



BAY OF BENGAL PROGRAMME
DEVELOPMENT OF SMALL-SCALE FISHERIES



FURTHER TRIALS OF MECHANISED TRAWLING FOR
FOOD FISH IN TAMILNADU

BOBP/WP/20

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This document describes the aims, scope and results of experiments conducted with high-opening bottom trawls in Palk Bay and Gulf of Mannar, and off the Coromandel Coast, from July 1980 to May 1981 (An earlier paper, BOBP/WP/10, described experiments conducted during March-July 1980).

The experiments were carried out jointly by the FAO/SIDA Bay of Bengal Programme and the Directorate of Fisheries, Tamil Nadu. The BOBP provided the services of a fishing technologist, G. Pajot, and a consultant masterfisherman, John Crockett. On behalf of the Government of Tamil Nadu, two officials—S. Pandurangan and P. V. Ramamoorthy—served as counterparts.

The BOBP is a regional fisheries programme executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Swedish International Authority. It covers five countries bordering the Bay of Bengal – Bangladesh, India, Malaysia, Sri Lanka and Thailand. Its main aims are to develop, demonstrate and promote appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk and the supply of fish from the small sector in the five membercountries.

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

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1. INTRODUCTION

The prawn fishery is the basis for a lucrative export trade in Tamil Nadu and other maritime states of India. More and more capital has been invested in trawlers with the result that the catch rates have declined and are uneconomic except during the short, peak prawn season. At best, prawn trawling with motorized boats is feasible only during a season of 3—4 months. For the rest of the year these vessels must either move to other fishing grounds at considerable distances from the home base, or resort to catching fish with trawls not suitable for this purpose. In some areas, the prawn trawlers are laid up during the off-season.

It would therefore be desirable to re-deploy some of the inshore trawlers on to fishing the supposedly under-exploited food fish resources. Given the nature of the under-exploited stocks, broadly similar methods of capture could be used, such as high-opening bottom and mid-water trawling, for which the existing vessels could be employed.

Thus, when the Bay of Bengal Programme, in cooperation with the Tamil Nadu Directorate of Fisheries, set out to identify opportunities for diversifying the activities of the prawn trawler fleet, their efforts were concentrated upon ascertaining the potential of two-boat and one-boat high-opening bottom trawls. A series of fishing trials were carried out from February 1980 to July 1980 and are described in a previous working paper (BOBP/WP/10, October 1980). The findings were encouraging enough to justify further trials. These further trials are described in the present working paper. They were carried out over a period of 11 months from July 1980 to May 1981 in certain delimited areas of the Gulf of Mannar and Palk Bay, and off the Coromandel Coast.

2. OBJECTIVES

The main objectives of the present series of trials were to demonstrate the possibility of diversifying the activities of the trawler fleet; and to ascertain the commercial feasibility of catching food fish with standard 32 ft. inshore trawlers. To these ends, the trials were designed to:

- Locate suitable fishing grounds in different geographical areas of the state of Tamil Nadu.
- Further develop and adapt fishing gear (trawls) and methods to specific identified resources and fishing conditions (nature of bottom, type of boat, etc.).
- Conduct demonstrations and provide in-service training for counterparts, net-makers and fishermen in the design, construction and use of fishing gear, equipment and methods.
- Further develop simple equipment and arrangements to improve fishing operations and gear handling, with regard to efficiency, safety and comfort.

The last item is reported on separately in BOBPJWP/21.

3. CONDUCT OF TRIALS

3.1 Organisation

The BOBP entered into an agreement with the Tamil Nadu Directorate of Fisheries whereby the latter were contracted to provide two standard motorized inshore trawlers, shore facilities (storage), two “counterpart” officials and crew to undertake the trials, Initially BOBP undertook

to provide the necessary equipment (echo sounder, portable two-way radio, trawl gear and accessories, and deck equipment); to supplement the proceeds of fish sale so as to cover all running expenses; and to provide consultancy services as required for the duration of the trials.

