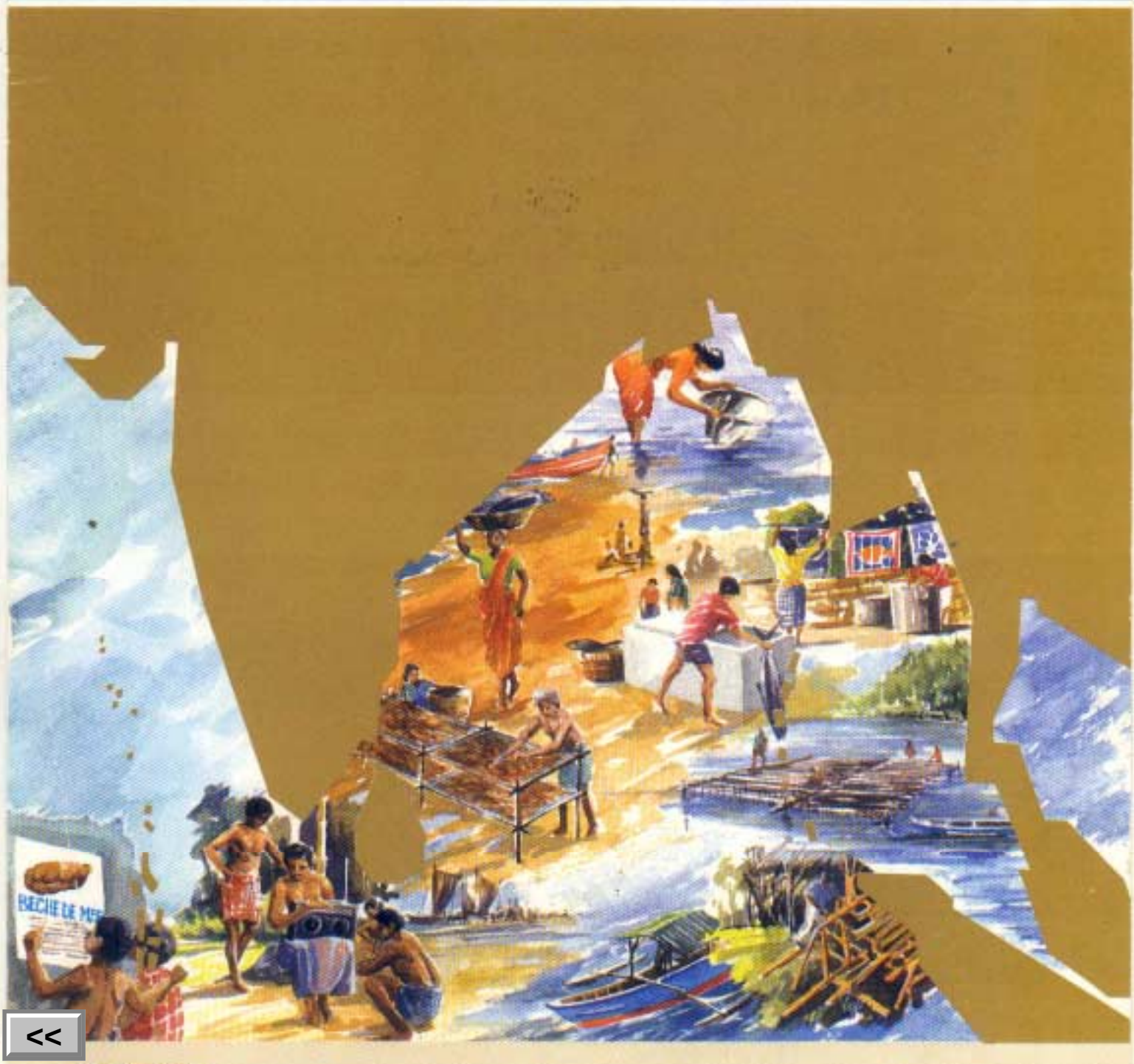
BOBP/WP/91

Further Exploratory Fishing for Large Pelagic Species in South Indian Waters



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Further Exploratory Fishing for Large Pelagic Species in South Indian Waters

by G Pajot
Sr. Fishing Technologist

BAY OF BENGAL PROGRAMME
Madras, India
1993

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Despite the substantial increase in the traditional fishing fleet of small craft in Tamil Nadu, India, production has remained more or less constant in the last few years, indicating that fisheries resources within the range of this fleet have been fully exploited.

From the Sixties, however, introduced small fishing craft in neighbouring Shri Lanka have been operating in deep sea waters and reporting good catches of large pelagic species, particularly shark. Although Tamil Nadu is geographically well placed for the exploitation of these resources, the potential has not been realized.

In order to introduce fishing for large pelagic species in Tamil Nadu by demonstrating the experience in Shri Lanka, a subproject for fishing demonstrations was established in 1989. The executing agency was the Tamil Nadu Department of Fisheries with technical and financial support from the Bay of Bengal Programme (BOBP), which had played a part in this development in Shri Lanka.

Two 10 m FRP boats (SRL-15) tested in Shri Lanka's commercial offshore fisheries were selected for exploratory fishing trials from Chinnamuttam fishing harbour near Cape Comorin and Royapuram fishing harbour in Madras. Results and conclusions of the Chinnamuttam and Madras trials are reported in this paper. Craft and gear details, as well as earlier trials at Chinnamuttam, have already been reported in greater detail in BOBP/WP/81 — *Exploratory Fishing for Large Pelagic Species in South Indian Waters.*

The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Shri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new technologies, methodologies and ideas to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, and also by UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

This document is a technical working paper and has not been cleared by the Government concerned or the FAO.

