cochin, India the results of a preliminary survey were reported. The survey was carried out by its modern fishery research ship, FAO's Norwegian supplied Dr. Fridtjof Nansen and Japan's Shoyo Maru in an area extending from Somalia through the Gulf of Oman to the Pakistan-Indian border during January, 1975 through December, 1976.

Acoustic method was found to be particularly suitable for this tropical and subtropical region. As per the report the fish resource of the North Arabian Sea area may amount to 1.4 to 2.2 million tonnes of pelagic species and an enormous 100 million tonnes of meso-pelagic species.

Impressed by the potential for fishery development revealed by the report, the Commission's Executive Committee spent some time to consider the utilisation of the catches. Although initially they would go for reduction to meal and oil for export to generate capital, it was felt that the eventual aim should be the fullest use of the resource for direct human consumption.

Ferro-cement boats for inshore fishing

The College of Fisheries in Mangalore has tested a prototype of small type fishing boat. Experiments have shown that ferro-cement can be used to build small fishing boats for inshore fishing powered by either out-board motors or sails.

The Fishery Engineering Department at the College has designed, built and successfully tested a boat with an overall length of 3.12m, beam of 1.03 m, draught of 0.36 m and displacement when loaded of 560 kg.

Costs of such a ferro-cement boat are expected to be comparatively less than similar boats built with conventional material. The test boat would cost about Rs.620 compared to about Rs. 1000 for a similar boat of wood used for traditional indigenous fishing craft. Another advantage is that no special elaborate workshop facilities are required which cuts out cost of transportation.

World's fishing fleet increase

Ships engaged in fishing, processing, carrying in 114 countries		Aggregate tonnage
1976	19651	11,848,548
1977	19940	12,162,035
USSR	4017 (20%)	6,440,068 (53%)

Set out in Lloyd's Register of Shipping Statistical Tables for 1977.

Brunei plan for largest ever prawn farm.

A fish and prawn farm planned for a former rubber estate in Brunei, South east Asia, will be the largest of its type in the world according to a project sponsored by a company called Borneo Fish Farm Ltd. with directors including a London consultant. The Company was registered by Centre Enterprises Ltd. of Hong Kong.

The large fresh water prawn *Macrobrachium rosenbergii* will be grown. This species has been well developed in aquaculture in recent years and several viable technologies are available for farming it. The Brunei farm will include 1000 acres of ponds 10-acre hatchery laboratories and freezing plant. The production is expected to amount to about 1000 tonnes a year.

Fishing News International 17 (1): Jan. 1978

BIOMASS programme to investigate the potential of krill as new food source

It has been estimated that underneath the icy waters of the Antarctic Ocean lies, probably the worlds largest untapped living resource of krill, the shrimp-like crustaceans, the standing stock amounting to more than 1000 million tonnes. Out of this 100 million tonnes could be fished every year, thereby almost doubling the world's marine harvest. However, this is only an estimate and proper management in the exploitation is necessary in order to avoid an ecological imbalance in Antarctic waters where seals, whales, penguins and fish compete for the same food, mainly krill.

An international group of marine scientists has developed plans for the Biological Investigations of Marine Antarctic Systems and stocks (BIOMASS). The main objectives of BIOMASS are to learn the fundamental biology of the species of krill namely *Euphausia superba*, extent of dependence of other animals on the species, and to study the behaviour of Antarctic water masses affecting krill swarming.

(Continued inside back cover)

BOOKS

Genetics of Speciation. Benchmark Papers in Genetics, Vol. 9 Edited by D. L. Jameson. Dowden Hutchinson & Ross, Inc. Stroudsburg, Pennsylvania, pp 336, 1977.

This is the ninth volume of the series 'Benchmark Papers in Genetics'. It includes selected papers on the genetic nature of species, the origin and development of isolating mechanisms, the structure of natural populations and the modes of the origin of species.

The underwater Handbook. A guide to Physiology and performance for the Engineer. Edited by Charles W. Shilling, Margaret F. Werts and Nancy R. Schandeleier. Plenum Press. New York and London, pp 912, 1976.