Subsequently BOBP entered into agreements with commercial fishermen who were contracted to provide standard trawlers and crew to undertake trials; in return, BOBP provided equipment, fishing gear and expertise. The commercial fishermen met all costs, i.e., wages, food, fuel and lubricants, etc. All proceeds of fish sale went to the fishermen and boat owners as compensation for services rendered. These trials were supervised and monitored by the officials of the Directorate of Fisheries with technical guidance by BOBP staff and consultants.

3.2 Boats and gear

The vessels were of local construction of standard designs commonly used for inshore trawling. The principal characteristics are:

Type	trawler
Material of construction	wood
LOA (m)	10
Beam (m)	2.90—3.50
Draught (m)	1.10—1.20
Horse power (hp)	65—75
Cruising speed (knots)	6—7

Four different types of trawls were employed during the trials:

One-boat high-opening fish-cum-shrimp trawl	(OHFS)
One-boat high-opening bottom trawl	(OH)
Two-boat high-opening bottom trawl	(TH)
Two-boat mid-water trawl	(TMW)

The main characteristics of the trawls and the time they were in use are given in the table below:

	Traditional shrimp trawl	One-boat high-opening fish-cum-shrimp trawl	High-opening bottom trawl		Two-boat mid-water trawl
			One boat	Two boats	
Mouth opening height (m)	1	3	4	6	6
Mesh size in cod end (mm)	15	30	30	25	25
Mesh size in wings (mm)	40	80	200	200	200
Cost(Rs.)	1800	3600	3500	5000	4000
Time used in trials (days)	—	60	62	206	58

Details of the four new trawls are presented in Appendices I to 4.

3.3 Operations

Trawling operations were restricted to the areas of Palk Bay, Gulf of Mannar and Coromandel Coast regularly fished by inshore trawlers and country craft (see Appendices 5 to 7). There was no real attempt to explore new grounds.

The total fishing time – when the trawl was actually towed along the sea bed – was about 950 hours.

The trawlers were based at Tuticorin in the Gulf of Mannar, Mandapam and Mallipatnam in Palk Bay and Madras on the Coromandel Coast. There were never more than two boats operating at any time at any location. Trawling operations were carried out only during daylight in order to reduce interference with the traditional fisheries.

The trials were conducted as much as possible along commercial lines. All fish landed was sold at fixed prices to the Tamil Nadu Fisheries Development Corporation (TNFDC), or to local buyers at fixed prices, or auctioned at current ruling market prices. This was to permit a tentative estimate to be made of the costs and earnings of commercial fishing using these gears and methods. It was felt, however, that the best prices were not always realised.

The following information was recorded for each haul: date, position, type of trawl, fishing depth, fishing time, total catch, species composition, etc. For each trip, the proceeds of sale were recorded. Data were subsequently processed and analysed by staff of the Directorate of Fisheries and the BOBP.

One of the Directorate's vessels was equipped with a new gantry as outlined in BOBP/WP/10 and fully described in BOBP/WP/21 while the others had traditional layout and gear handling equipment.

Small low-cost portable echo sounders were installed on board for depth sounding and fish finding. The transducer was fixed to a steel pipe clamped to the side of the boat.

4. TRIALS FROM TUTICORIN

Trials with a two-boat high-opening bottom trawl (TH) and a mid-water trawl (TMW) were conducted alternately 15 July–2 October 1980 and 17 November 1980–7 January 1981, and with a one-boat high-opening fish-cum-shrimp trawl (OHFS) 28 April–29 May 1981.

4.1 The TH trawl was used in 75 days during which 230 hauls were made; the actual trawling time was 273 hours. The details of the fishing operations are given in Table 1.

Although the trials were designed to simulate commercial operations, the actual trawling time (about 4 hours) was much shorter than that of commercial shrimp trawlers; they usually attain about 6 hours per day.

The average catch rate over the whole period was 101 kg/hr. with a lowest and highest monthly average of minus and plus 50% (disregarding October with only two fishing days).

The value of the landings varied considerably. The highest prices were attained in September (2.87 Rs/kg) and the lowest in January (1.15 Rs/kg). The prices are largely determined by the catch composition which is shown in Table 3. The large portion of high-value species like perches in the July–November period accounts for the higher prices.