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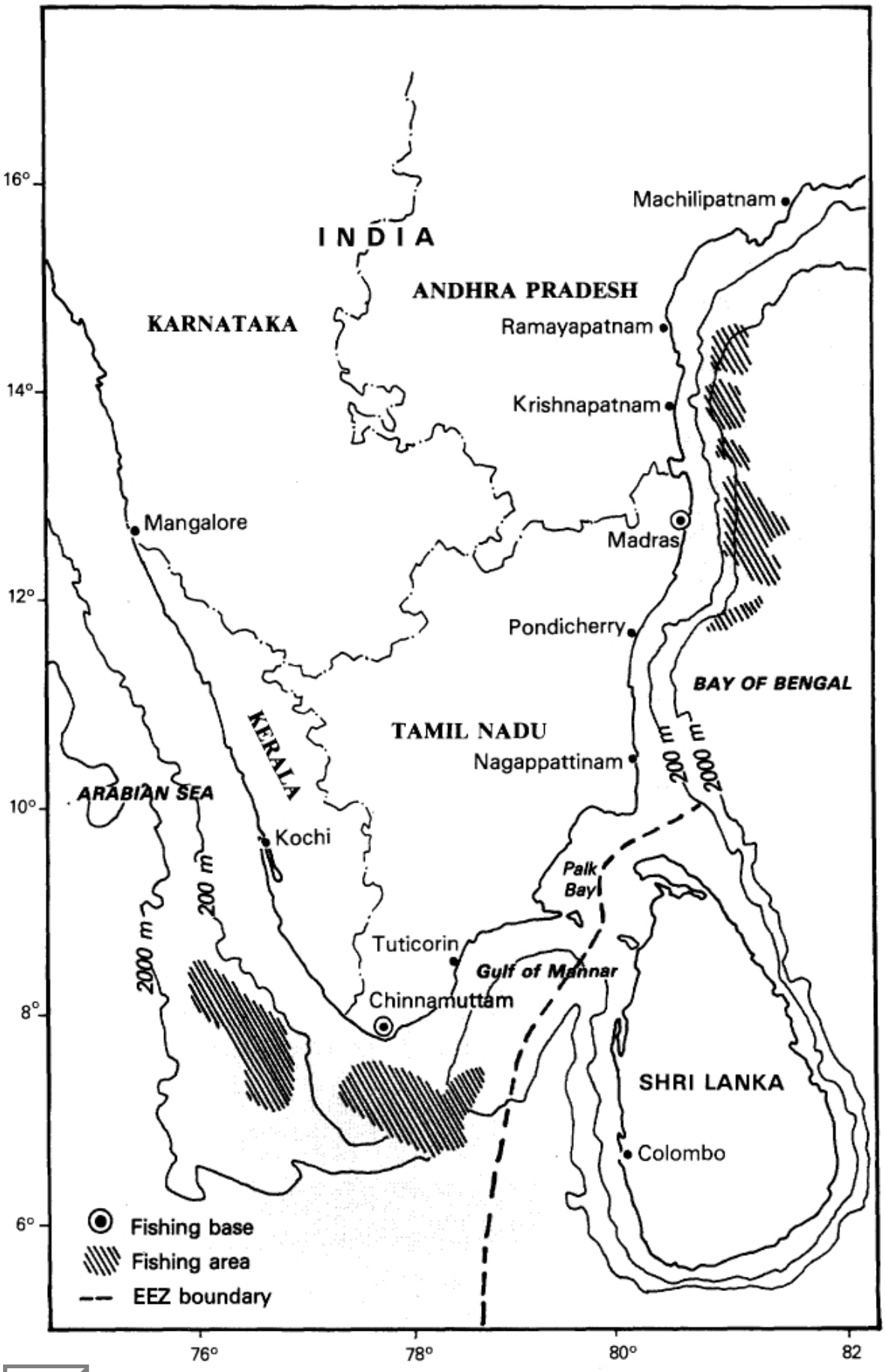
Fig. 1 **Map of South India showing the fishing areas.**



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1. *INTRODUCTION*

A subproject under the Bay of Bengal Programme (BOBP) was established in 1989 to demonstrate offshore fishing for large pelagic species in South Indian waters. Two small multiday boats (type SRL-15), developed and tested in Shri Lanka, were used in the demonstrations, which commenced in July 1990 from Chinnamuttam, near Cape Comorin. The results of the first year, until August 1991, were presented in BOBP/WP/81, *Exploratory Fishing for Large Pelagic Species in South Indian Waters.*

The performance and results of the fishing trials were, on the whole, satisfactory. But they were not up to full commercial standard because of the inexperience of the crew and the exploratory nature of fishing with only two boats, and sometimes only one. An economic analysis indicated commercial viability. However, half the revenue came from seasonal catches of highly priced seerfish within 60 n miles from the shore, for which multiday offshore boats would not be required. The price of the other fish, tuna and shark, was very low and it was doubtful whether the catch rate of these species could be increased to the level needed to attain commercial viability without the seer. It was, therefore, proposed to move the trials to the Coromandel Coast and operate out of Madras. It was reasoned that there would be higher catch rates, particularly of shark, and that the prices of fish would be higher in a metropolitan area.

The idea was to operate the boats for a full year before April 1993, which would be when the subproject would have to be terminated. However, bureaucratic snags delayed the transfer of the boats from Chinnamuttam to Madras by six months. The fishing trials, therefore, continued from Chinnamuttam during the period September '91 – May '92 and were conducted from Madras only during September '92 – May '93.

This paper gives an account of these two trial series. Details of the boats and the fishing gear have already been given in BOBP/WP/81 and are not repeated in this paper.

2. *TRIALS FROM CHINNAMUTTAM*

Period		September 1991 - May 1992
Fishing area	:	South and west of Cape Comorin, up to 100 n miles from Chinnamuttam. (See Figure 1 facing).
Marketing	:	Through a fish merchant at fixed prices that were adjusted monthly.
Boats	:	Two SRL-15s, I and II.
Fishing gear	:	20 driftnets (1000 mesh) 20 bundles of shark drift-longline of 5 hooks each 4 trollinglines

One of the SRL-15s in Madras

SRL-15 I and SRL-15 II operated in tandem most of the time and their performance as to fishing time, catch rates and sales proceeds was, for all practical purposes, identical. Therefore, only the results of SRL-15 II are presented in this report, as was done in BOBP/WP/81.

2.1 *Fishing time*

During the nine-month period, SRL-15 II made 41 trips and attained 123 fishing days. This gives an average of 13.6 fishing days per month against the target of 15 days.

There was no increase in fishing time from the previous year (13.8 days). Details are given in Table 1. Driftnets were used on all fishing days, on an average of 8.5 hours/day. The drift-longlines were used during 60 per cent of the fishing days. The average soaking time was 12 hours.