This volume provides the information necessary for a variety of underwater activities. This deals with such aspects as energy production, motor performance, temperature control, communication, information receptors, behaviour and motivation considering man as a machine. A number of areas are examined like decompression sickness, the effect of cold on divers, visual and auditory acuity and the problems of communication under high pressure and while breathing helium. It is an essential source book for those concerned with working and living in marine habitats or designing and operating submersibles.

Chemistry of marine Sediments. Edited by T. F. Yen. Ann Arbor, Science Publishers Inc. Ann Arbor, Michigan, U. S. A. pp 265, 1977.

It is a compilation of a series of papers which comprehensively examine the subject in great detail.

It deals with the potential of marine sediments in energy development with an emphasis on petroleum,

description of chemical changes of fossil organic remains, the environmental effects of pollutants in sediments such as heavy metals and pesticides, description of interaction of sediments and seawater on organo-metallic pollutants. It will be of interest to marine scientists, chemists, engineers, oceanographers and environmental generalists.

Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms. Vol. I. Nature and Fate of Petroleum, pp 321. Vol. II. Biological Effects, pp 500. Edited by Donald C. Malis. Academic Press, Inc., New York, San Francisco, London, 1977.

These volumes are compilations of current knowledge on marine environments and ecosystems with reference to the arctic and subarctic. While Vol. I deals with the nature and fate of petroleum in the marine environment, Vol. II covers the biological effects of petroleum specially alterations in life process and in community structures.

Crabs of Japan and the adjacent seas by T. Sakai. Published by Kodansha Ltd., Tokyo, 1976. Set of 3 volumes, 520-page colour plate volume, 804-page English text volume and 464-page Japanese text volume.

This is a comprehensive and monumental work on the crabs of Japan and the adjacent seas including the Pacific and Indian Ocean. It can be properly considered as Dr. Sakai's life work spanning 40 year of field work and research well known in the field of carcinology. Dr. Sakai has included in the volume approximately 130 new species. The English text volume includes 900 species of crabs of Japan and the adjacent seas with details of classification, diagnostic features, synonyms, ecology, distribution and generation. 605 species appear in the 251 colour plates and 479 text figures are included in the text volume.

Compiled and prepared by M. J. George, S. K. Dharmaraja, Varughese Jacob, P. V. Rao and G. Subbaraju

Published by Dr. M. J. George, Scientist on behalf of the Director
Central Marine Fisheries Research Institute, Cochin-682 018

SYMPOSIUM ON COASTAL AQUACULTURE

12-18 JANUARY 1980

BACKGROUND

Aquaculture, though ancient in origin, has emerged as a recognised industry only during the last decade. While highly advanced and sophisticated technologies have been evolved for the capture of fishes, agriculture and livestock development, man has until recently neglected the farming of aquatic animals and plants. Faced by the challenges of providing food for the ever growing human population, shrinking land area for production, and of huge investments required to realise even marginal increase in fish production from the seas, he has now turned his attention to farming of aquatic organisms.

The near shore sea, the bays and lagoons, the estuaries and mangroves, the backwaters and the brackishwater lakes are well-known for their fishery resources. These ecosystems, having distinct biological and environmental features are naturally evolved as nursery grounds for several organisms of marine and fresh water origin. With these endowments, and possessing characteristic physiography, nutrient rich soil and productive waters, this region constitutes an ideal base for coastal aquaculture.

Traditional brackishwater fish culture in the coastal zone is prevalent at present in several countries like India, Bangladesh, Philippines, Malaysia, Singapore and Indonesia. The practice as followed in India involves mere trapping of juveniles of fishes and prawns brought in by the incoming tidal currents in the low-lying fields adjacent to the estuaries and backwaters, and holding them for a short period before harvesting. As the operation is carried out on unorganised and unscientific lines and without any management or husbandry principles, the production from this practice has been found to be very low and consequently, it has remained only at a subsistence level. Further, coastal aquaculture is practised on a limited scale, confined to

a small extent of the vast water area available in these countries. Nevertheless, the role of coastal aquaculture for augmenting protein food production, improving rural economy and providing large-scale employment opportunities has been well recognised. In view of these most of the maritime countries are making efforts to develop this sector and it has rightly been assigned high priority in the development programme of these nations.