The performance during the months of July, August and September suggests that fully commercial operations with TH trawls would have been economically viable. At 6 hours trawling per day the gross earnings would amount to Rs. 1,470 per day. The total costs including those of capital are estimated at Rs. 1,260 for a pair of boats. During the period November–January, however, the gross earnings (Rs. 760 per day) would not have been sufficient even to pay the operational costs estimated at Rs. 970 per day.

The performance of the boats during the July–September trials led fishermen/boat owners to experiment with two-boat high-opening bottom trawls as early as November 1980. Several fishermen made similar trawls on their own initiative. At onetime (in March 1981), about 30 boats were using various versions of the high-opening bottom trawl, fishing in pairs.

4.2 The TMW trawl was employed during 32 days in the period August 1980—January 1981. The fishing time was 81 hours during which 82 hauls were made. The details are given in Table 2.

The average catch rate was 189 kg/hr. Most of the fish caught was silver belly and sardine which have a relatively low market value. The average price attained was 0.87 Re/kg.

The results of the trials do not indicate good commercial prospects. Under fully commercial conditions the fishing time would have been longer, perhaps double, but still the economic viability is doubtful because of the low fish prices.

4.3 The OHFS trawl was tested for one month on a private boat in April/May which is the lean season as far as shrimps are concerned. 12 days of fishing resulted in 63 hours of trawling — an average of more than five hours per day. The catch rate was 117 kg/hr of fish and 2 kg/hr of shrimps, the details of which are given in Table 4. The daily average income was just over 1,000 Rs/day. Since the total daily costs including that of capital of such a boat are only 630 Rs/day the fish-cum-shrimp trawl might offer excellent commercial opportunities.

Many local boat owners/fishermen who observed the trials expressed interest in the new net, which is always a good sign of viability, and two of them were provided with nets at full cost.

5. TRIALS FROM MANDAPAM

Fishing trials with two-boat and one-boat high-opening trawls were carried out from 4th October to 28th November 1980.

5.1 The TH-trawl was used during 21 days; 59 hauls were made. The average catch rate was 151 kg/hr and the prices of fish were low, producing a meagre income. Details are given in Table 5. The catch consisted mainly of silver belly which fetches a low price (see catch composition in Table 7).

It must be concluded that TH-trawling from Mandapam during October/November is not an economic proposition. It may be mentioned though that similar trials from March to July in the same year produced excellent and commercially viable results (BOBP/WP/10).

5.2 The OH-trawling trials also produced disappointing results during 14 days of operation. The catch rate was 76 kg/hour (Table 6). The prices obtained were very low because of the high portion of silver belly in the catch (Table 7). OH-trawling from Mandapam at that time of the year also clearly seems not to be viable. As for the TH-trawl much better results were obtained earlier in the year (BOBP/WP/10).

6. TRIALS FROM MADRAS

Fishing trials with the two-boat high-opening trawl (TH) were carried out from 26 January to 5 March 1981. Only 11 fishing days were attained because one of the vessels capsized during the trials and could not be replaced for some time (Table 8).

The average catch rate was 93 kg/hr, i.e. very similar to that attained in Tuticorin. The catch contained about 25% of silver belly and several varieties of high-value species such as perches and pomfrets.

The trials were of too short a duration to draw any conclusions. But the indicative catch rates and catch composition are such that commercial operations might be viable.

7. TRIALS FROM MALLIPATNAM

Trials with three types of trawls – viz., two-boat and one-boat high-opening bottom trawls and two-boat mid-water trawl—were held from 18 March to 30 May, 1981.

7.1 The TH-trawl was used during 29 days. The average catch rate was 114 kg/hr (Table 9) which compares well with those obtained from the other bases described above. However, the price of fish is low, resulting in poor economic performance. The catch composition is given in Table 12. Even at commercial effort i.e. 6 hours trawling per day the fishing would not have been profitable. The operational costs would perhaps just have been covered.

7.2 The OH-trawl was used for 11 days only with very poor catches (Table 10). The result gives an indication of no prospects but the duration of trials was too short for any conclusions.

7.3 The TMW-trawl was employed for 26 fishing days. The catch rate was 106 kg/hr (Table 11). The price of fish, mainly consisting of sardine (Table 12), was low resulting in non-economic operations.