Table 1: SRL 15 II : Record of fishing time, Chinnamuttam

YEAR	Sep 1991	Oct	Nov	Dec	Jan 1992	Feb	Mar	Apr	May	TOTAL
Fishina trips (no)	6	$	2	2	4	6	5	5	41	
FISHING TIME (day)										
Dritmets	16	18	13	5	6	14	18	19	14	123
Drift-longlineS		7	10	3	3	6	14	16	14	73
Trollinghnes	6	18	3	5	6	14	18	19	14	23
FISHING TIME (nours)										
Driftnets	128	97	135	42	54	99	189	168	31	1Q43
Drift-longlines	—	78	109	36	38	75	194	185	169	884
Trollinglines	64	69	81	25	32	31	89	63	30	484

2.2 *Catches*

The total catch, over nine months, was 19 t, valued at IRs 285,000[1].Details are given in Table 2. The monthly averages are 2.1 t of catch and IRs 31,700 of revenue, while the corresponding figures for the first year of trials, September '90-August '91, were 2.4 t and Rs 24,750. Thus, the catch rate dropped by about 12 per cent but fish prices increased by 50 per cent.

The highest catches were recorded in October, March and May. The seasonal pattern is similar to that of the previous year, with a lean winter season (See Figure 2).

Fig. 2 SRL-15 II — Monthly catches by weight, Chinnamuttam

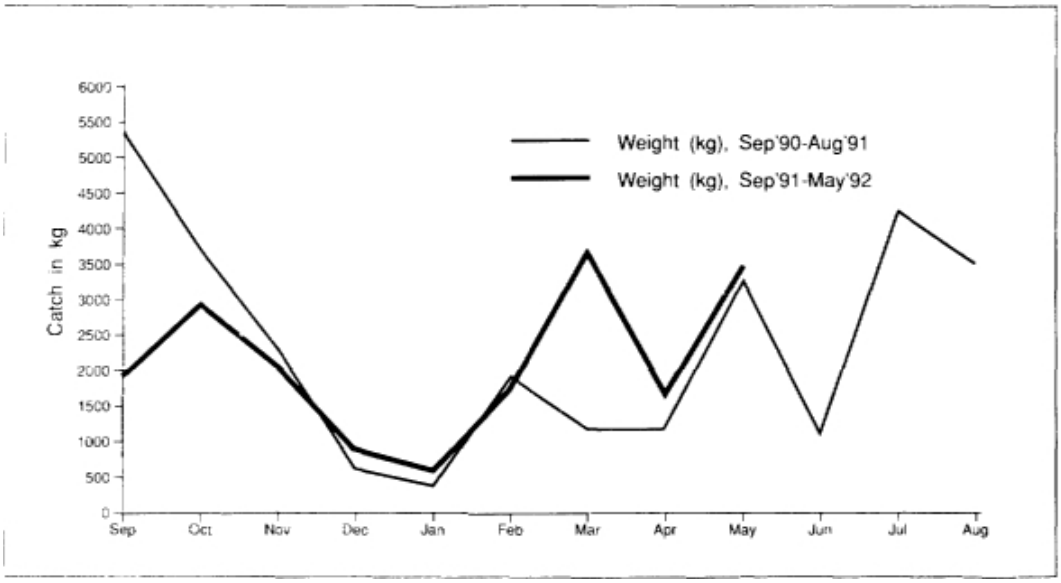

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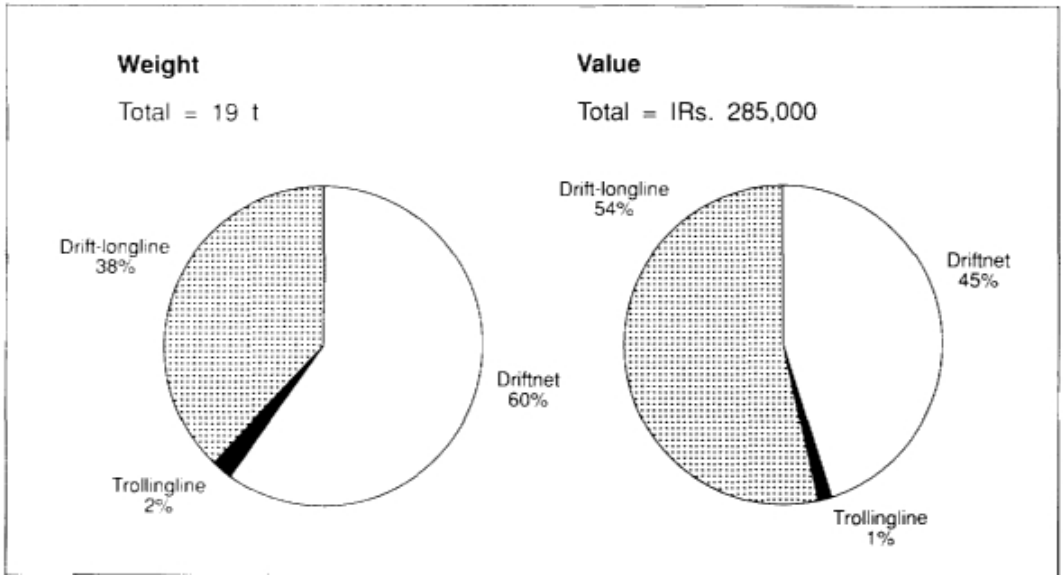
Table 2 : Monthly catch by fishing gear and species, Chinnamuttam