Pioneering researches carried out on coastal aquaculture in different countries have provided a wide technological base for several systems of culture. Proven techniques on the culture of various species of finfishes, crustaceans, molluscs and seaweeds are now available. Considerable information is also available on open sea farming and oceanic farming. The scientific coastal aquaculture operation not only endeavour to employ the modern techniques of culture, but also envisages effective use of a wide range of farming ecosystem integrating crop, livestock and fish. Thus the coastal aquaculture is emerging as a multi-disciplinary science. Several aspects such as selection of species, survey and location of sites, construction of farms, controlled breeding and seed production, feed development, culture operation, monitoring of stocked species, control of diseases, maintenance of water quality, manipulation of environment, harvesting, processing, and marketing are involved in the modern technology of coastal aquaculture. Besides, socio-economics also play a vital role in the development of this sector.

Several research and development organisations as well as universities in India and abroad are now engaged in intensive research on various aspects of coastal aquaculture. These research efforts have considerably advanced our knowledge. While the general technology of culture developed in various countries

is similar it is becoming increasingly clear that adoptable techniques are location-specific. Recent investigations carried out in India have shown that the growth rate of several cultivable organisms such as prawns, mussels and seaweeds are so fast that they reach harvestable size within three to four months after stocking and that by following simple indigenous techniques they could be cultivated in different types of eco-systems. In developing countries, greater emphasis has now been laid on low-cost technologies so that they could be taken up by the small and marginal farmers without much investment.

Following global awareness on aquaculture and increasing research and developmental efforts put in this field, several symposia, seminars, workshops and conferences have been organised at national, regional and international levels with a view to review the state of the art of aquaculture, to identify constraints and problems and to formulate strategies for further development. However, in such multi-disciplined symposia, the coastal aquaculture has not received the desired attention. The first symposium exclusively on coastal aquaculture was held in 1970 in Bangkok organised by the Food and Agriculture Organisation of the United Nations in conjunction with the 14th Session of the Indo-Pacific Fisheries Council. Since then, extensive information has accumulated and considerable progress has been achieved in the field both at scientific/technical and developmental levels. The results of field experiments, demonstration and pilot projects have indicated that the coastal aquaculture is at a take-off phase in many countries. It is felt that the time is opportune at this juncture to take stock of its present status and to plan ahead. On these premises, it is proposed to hold a SYMPOSIUM ON COASTAL AQUACULTURE in January 1980.

OBJECTIVES

The main objective of the Symposium is to promote and develop coastal aquaculture by disseminating the knowledge and experience gained and modern technologies developed among the scientists, technicians, extension workers, administrators, planners, farmers and industrialist, through:

- (a) a review of the present status of coastal aquaculture;
- (b) discussions on the technologies of culture of various organisms in different types of ecosystems in the coastal zone as well as on the technologies of harvesting, processing, marketing and utilisation of the produce;
- (c) identification of the major inputs required for research, developmental, educational and training programmes for rapid development of coastal aquaculture leading to the establishment of an organised industry;
- (d) production intensification by integrated crop-livestock-fish farming technologies;
- (e) an assessment of the social, economic and legal aspects deriving from the development of coastal aquaculture; and
- (f) linkages, co-ordination and communication among the national and international organisations involved in research, development and promotion of coastal aquaculture.

SCOPE

The Symposium will consider all scientific and technical aspects of ecosystems, breeding, rearing, propagation and culture of finfishes, crustaceans, molluscs, seaweeds and other organisms in the coastal and contiguous water areas, fish diseases, nutrition, farm engineering, harvesting, post-harvest technologies and marketing. The Symposium will also deal with developmental aspects such as planning, organisation, socio-economics, legal, manpower requirements, training and industry relating to coastal aquaculture.

VENUE

The Symposium will be held at Cochin, a famous coastal city in Kerala State in South India. Cochin is one of the important centres of fishing activities in the country. Besides serving as an industrial base for the fishing and connected industries, the low-lying fields adjoining the backwaters of Cochin support an

age-old practice of brackishwater fish culture. The headquarters of the Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, FAO/UNDP Pelagic Fishery Project, Central Institute of Fisheries Nautical Engineering and Training, Integrated Fisheries Project, Marine Products Export Development Authority, University of Cochin, Kerala Fisheries Corporation and State Fisheries Organisation are located here.