8. COMMENTS

With limited resources and time, it is seldom possible to conduct fishing trials on a large enough scale and over a long enough period of time in one area for the results to survive a statistical test. However, in retrospect it may be argued with reason that the efforts of the trials were too dispersed. This has to do with the design and strategy of BOBP which deals with technology development on a trial and error basis and not systematic exploratory fishing. By trying new or modified technologies at different locations and different times it is expected that some successes may emerge which can then be extended and expanded in time and space.

Because of the short duration of the trials the results are only indicative and the conclusions drawn about economic viability are only tentative. The positive or negative experiences could well be a consequence of a particular set of circumstances which is not representative over longer periods. Despite such shortcomings—both in these trials and those conducted earlier in 1980 (BOBP/WP/10)—the following general comments may be made.

- The fishing trials have confirmed that there are opportunities in some places at some seasons for increased exploitation of those less heavily fished demersal and pelagic fish stocks which are available to capture by trawling. For example, seasonally rewarding opportunities for food fishing by trawl have been identified in the Gulf of Mannar and Palk Bay.
- High-opening bottom trawls are better tools than the conventional shrimp trawl for production of food fish. Their use does not entail additional investment or operating cost, apart from the cost of the trawl net itself.
- It appears that one type of trawl will not produce the best results. The availability of different types of fishery resources varies by season and location and in order to be successful the operator may have to use alternative types of gear such as those tested by BOBP together with the traditional shrimp trawl depending on time and location.
- Re-deployment of the prawn trawling fleet into a food fish fishery is therefore possible to some extent at least. However, general acceptance of the appropriate technique will depend on the financial returns being higher than those derived from the existing shrimp fishery. Otherwise the introduction of high-opening trawling will be supplementary to shrimp trawling and will have little effect on the reduction of fishing effort on the prawn resources. Also, in the absence of reliable stock assessments, the re-deployment of shrimp trawlers on

to catching food fish must be carried out with caution and subject to management and regulation. Otherwise too high a fishing effort may be deployed, which would reduce the catches below the economical level.

- One must also bear in mind that the trials were conducted with crews not familiar with any other trawling gear than the traditional shrimp trawl. By exposure to and experience of new technologies they are bound to improve and do better than was done during these trials. This may refer particularly to mid-water trawling.

The vessels employed in the trials are in many ways obsolete. On one of them the deck machinery was modified by introducing a gantry and tiltable drum winch. This was quickly accepted by the fishermen as superior to the traditional hardware without any substantial extra costs. There are many ways by which the vessels could be improved. The stability is low (one of the boats capsized), the propulsion arrangement has low fuel efficiency and the fish preservation facilities and accommodation are poor. A vessel of improved design and construction would become somewhat more expensive but more efficient and versatile. For instance, an appropriate vessel able to stay out fishing for 2–3 days would save fuel (accounting for more than half of the operating costs) on steam between port and fishing ground and attain a much longer fishing time.

- More than a year has elapsed between the completion of trials and the publication of this report. In the meantime, extension and demonstration work on high-opening bottom trawling has been conducted at Mandapam and Tuticorin. The result is that more than 100 boats have taken up two-boat high-opening trawling and one-boat high-opening fish-cum-shrimp trawling on a seasonal basis.

Table 1

**Record of Operation of Two-Boat High-Opening Bottom Trawl
(TH) from Tuticorin, July 1980—January 1981**

Note: During the days marked () the mid-water trawl was also used, the record of which is given in Table 2.*