Month / *YEAR*		*Sep* /99/	*Oct*	*Nov*	*Dec*	*Jan* 1992	*Feb*	*Mar*	*Apr*	*May*	*TOTAL*
BY FISHING GEAR											
Driftnets	kg:	1759	2328	1152	864	464	1163	1109	625	1999	11463
	Rs	26083	20740	10804	8401	3255	12347	16951	701$	21970	127566
DrIlt-longlines	kg:	—	$96	835	—	140	540	2535	069	1462	7177
			9787	6502	—	3080	11880	53235	2533!	35088	54903
Trollinglines	kg:	193	55	20	44	—	—	17	—	24	351
	Rs:	491	230	100	370	—	—	510	—	144	2845
TOTAL	kg:	1952	2979	2007	908	604	1703	3661	1694	3485	8993
	Rs:	27574	30757	27406	877!	6335	24227	70696	32346	57202	285314
BY SPECIES											
Small tuna	kg:	273	263	—	—	76	40	—	—	—	652
	RI:	1092	1052	—	—	380	200	—	—	—	2724
Yellonfirt	kg:	—	1039	372	91	38	61	85	53	400	2139
	Rs:	—	4684	2232	546	228	366	510	318	2400	11284
Skiptauk	kg:	—	760	276	IS	262	560	200	222	744	2539
	Rs:	—	1212	380	75	144!	3360	1200	1332	4464	4464
Shark	kg:	66	979	1338	717	160	965	3166	1237	1925	10553
	Ri:	528	15599	23614	7443	3520	19454	66486	29363	45914	211921
Billfish	kg:	—	20	18	33	62	77	179	109	400	898
		—	17$	162	297	682	847	1969	1199	4400	973!
Seertish	kg:	850	168	—	—	—	—	17	—	—	1243
	Ri:	19734	7728	—	—	—	—	510	—	—	27972
Others	kg:	755	50	3	52	6	—	4	73	16	969
	Ri:	6270	307	18	410	84	—	21	34	24	7218
TOTAl	kg:	1952	2979	2007	900	604	1703	3661	1694	3485	18993
	Ri:	27574	30757	27406	877!	6335	24227	70696	32346	57202	285314

The driftnet accounts for 60 per cent of the catch, the longline for 38 per cent and the trollingline for the rest. In terms of value, however, the longline is more important *(54%)*than the driftnet *(45%)* because of the higher shark prices (See Figure 3).

Fig. 3 SRL-15 II — Weight and value of catch by type of gear, Chinnamuttam



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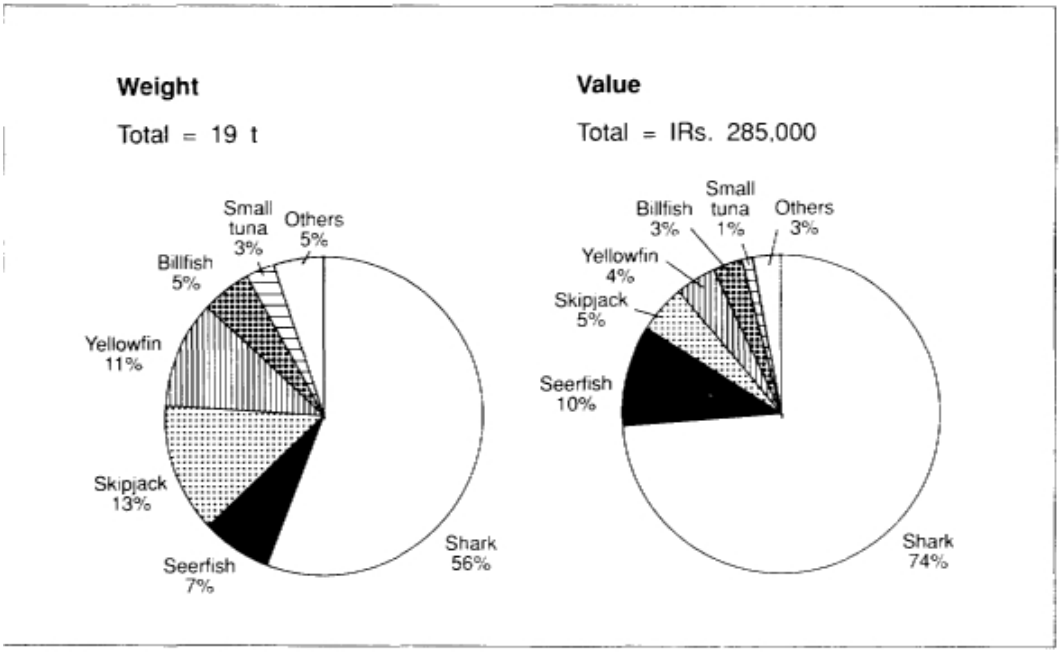
The dominant species caught was shark, which accounted for 56 per cent by weight and 74 per cent by value. The corresponding figures for tuna species were 27 per cent and 10 per cent and for seerfish 7 per cent and 10 per cent (See Figure 4). The seerfish was the dominant species in the previous year in terms of weight (28%) and value (48°/a). There was, thus, a significant change in the catch composition between the two years due to greater use of longlines.

Fig. 4 SRL-15 II — Weight and value of catch by species, Chinnamuttam



Between the two years 1990/91 and 1991/92 the catch rate for driftnets has come down by some 30 per cent and that for longlines has increased by 65 per cent. The main reason is the changed fishing pattern, with higher emphasis on longline fishing for shark.

The monthly average catch rates, expressed in kg per fishing day, were as follows

itol*onth*	*Sep*	*Oct*	*'Oat*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*A* cg
Driftnet 99192	110	29	89	173	77	83	62	33	(43	93
1990/ 91	(281)	(170)	(144)	(44)	(61)	(93)	(65)	(87)	(125)	(133)
Drift-longline 99192	—	85	84	0	47	90	181	67	04	98
199091	—	(14)	(19)	(18)	(11)	(68)	(16)	(84)	(279)	(59)

One conclusion that may be drawn regarding the seasonal variations is that the period December-April is lean for driftnetting. The lengline catches are also low in December, but vary a lot during the other months.

2.3 *Economics*

The average monthly revenue during the nine-month trial period was Rs 31,700. Since Jun-Aug were fairly good months in the previous year (See Figure 2), it is considered safe to assume that the average figure will be valid for the whole year. The yearly revenue would, therefore, be Rs. 380,000. The actual prices obtained per kg for different species are given alongside.

Seerfish	Rs, 2050
Shark	20.10
Billfish	1018
Others	7.45
Skipjack	5.70
Yellowfin	5.27
Small tuna	4.20

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In 1991, the estimated total investment cost of the SRL-15 type of boat was Rs 460,500. It was based on a hull constructed in India, fitted with an Indian-made 29 hp engine and equipped with locally available fishing gear. The breakdown was as alongside.