DATES

The Symposium will be held for 7 days from 12th to 18th January, 1980.

SPONSORING AGENCY

The Symposium is being organised by the Marine Biological Association of India. The Marine Biological Association of India was founded in 1958 and has the rich experience of successfully organising and conducting the following symposia at international levels.

1. Symposium on Scombroid Fishes 1962
2. Symposium on Crustacea 1965
3. Symposium on Mollusca 1968
4. Symposium on Corals and Coral Reefs 1970
5. Symposium on Indian Ocean and Adjacent Seas—Their Origin, Science and Resources 1971

The present SYMPOSIUM ON COASTAL AQUACULTURE is the sixth in the symposia series of the Marine Biological Association of India. The official organ of the Association is the *Journal of the Marine Biological Association of India*.

TECHNICAL SESSIONS

TECHNICAL SESSION I: REVIEW OF THE PRESENT STATUS OF COASTAL AQUACULTURE

Global, regional, national and system-wise reviews on coastal aquaculture.

TECHNICAL SESSION II: CULTURE ECOSYSTEMS IN THE COASTAL ZONE

Types, extent, and environmental characteristics of presently utilized ecosystems and potential areas.

TECHNICAL SESSION III : SITE SELECTION AND FARM ENGINEERING

Technical and administrative criteria for selection of sites for different culture systems - design, layout, material input, construction of farms - construction of hatcheries - open sea farm engineering.

TECHNICAL SESSION IV: REPRODUCTION AND INDUCED BREEDING

Reproductive physiology of finfishes and shell fishes - growth and reproduction through physiological control - endocrine control on growth, maturation and spawning - techniques of induced breeding, maturation and rematuration - reproduction in marine algae.

TECHNICAL SESSION V: SEED PRODUCTION AND TRANSPORTATION

Seed requirements - natural seed resources, abundance, methods of collection - hatchery production of seed - techniques, constraints, economic viability - transportation and transplantation.

TECHNICAL SESSION VI: TECHNIQUES OF CULTURE FOR:

- (a) FINFISHES
- (b) CRUSTACEANS
- (c) MOLLUSCS
- (d) SEAWEEDS AND ALGAE
- (e) OTHER ORGANISMS
- (f) POLYCULTURE

Traditional practices, modern techniques - low-cost technology - identification of bottle-necks and research input needed - harvesting technology for different systems. Live food organisms for larval rearing and forage for adults.

TECHNICAL SESSION VII: FINFISH AND SHELLFISH NUTRITION

Nutritional requirements and metabolism of cultivable marine organisms - ecological energetics and food conversion efficiencies - conventional and new resources of protein for feeds - feed formulations and assessment of their nutritive value - manufacture of feed and economics.

TECHNICAL SESSION VIII: GENETIC RESOURCES

Germplasm of cultivable organisms - germplasm conservation - upgradation of stocks - interspecific hybridization to synthesize new breeds - genetic manipulation for monosex culture - genetic improvement of cultivated organisms.

TECHNICAL SESSION IX: FISH AND SHELLFISH DISEASES AND CONTROL

Parasites, their life-histories and host specificity - effects of pathogenic organisms on the growth and reproduction of cultivable organisms - histopathological investigations - diagnosis and control of diseases - immunological and prophylactic measures in cultivated aquatic organisms.

TECHNICAL SESSION X: COASTAL AQUACULTURE AND ENVIRONMENTAL MANAGEMENT

Sources and types of environmental damage to the culture areas - effect of pollution on the survival, growth and reproduction of cultivable organisms - bioassay experiments on such organisms - developments in the environmental monitoring technology - legal and social aspects of control systems.

TECHNICAL SESSION XI: POST-HARVEST TECHNOLOGY AND UTILIZATION

Purification - quality control - processing - development of low cost products - transportation and marketing.

TECHNICAL SESSION XII: INTEGRATED CROP - LIVESTOCK - FISH FARMING

Synergy of bio-systems - Techniques of integrated crop-livestock-fish farming - blending culture and capture fisheries.