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>July 1980</i>								
15		3	E4	3.30	142	41	120	0.85
16		3	E2, E3	2.45	232	84	326	1.41
17		3	E5	1.00	233	233	337	1.45
18		4	E5, E6	3.15	326	100	781	2.40
19		3	E5	1.45	263	150	341	1.30
21		3	E5, E6	3.15	990	305	2713	2.74
22		3	E6, E5	3.45	395	105	1048	2.65
23		3	E5	4.15	571	134	1535	2.69
24		1	E5	1.15	387	310	995	2.57
30		2	E4, F4	3.30	156	45	97	0.62
	10	28		28.15	3695	131	8293	2.24
<i>August 1980</i>								
4		4	F4, F5	3.45	750	200	890	1.19
5*		3	F4	3.45	531	142	473	0.89
6*		2	F5	2.00	322	161	275	0.85
7		5	F5, E4, F4	5.00	620	124	819	1.32
8		5	F4, F5	5.00	867	173	1717	1.98
9		2	F4, F5	2.00	348	174	649	1.86
12		4	F4, F5	4.00	221	55	244	1.10
13		1	F5	1.00	104	104	164	1.57
14		3	F4, F5, E4	2.45	128	47	177	1.38
16		4	F4, E4, F5	3.30	238	68	666	2.80
18		5	E5, F4, E4	5.10	403	78	926	2.30
19		4	E4, F5	4.15	396	93	905	2.29
20		4	F5, E5, F4	5.00	442	88	1311	2.97
21		4	E5, E4	3.20	156	47	446	2.86
22		5	E4, E5	5.00	335	67	882	2.63
23		4	E4, F4	4.30	217	48	683	3.15
25		2	E4, E5	1.20	90	68	106	1.19
26		4	E4, F4	4.00	201	50	495	2.46
28		2	F5	1.15	153	122	479	3.13
	19	67		66.35	6522	98	12307	1.89
<i>September 1980</i>								
2		3	F5	2.30	648	259	2057	3.17
3*		1	F5	1.00	115	115	333	2.88
4*		3	E4, E5	2.45	283	103	176	0.62
5		3	E3, E4	4.45	479	101	1518	3.17
6		4	F5, F6	4.45	723	152	1732	2.39
8		4	E5, F6	5.00	686	137	2266	3.30
9		4	E5, F6	5.15	615	117	1440	2.34
10		3	F5, F6	4.45	533	112	1880	3.53
11		2	F5, E4	3.30	436	125	1346	3.10
12		3	E4, E5, F5	4.00	835	209	2006	2.40
13		3	F5	4.15	550	129	1683	3.06

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
15		6	E4, F4, F5	5.05	287	54	752	2.62
16		4	F5, F4	5.40	426	75	1441	3.38
17		3	E4, E5, F5	4.30	170	38	448	2.63
18		4	F5, F6	5.15	159	30	336	2.11
19		4	F5, F6	4.00	389	97	894	2.30
20		4	E5, F5, F6	5.15	688	131	2076	3.02
22		5	E5, F5, F6, G6	7.45	683	88	2043	2.99
23		4	E5, F5, F6, F4	6.00	422	70	856	2.03
24		5	F4, F5, F6	6.00	673	112	2100	3.12
25		4	F5, F6, G6	6.45	390	58	1069	2.74
26		4	F5, G5, G6	5.15	427	81	1339	3.14
27		3	F4, F5	5.00	411	82	1161	2.82
29		2	F4	3.30	344	98	1183	3.44
30		4	F5, F6	4.25	720	164	2510	3.49
	25	89		116.55	12092	103	34645	2.87
<i>October 1980</i>								
1		2	E4, F5	3.00	83	28	115	1.38
2		2	F5	2.30	20	8	53	2.65
	2	4		5.30	103	19	168	1.63
<i>November 1980</i>								
17		2	F5	3.15	20	6	40	2.00
18		4	E5, E6	4.00	580	145	420	0.72
20*		3	F5	4.30	57	13	157	2.75
25		3	E5, F5	3.45	269	72	991	3.68
27*		2	F5	2.45	77	28	191	2.48
	5	14		18.15	1003	55	1799	1.79
<i>December 1980</i>								
2*		2	E5	2.00	17	8	34	1.94
5		3	E4	4.15	93	22	175	1.88
23*		2	F6	2.15	195	87	240	1.23
24*		1	F6	1.00	105	105	120	1.14
27		2	E6, F6	2.30	187	75	192	1.03
29*		1	F6	1.00	195	195	150	0.77
30*		2	F6	2.30	245	98	174	0.71
31		3	E6	4.30	1947	433	2723	1.40
	8	16		20.00	2984	149	3808	1.28
<i>January 1981</i>								
1		1	E4	1.30	90	60	92	1.02
2*		2	E5, E5	2.30	88	354	128	1.45
3*		3	E5, E4	4.30	236	52	295	1.25
5*		1	E4	1.30	310	207	318	1.02
6*		1	E6	2.00	100	50	96	0.96
7*		4	F6, F5	5.00	265	53	320	1.21
	6	12		17.00	1089	64	1249	1.15
<i>Total for the Reporting Period</i>								
	75	230		272.30	27488	101	62269	2.26