		Inilial Cost Rs	Depreciation (Ye)	Depredation Ru
Hull and fittings		290,000	16	18,125
Diesel engine		90,000	8	11,250
Fishing gear		80,500	4	20,125
20 driftnets	72,000			
20 longlines (sets)	8,000			
4 irollinglines	500			
Total		460,500		49,500

The annual fixed costs are, therefore, Rs. 49,500 plus Rs. 13,000 for insurance — in total, Rs. 62,500.

The variable costs were recorded during the trials and have been extrapolated over a twelve-month period. The amount is listed alongside.

Fuel	45,900
Food	18,200
Ice	9,500
Misc,	9,200
Sub total	82,800
Crew	118,900
Repair/mainE,	20,000
Total	221,700

The total annual cost is therefore Rs. 284,200 (221,700 + 62,500), leaving a profit of Rs. 95,000. This corresponds to a return on investment of 21 per cent.

It can, therefore, be concluded that the fishing trials have successfully demonstrated the economic viability of offshore fishing for large pelagic species by small boats in the Chinnamuttam area.

- 40% of (380,000-82,800)

3. *TRIALS FROM MADRAS*

Period : Sept '92—May '93

Fishing area Coromandel Coast, latitude 12° — 15°. (See Figure 1)

Marketing Through public auction in Royapuram fishery harbour.

Boats Two SRL-15, I and II.

Fishing gear 10 driftnets (1000 mesh)
40 bundles of shark drift-longline of 5 hooks each
4 trollinglines

As in the trials off Chinnamuttam, the performance of the two boats was very similar and, so, only the records of SRL-15 II are presented below.

3.1 *Fishing time*

The fishing effort in terms of days per month was only 13.2 against the target of 15 (Table 3). The trips were also short, 2.4 days against 3 days per trip in Chinnamuttam.

Both the driftnets and the longlines were used on nearly all fishing days. However, only a few driftnets were used at a time, mainly to catch tuna as bait for the longlines.

Table 3 : SRL.15 II: Record of fishing time, Madras

YEAR	Sep /992	Oct	Nov	Dec	Jan 1993	Feb	Mar	Apr	May	TOTAL
Fishing trips (no)	6	6	8	6	5	5	6	3	4	49
FISHING TIME (days)										
Driftnets	14	11	13	11	17	17	17	12	11	119
Drift-longlines	16	13	8	10	17	17	17	12	Ii	117
Trollingllines	11	13	13	11	17	17	17	12	II	118
FISHING TIME (hours)										
Driftnets	142	119	134	129	179	136	171	105	99	1214
Drift-longlines	236	183	114	142	249	192	253	165	151	1685
Trollinglines	38	59	57	5!	65	56	86	56	56	524

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3.2 *Catches*

The total catch during nine months was 12.9 t valued at Rs. 221,000. The monthly average was therefore only 1.4 t.

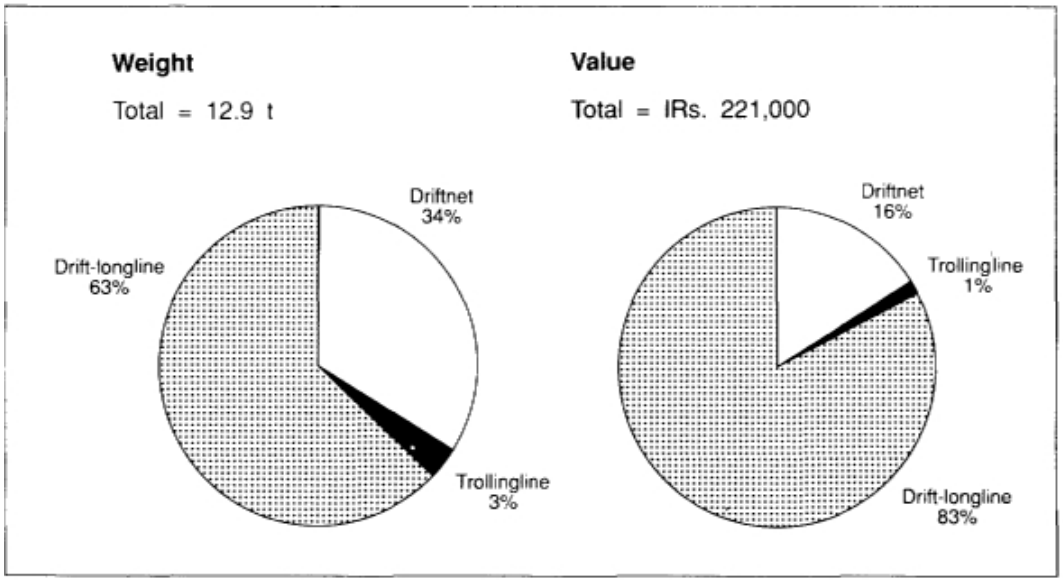
Table 4 : Monthly catch by fishing gear and species, Madras

Month / *YEAR*		*Sep* */99/*	*Oct*	*Nov*	*Dec*	*Jan* *1992*	*Feb*	*Mar*	*Apr*	*May*	*TOTAL*
BY FISHING GEAR											
Driftnets	kg	996	545	358	674	566	79	598	233	311	4360
	Rs:	8939	4043	3923	4529	5777	469	4539	1813	2957	36989
Drift-longlines	kg:	265	553	408	865	1290	873	804	974	145	8177
	Rs:	28308	0470	7855	155585	24965	16185	47830	28165	2830	182193
Trollinglines	kg:	12	64	65	0	0	21	169	56	1	388
	Rs:	44	252	458	0	0	192	89!	280	3	2120
TOTAL	kg:	2273	1162	83!	1539	1856	973	257!	1263	457	2925
	Rs:	3729!	4765	12236	20114	30742	16846	53260	30258	5790	221302
BY SPECIES											
Small tuna	kg:	8	10	26	77	2	2	72	16	110	333
	Rs:	24	30	93	234	6	36	245	48	595	1311
Yellowfin	kg:	87	116	182	28	59	167	58	125	0	822
	Rs:	420	1005	1745	200	516	1150	390	760	0	6186
Skipjack	kg:	475	131	179	477	202	58	306	97	10	2015
	Rs:	1588	519	1576	3100	1010	290	1800	485	50	10418
Shark	kg:	1488	476	342	814	1507	704	1673	873	240	8117
	Rs:	34249	10750	7775	15500	28575	15075	46870	27595	4660	91049
Billfish	kg:	190	298	54	128	80	23	342	107	0	1222
	Rs:	850	2105	390	910	495	145	1380	730	0	9005
Others	kg:	25	131	48	15	6	9	40	45	97	416
	Rs:	160	356	657	70	40	150	575	640	485	3333
TOTAL	kg:	2273	1162	831	1539	1856	973	2571	1263	457	12925
	Rs:	37291	14765	12236	20114	30742	6846	53260	30258	5790	221302

The highest catches were recorded in March, but there was also a lower peak in September. With only nine months of operation in a single year, it is not possible to conclude anything about seasonal variations.