TECHNICAL SESSION XIII: ECONOMIC VIABILITY OF COASTAL AQUACULTURE SYSTEMS

Economics of different culture systems - case studies on pilot plants and commercial plants - Financial resources - credit facilities.

TECHNICAL SESSION XIV: IMPACT OF COASTAL AQUACULTURE ON SOCIO-ECONOMIC AND RURAL DEVELOPMENT

Present status of social, economical and nutritional standards of fishermen and fish farmers - role of aquaculture in raising this standard.

TECHNICAL SESSION XV: LEGAL ASPECTS OF COASTAL AQUACULTURE

Legal measures available in different countries - ownership, licensing, and leasing policies - legal aspects of pollution prevention and control - legal aspects of joint ventures.

TECHNICAL SESSION XVI: MANPOWER AND TRAINING IN COASTAL AQUACULTURE

Assessment of research, technical, managerial operative and extension personnel for development of aquaculture - training facilities available at national, regional and international organizations and future requirements.

TECHNICAL SESSION XVII: EXTENSION

Transfer of technology, extension techniques - methods and media.

TECHNICAL SESSION XVIII: CO-OPERATIVE PROGRAMMES AMONG NATIONAL AND INTERNATIONAL AGENCIES FOR COASTAL AQUACULTURE RESEARCH AND DEVELOPMENT

Existing arrangements and facilities for co-operative and collaborative research programmes - constraints - identification of productive and beneficial areas for collaboration.

TECHNICAL SESSION XIX: STRATEGIES FOR FUTURE COASTAL AQUACULTURE DEVELOPMENT

National policies and planning for the development of coastal aquaculture - identification of priorities - R & D programmes - Integrated Fisheries Development Programmes.

EXCURSIONS

Excursions to centres of fisheries and aquaculture interest around Cochin will be arranged during/after the Symposium. Visits to places of historical and tourist interest can also be arranged on request.

REGISTRATION

Intending participants are required to pre-register their names by returning the attached "Notice of participation" to enable the Symposium Office to make prior arrangements. Those desirous of presenting papers for the Technical Sessions are requested to give the Title(s) of the paper(s). Registration of participants will be done at the Symposium venue on 11th and 12th January, 1980. A registration fee of Rs. 25/- will be charged for participants from India and U. S. \$20 or its equivalent for those from abroad. Members of the Marine Biological Association of India with a standing of atleast 3 years (1977 through 1979) are exempted from the registration fee.

FINANCE

The Association will finance in the organisation and conduct of the symposium, printing of Abstracts of papers and publication of the Proceedings. Costs of travel, accommodation, boarding, tourist excursions and other expenditure will have to be borne by the participants themselves or by their sponsoring organisation.

LANGUAGES

The official language of the Symposium is English. However, papers in French, German and Spanish with summaries in English will be accepted.

PAPERS FOR THE SYMPOSIUM

The Symposium will accept review, status and experience papers. Review and status papers will be invited from specialists in the various fields of coastal aquaculture. The experience papers should contain recent unpublished informations. All papers will be screened by an Editorial Committee and only those considered relevant and suitable for the Symposium will be accepted.

ABSTRACT

The Abstract(s) of the paper(s) (in duplicate) to be contributed to the Symposium must reach the General Convener latest by 30th June 1979. Each abstract should not exceed 500 words. Since the abstracts of the accepted papers are to be distributed to the participants at the time of registration, extreme care may be taken in the preparation of abstracts to make it self-contained by including the salient results of studies.

PAPERS

The full papers in the final form (in duplicate) must reach the General Convener by 31st October 1979. The review/status papers shall not ordinarily exceed 30 pages typed double space and the experience papers, 20 typed pages. Authors are requested to follow the guidelines given on next page while preparing the manuscripts of the papers for the symposium.

GUIDELINES FOR THE PREPARATION OF MANUSCRIPTS

Manuscripts should be type-written on one side in double space throughout on foolscap paper leaving 4 cm margin and submitted in duplicate. MS should not exceed 30 typewritten pages including Tables and Figures in respect of review papers and 20 pages in case of experience papers. Before submitting the MS the authors should check whether there are inconsistencies among the Tables and Figures and the text or within the text. Both Tables and graphs illustrating the same point will not be accepted. As a rule, foot notes should be avoided except when they are used to credit Institution contribution series number and unpublished material. In Tables, subscript/superscript numerals should denote footnotes which should be explained below the concerned Table, with first line indented.