Table 2

**Record of Operation of Two-Boat Mid-Water Trawl (TMW)
from Tuticorin, August 1980—January 1981**

Note: During the days marked () the high-opening bottom trawl was also used, the record of which is given in Table 1.*

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>August 1.980</i>								
5*		2	F5	1.30	189	126	148	0.78
6*		5	F5, F4	2.30	502	201	411	0.82
	2	7		4.00	691	173	559	0.81
<i>September 1980</i>								
3*		3	F5, F4	2.30	121	48	291	2.40
4*		3	E5, E4	2.00	32	16	36	1.13
	2	6		4.30	153	34	327	2.14
<i>November 1980</i>								
19		4	E5,E6	3.15	1191	366	834	0.70
20*		1	E6	0.45	62	83	44	0.71
21		6	E6,E5	4.15	972	229	979	1.00
22		5	[5	3.00	1264	421	791	0.63
24		4	E5	3.15	473	145	436	0.92
27*		2	E5	1.20	467	351	410	0.88
	6	22		15.50	4429	280	3494	0.79
<i>December 1980</i>								
1		4	E5	3.30	542	155	422	0.78
2*		1	E5	1.00	273	273	217	0.79
3		4	E5	5.45	1117	194	860	0.77
4		4	E6	5.45	1431	249	1205	0.84
6		2	E6	2.45	333	121	232	0.70
8		5	E6, F6	7.30	1173	156	1441	1.23
9		1	F6	1.15	278	222	325	1.17
11		1	E6	1.30	44	29	40	0.91
12		1	E6	1.00	80	80	70	0.87
13		1	E6	1.30	220	147	215	0.98
15		2	E5	3.30	345	99	296	0.86
16		2	E6	2.15	86	38	78	0.91

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
17		3	F6	4.30	1059	235	817	0.77
23*		2	F6	2.45	732	266	506	0.69
24*		2	F6	2.00	436	218	597	1.37
29*		1	F6	0.30	180	360	146	0.81
30*		3	E6, F6	2.00	610	305	411	0.67
	17	39		49.00	8939	182	7878	0.88
<i>January 1981</i>								
2*		2	E5	2.00	385	192	267	0.69
3*		1	E5	1.15	64	51	96	1.50
5*		1	E4	1.00	190	190	200	1.05
6*		2	E6	1.30	195	130	213	1.09
7*		2	E5	1.45	260	148	250	0.96
	5	8		7.30	1094	146	1026	0.94
<i>Total for the reporting period.'</i>								
	32	82		80.50	15306	189	13284	0.87

Table 3

Catch Composition of Two - Boat Trawling Trials from Tuticorin, July 1980—January 1981 *(In percentages)*

Type of Fish	Month Fishing Days	TYPE OF TRAWL															
		TH-Trawl							TMW-Trawl								
		July 10	Aug. 19	Sep. 25	Oct. 2	Nov. 5	Dec. 8	Jan. 6	July —	Aug. 2	Sep. 2	Oct. —	Nov. 6	Dec. 17	Jan. 5		
Silver belly	3	12	3	—	—	10	28	—	—	20	—	6	1	21
Sardine	—	—	—	—	—	34	31	—	35	—	—	48	85	44
Anchovy	—	—	—	—	—	—	—	—	13	—	—	—	—	—
Catfish	—	—	—	—	5	20	—	—	—	—	—	8	3	—
Perch	66	45	73	67	40	3	3	—	—	64	—	—	1	7
Caranx	4	7	5	6	2	—	—	—	5	—	—	—	—	—
Pomfret, Seer	—	—	4	—	—	—	1	—	—	1	—	—	—	4
Ray	9	10	12	22	—	1	30	—	5	—	—	—	—	6
Miscellaneous	18	26	3	5	53	32	7	—	42	15	—	38	10	18