In terms of weight, more than half the catch (63%) came from the drift-longlines, because of the emphasis on capture of shark which would fetch the best market prices. Forty bundles of drift-longlines were used most of the time. Only two pieces of driftnets were used, primarily to catch fish for bait. Another reason for the limited use of driftnets was the persistent presence of big skates resulting in loss of fishing gear. Value-wise, the longline contributed 83 per cent (See Figure 5).

Fig. 5 SRL-15 II – Weight and value of catch by type of gear, Madras



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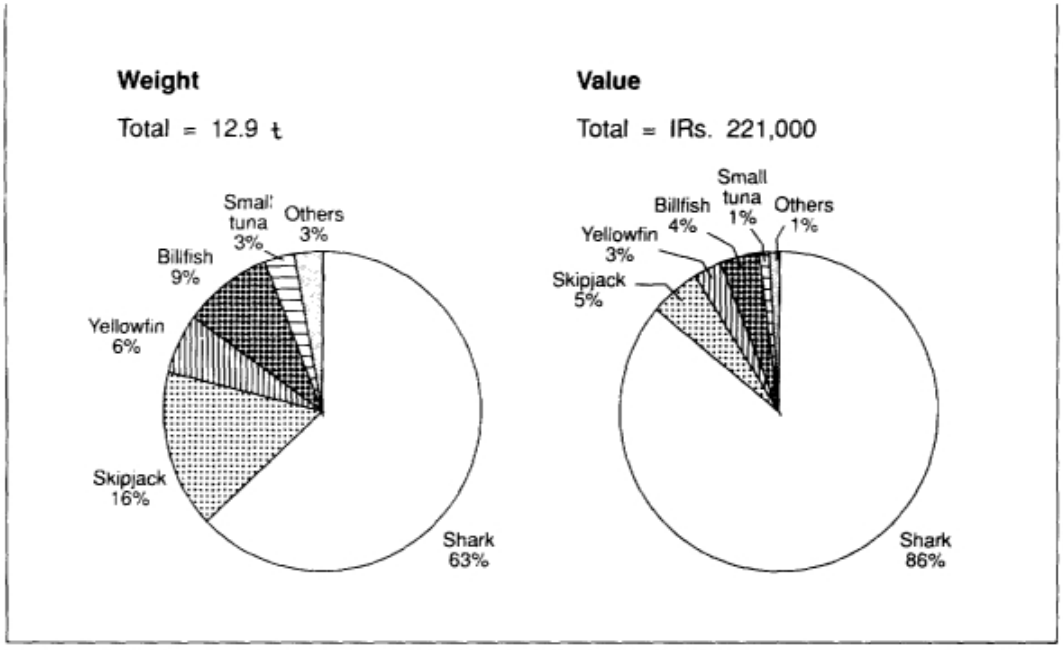
Shark was the dominant species, accounting for 63 per cent of the catch. Skipjack was 16 per cent of the catch, and bilifish 9 per cent, the rest being shared by various species, including seerfish. Unlike in the southern area, seerfish was not targeted and was only caught in small quantities, by trollingline to and from the fishing area (see Figure 6).

Because of its relatively high market price (22 Rs./kg) shark was, by value, still more dominant and represented 86 per cent of the total earnings.

Fig. 6 SRL-15 II – Weight and value of catch by species, Madras



The monthly average catch rate, kg/day, for driftnets and drift-longlines of the boats were as follows:

Month	*Sept*	Oct	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Aug*	*Avg.*
Driftnets	42	41	27	100	36	10	52	23	20	38	38
Drift-longlines	59	37	52	90	48	60	105	63	15	62	59

While a fleet of 1.8 km of nets was used daily in Chinnamuttam, only a few hundred metres of driftnets were used on the Coromandel Coast because there was the risk of losing fishing gear due to skates; hence the low catch rates for driftnets.

Big skates were found in large numbers in the offshore areas covered by the SRL-15 boats during the whole period of the trials and caused a fear of loss of fishing gear, particularly of the driftnet in which large fish get very easily entangled. Large skates entangled in driftnets often result in partial or total loss of the fishing gear or crushing of tuna species.

At the early stage of the fishing operation, crushing of tuna, due to entanglement of large skates, and loss of driftnets and drift-longlines to a value of Rs. 48,000 were experienced. A full-scale operation of a regular fleet of driftnets *(1.5 – 2* km) was found too risky. This was an unusual phenomenon, found not only in Tamil Nadu but also on the Andhra Pradesh coast.

The geographical coverage was restricted to 50 n miles from shore and no area with noticeably better fishing opportunity could be identified. Much more commercial fishing operations are required to define the best pattern of fishing as to geographical area and seasonal variations.

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3.3 *Marketing*

The catches were disposed of through auction at Royapuram harbour as well as through a wholesale agent at the Saidapet market to identify the best marketing channels. After two months of sales at both places, no significantly higher prices were realized for most of the species in Saidapet market, so that, after payment for the handling and transport, there was not sufficient incentive for catches to be taken to it. The sale commission of the auction was also the same in Saidapet and Royapuram. And as regards shark, the main target species, except for tiger shark, all other shark species realized better prices at Royapuram harbour. Selling fish to Saidapet market was, therefore, abandoned.

Table 5 below gives the monthly selling price of fish for the two boats at Royapuram harbour through public auction.