Acknowledgement should be made preferably in the 'Introduction' in a separate paragraph. Underscore only when *italics* are intended as in the address under the author(s) name (s), scientific names and source of publication in literature citation at the end of the paper. Material and methods, when given should be limited to what scientists need in understanding the design of the study and in judging whether the data obtained are adequate. The relative importance of the headings should be shown by their position on the page and by proper use of the capitals and lower case. When Greek symbols or unusual signs which normally cannot be typed are used, they should be written out quite legibly and made easy to differentiate. Similarly, complex mathematical equations should also be clearly written out if they cannot be typed fully. Double space should be left above and below the lines that have equations and formulae with superscript and subscript. All measurements should be given in the metric system only.

The Title of the MS should be brief but should be typed wholly in capitals. This is followed by the author(s) name(s) with initials preceding the surname. No periods follow the Title or the author(s) name(s). The address of the author(s) given below the name(s) should be underscored with no period at the end. Titles with scientific names must contain a common identifying term, e.g. '.....The copepod *Temora turbinata* (Dana).....'.

Abstract should be double spaced starting on the Title page leaving 5 cm margin. It should not be a summary of work done, but should highlight the salient points and recapitulate the findings and conclusions.

Citation of literature should have author(s), year, title, name of journal, volume, number and inclusive pages. Abbreviations of the names of the Journals should be according to the 'World list of Scientific Periodicals'. In the text, the references should be cited thus: Fogg (1952); Schaefer and Marr (1948) with author(s) name(s) followed by the year of publication in parenthesis.

Tables when given should not contain bulky data and should be given on separate sheets and their position in the text indicated suitably. Each Table should be numbered with Arabic numerals (e. g. Table 3) and should have a brief heading which is underscored.

Drawings or illustrations should be made in Indian ink on white Bristol board or good quality tracing paper or on co-ordinate paper with blue grids and normally be twice that of the final printed size. The size of the printed area is 18 x 12.5 cm and this will be the maximum size for a full page figure with legend. Figures should be numbered in Arabic numerals and indicated in the text thus: Fig. 1 and should have the Figure number, legend, author and abbreviated title of the paper or note on the back. Photographs or Photomicrographs for reproduction must be clear and show good contrast and must be free of clip markings and cracks. Prints must be in glossy glazed paper and of a size not smaller than 8.0 x 5.5 cm. When photographs are grouped as one plate, they should be trimmed and mounted with no space between those in the group as intended for final reproduction. Each photo of such a group should be lettered with a block letter (A, B, C, etc.) and in the text indicated thus: Plate IA. Such notations on text-figures should be given as a, b, c, etc. Type-written lettering on figures is not acceptable. Also, legends for figures should be written on a separate sheet headed 'Captions for illustrations' at the end of the manuscript. Scale of the magnification of *camera lucida* drawings should be indicated beside the drawing itself.

All Correspondences should be addressed to:

THE GENERAL CONVENER,
SYMPOSIUM ON COASTAL AQUACULTURE,
THE MARINE BIOLOGICAL ASSOCIATION OF INDIA,
POST BOX No. 1244,
COCHIN 682 011.
KRRALA, INDIA.

SYMPOSIUM ON COASTAL AQUACULTURE

12 — 18 JANUARY 1980

MARINE BIOLOGICAL ASSOCIATION OF INDIA

P. B. No. 1244

COCHIN-682 011, INDIA

NOTICE OF PARTICIPATION

(This form should be returned to the General Convener of the Symposium)

Name: Dr., Prof., Mr., Mrs., Miss.

(IN BLOCK LETTERS)

Position:

Organisation:

Mailing Address:

Telephone No:

Telegraphic Address:

Title(s) of paper(s) proposed to be contributed to the symposium:

No.	Author (s)	Title of Paper
1.
2.
3.

Propose to personally attend the symposium: Yes/No

Signature

To

The General Convener,
Symposium on Coastal Aquaculture,
Marine Biological Association of India,
Post Box No. 1244,
COCHIN-682 011.
Kerala, India.