Table 5 : **Monthly** average **selling price of fish at Royapuram harbour in IRs.**

Month / *YEAR*	*Sept* / *1992*	*Oct*	Nov	Dec	Jan / *1993*	Feb	Mar	Apr	May	Avg.
I. Small tuna	3.00	3.16	33.25	3.36	3.00	3.00	3.38	3.00	3,95	3.23
2. Yel]c'vfin	4.4!	7.6!	8.4!	7.57	7.52	7.28	6.85	7.79	—	7.05
3. Skipjack	3.65	33.9!	6.19	6.40	5.00	5.00	5.23	5.00	5.00	5.04
4. Shark	20.53	19.22	19.86	19.14	20.06	20.05	25.94	30.80	21.08	21.90
5. Billfish	3.73	5.22	7.22	6.96	6.70	6.44	8.41	6.02	9.00	6.23
6. Seerfiih	18.12	—	25.69	23.37	—	—	20.66	—		21.96
7. Others	5.76	10.35	8.29	13.73	19.66	16.14	8.85	17.40	13.59	12.64

The supply and demand market force did not seem to influence the price of fish during the whole period. The price of most offshore species remained more or less at the same level. Tuna and billfish species fetched the lowest prices. As regards shark, the prices were good throughout the period because the demand far exceeded the supply. It is a demand market because there is a good export of finfish besides a market for salted shark meat in Kerala.

3.4 *Economics*

Based on the period of fishing operation for which data were available and on the assumption that the catch value for the months of June, July and August would be the average of the catch values of September-May, the catch value for a full year of SRL-15 operation would be IRs 295,000. The variable operational expenses incurred during the trials were recorded and are given in Table 6.

Table 6 : **Variable operational** costs **in IRs**

Month / YEAR	*Sept* / *1992*	*Oct*	*Nov*	*Dec*	*Jan* / 1993	*Feb*	*Mar*	*Apr*	*May*	*TOTAL*
Fuel	3613	3836	4311	4388	2626	3766	4768	3524	2730	33562
Lub oil	0	0	440	225	235	854	0	900	300	2954
Food	2912	3075	2376	2665	2745	2500	2517	1490	1860	22140
Bait	3040	2882	1329	1700	3427	3813	2090	1843	1635	21759
Ice	218	1820	990	1430	1180	825	1155	825	770	11513
Others	2356	223!	1600	1376	2351	662	1504	2006	757	17843
Total	14439	13844	11046	11784	12564	13420	14034	10588	8052	109771

Based on the above data, the variable operational costs for a full year would be IRs 146,000.

The crew share is 40 per cent of the gross revenue after deduction of the operational costs, *i.e.* of Rs 149,000 (295,000 – 146,000), and amounts to Rs 59,000.

The **maintenance costs** during the trial period were Rs 4,558 only, probably because the boat was in perfect condition at the start. The yearly costs are estimated at Rs 20,000.

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***Top:** An SRL-15's shark catch in Chinnamuttam*

***Above:** Catch being loaded for transport to wholesaler*

***Right:** Catch being weighed at wholesaler's in Chinnamuttam*

in 1992, the total investment cost of an SRL-15, if built in India and fitted with a locally manufactured engine and equipped with gear purchased locally, was estimated as follows

		Investment (Rs)	*Depreciation (yr)*	*Annual cost (Rs)*
Hull and equipment		***325,000***	**16**	20,300
29 hp diesel engine		105,000	8	13,125
Fishing gear		78,000	*4*	*19,500*
10 driftnets	48,000			
40 **bundles of drift-longlines**	29,000			
4 trollinglines	1,000			
		508,000		52,925

The total cost picture is therefore

Depreciation	53,000
Insurance	14,000
Operational costs	146,000
Maintenance	20,000
Crew	60,000
Total	293,000

Since the total costs amount to about the same as the gross revenue, the fishing operations were not economically viable. In order to attain a rate of return on investment of, say, 15-20 per cent, the catch, assuming similar species composition, would have to be about 30 per cent higher *i.e.* 1.8 t per month.

PUBLICATIONS OF THE BA Y OF BENGAL PROGRAMME (BOBP)

The BOBP brings out the following types of publications:

Reports (BOBP/REP/...) which describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

Working Papers (BOBP/WP/...) which are progress reports that discuss the findings of ongoing work.

Manuals and Guides (BOBP/MAG/. .) which are instructional documents for specific audiences.

Information Documents (BOBP/INF/...) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters (Bay of Bengal News) which are issued quarterly and which contain illustrated articles and features in nontechnical style on BOBP work and related subjects.

Other publications which include books and other miscellaneous reports.

Those marked with an asterisk (*) are out of stock but photocopies can be supplied.

Reports (BOBP/REP/...)

32.* *Bank Credit for Artisanal Marine Fisherfolk of Orissa, India.* U. Tietze. (Madras, 1987.)

33. *Nonformal Primary Education for Children of Marine Fisherfolk in Orissa, India.* U. Tietze, N. Ray. (Madras, 1987.)

34. *The Coastal Set Bagnet Fishery of Bangladesh — Fishing Trials and Investigations. S.* E. Akerman. (Madras, 1986.)

35. *Brackishwater Shrimp Culture Demonstration in Bangladesh.* M. Karim. (Madras, 1986.)

36. *Hilsa Investigations in Bangladesh.* (Colombo, 1987.)

37. *High-Opening Bottom Trawling in Tamil Nadu, Gujarat and Orissa, India: A Summary of Effort and Impact.* **(Madras,** 1987.)

38. *Report of the Eleventh Meeting of the Advisory Committee,* Bangkok, Thailand, 26-28 March, 1987. (Madras, 1987.)

39. *Investigations on the Mackerel and Scad Resources of the Malacca Straits.* (Colombo, 1987.)

40. *Tuna in the Andaman Sea.* (Colombo, 1987.)

41. *Studies of the Tuna Resource in the EEZs of Shri Lanka and Maldives.* (Colombo, 1988.)

42. *Report of the Twelfth Meeting of the Advisory Committee.* Bhubaneswar, India, 12-15 January 1988. (Madras, 1988.)

43. *Report of the Thirteenth Meeting of the Advisory Committee.* Penang, Malaysia, 26-28 January, 1989. (Madras, 1989.)

44. *Report of the Fourteenth Meeting of the Advisory Committee.* Medan, Indonesia, 22-25 January, 1990. (Madras, 1990.)

45. *Gracilaria Production and Utilization in the Bay of Bengal Region: Report of a seminar held in Songkhla, Thailand,* 23-27 October 1989. (Madras, 1990.)

46. ***Exploratory Fishing for Large Pelagic Species in the** Maldives.* R.C.Anderson, A.Waheed, (Madras, 1990.)

47. *Exploratory Fishing for Large Pelagic Species in Shri Lanka.* R Maldeniya, *S.* L. Suraweera. **(Madras,** 1991.)

48. *Report of the Fifteenth Meeting of the Advisory Committee.* Colombo, Shri **Lanka,** 28-30 January 1991. (Madras, 1991.)

49. *Introduction of New Small Fishing Craft in Kerala, India.* O. Gulbrandsen and M. R. Anderson. (Madras, 1992.)

50. *Report of the Sixteenth Meeting of the Advisory Committee.* Phuket, Thailand, 20-23 January 1992. (Madras, 1992.)

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52. *Feeds for Artisanal Shrimp Culture in India — Their Development and Evaluation.* J F Wood et al. (Madras, 1992.)

53. *A Radio Programme for Fisherfolk in Shri Lanka.* **R** N Roy. (Madras, 1992.)

54. *Developing and Introducing a Beachlanding Craft on the East Coast of India.* V L C Pietersz. (Madras, 1993.)

55. *A Shri Lanka Credit Project to Provide Banking Services to Fisherfolk.* **C.** Fernando, **D.** Attanayake. **(Madras, 1992.)**

56. *A Study on Dolphin Catches in Shri Lanka.* L Joseph. **(Madras,** April 1993.)

57. *Introduction of New Outrigger Canoes in Indonesia.* G **Pajot,** *O* Gulbrandsen. (Madras, 1993.)

58. *Report of the Seventeenth Meeting of the Advisory committve.* **Dhaka,** Bangladesh, 6-8 April 1993. (Madras, 1993.)

59. *Report on Development of Canoes in Shri Lanka. G.* **Pajot.** *O* Gulbrandsen. (Madras, 1993.)

61. *Small Offshore Fishing Boats in Shri Lanka. G.* **Pajot. (Madras, August** 1993

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49. *Pen Culture of Shrimp by Fisherfolk: The BOBP Experience in Killai, TamilNadu, India. F.* Drewes, G. Rajappan. (Madras, 1987.)

SO. Experiences with a Manually Operated Net-Braiding Machine in Bangladesh. **B. C.** Gillgren, A. Kashem. (Madras, 1986.)

51 *Hauling Devices for Beachianding Craft.* A. Overa, P. A. Hemminghyth. (Madras, 1986.)

52. E.vperimental Culture of Seaweeds (Gracilaria *Sp.) in Penang, Malaysia.* (Based on a report by M. Doty and **J. Fisher).** (Madras, 1987.)

53. Atlas of Deep Water Dernersal Fishery Resources in the Bay of'Bengal. T. Nishida, K. Sivasubramaniam. (Colombo, 1986.)

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58. *Shrimp F,sherie.s in the Bay of Bengal.* M. Van der Knaap. (Madras, 1989.)

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60. *Pen Culture of Shrimp in Chilaw, S/in Lanka.* D. Reyntjens. (Madras, 1989.)

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63. *Shrimp Seed Collectors of Bangladesh.* (Based on a study by UBINIG.) (Madras, l990.)

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66. Improving *Marketing Conditions for Women Fish Vendors in Besant Nagar, Madras.* K. Menezes. (Madras, 1991.)

67. *Design and Trial of Ice Boxes for Use on Fishing Boats in Kakinada, India.* I.J. Clucas. (Madras, 1991.)

68. *The By-catch from Indian Shrimp Trawlers in the Bay of Bengal: The potential for its impro ved utilization.* A. Gordon. (Madras, 1991.)

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71. *Manual Boat Hauling Devices in the Maldives.* (Madras, 1992.)

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73. *Small-scale Culture of the Flat Oyster (Ostreafolium) in Pulau Langkawi, Kedah, Malaysia.* **D.** Nair, **B.** Lindeblad. (Madras, 1991.)

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75. *Fishing Trials with Beachland'ng Craft at Thiru,nullaivasal, TamilNadu, India 1989-1992.* **G.** Pajot (Madras, 1992.)

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77. *Development of Canoe Fisheries in Sumatera, Indonesia. 0.* Gulbrandsen, G. Pajot. (Madras, 1992.)

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85. *The Processing and Marketing of Anchovy in the Kanniyakumari District of South India: Scope for Development.* T. W. Bostock, M. H. Kalavathy, R. Vijaynidhi. (Madras, 1992.)

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9. *Guidelines on Fisheries Extension in the Bay of Bengal Region.* I Jungeling. (Madras, 1993.)

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14. ***Building** a Liftable Propulsion System for Small Fishing Craft — **The BOB Drive.*** O. Gulbrandsen, **M R** Andersen. **(Madras, 1993.)**

18. ***A Handbook of Oyster Culture.*** **Y.B.H. Nawawi.** (In Malay). (Madras, **1993.)**

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10. ***Bibliography on Gracilania** — Production and Utilization in the Bay of Bengal.* (Madras, 1990.)

11. *Marine Small-Scale Fisheries of West Bengal.' An Introduction.* (Madras, 1990.)

12. *The Fisherfolk of Puttalam, Chilaw, Galle and Matara — A study of the economic status of the fisherfolk of four fisheries districts in Shni Lanka.* (Madras, 1991.)

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NOTE:

Apart from these publications, the BOBP has brought out several folders, leaflets, posters etc., as part of its extension activities. These include Post-Harvest Fisheries folders in English and in some South Indian languages on anchovy drying, insulated fish boxes, fish containers, ice boxes the use of ice etc. Several unpublished reports connected with BOBP's activities over the years are also available in its Library.

For further information contact:

The Bay of Bengal Programme, Post Bag No. *1054,* Madras 600 018, India.
Cable : BAYFISH Telex: 41-8311 BOBP Fax: 044-836102
Telephone: 836294, 836096, 836188

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