[11]

Table 4

Record of Operation of One-Boat High-Opening Fish-cum-Shrimp Trawl (OHFS) from Tuticorin, April—May, 1981

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs.)	Catch		Catch rate		Sales		Sales Total (As.)
					Fish (kg)	Shrimp (kg)	Fish (kg/hr.)	Shrimp (kg/hr.)	Fish (Rs.)	Shrimp (Rs.)	
<i>Apr 11 1981</i>											
28		5	3E	6	875	8	146	1.3	925	400	1325
29		6	4E	8	1000	8	125	1.0	774	400	1174
30		4	5E	6	500	12	83	2	485	600	1085
<i>May 1981</i>											
1		4	4E	6	340	4	57	0.75	400	200	600
2		6	5E	7	600	23	86	3.25	410	1150	1560
8		3	6E	3	140	15	45	5	158	600	758
11		4	6E	5	85	13	39	2.5	194	520	714
13		2	6E	3	235	9	78	3	400	360	760
15		2	FE	4	150	7	38	1.75	185	280	465
19		2	FE	3	240	2	80	0.75	296	100	396
25		4	5E	6	920	6	153	1	1082	300	1382
29		4	5E	6	2273	12	379	2	2580	600	3180
	12	46		63	7358	119	117	1.9	7889	5510	13399

Note: This fishing trial was carried out on a private boat.

[12]

Table 5

**Record of Operation of Two-Boat High-Opening Bottom Trawl
(TH) from Mandapam, October/November 1980**

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>October 1980</i>								
4		2	K9	4.00	90	22	54	0.60
6		4	J9, K9	6.30	330	60	239	0.72
7		3	J9, K10	6.00	701	117	603	0.86
8		4	K9, L9	6.30	716	110	599	0.84
9		3	L9, M9	4.45	1213	255	570	0.47
10		2	K9	5.15	791	151	548	0.69
11		3	K9, L9	7.30	1498	200	952	0.64
13		3	L9, K9	6.00	1002	167	506	0.50
14		3	K9, L9	5.45	1125	196	572	0.51
15		3	K9, L9	5.00	626	125	284	0.45
24		3	K9, L9	5.30	1412	282	659	0.47
25		3	K9, L9	5.15	1808	344	829	0.46
27		3	K9, J9	5.45	743	129	430	0.58
28		1	J9	1.30	60	40	28	0.47
29		1	K9	2.00	86	43	40	0.47
31		2	K9, L9	3.30	292	83	177	0.40
<i>November 1980</i>								
1		3	K9, L9	5.00	662	132	362	0.55
4		3	L9, M9	5.30	1150	209	586	0.51
5		3	L9, M9	6.00	893	149	514	0.58
7		4	K9, L9	5.15	569	108	387	0.68
8		3	J9, K9	3.15	161	54	84	0.52
	21	59		105.45	15928	151	9023	0.57

Table 6
Record of Operation of One-Boat High-Opening Bottom Trawl
(OH) from Mandapam, October-November, 1980

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>October 1980</i>								
16		3	K9, L10	5.30	24	4	11	0.46
17		3	J9	5.30	246	45	180	0.73
18		3	K9, L10	6.00	426	71	228	0.53
20		2	L9, K9	6.00	767	128	336	0.44
21		3	L9	6.00	600	100	283	0.47
22		3	K9, L9	6.30	473	73	211	0.45
23		3	K9, K10	6.30	454	70	202	0.44
30		1	K9	2.00	56	28	30	0.54
<i>November 1980</i>								
3		3	K9, K10	5.30	279	51	136	0.49
10		2	J8	2.15	271	120	132	0.49
11		2	J8	2.00	96	48	42	0.44
12		1	K9	1.00	392	392	197	0.50
13		2	K7	2.30	314	126	144	0.46
28		1	E5	1.30	93	62	47	0.51
	14	32		58.45	4491	76	2179	0.48

Table 7
Catch Composition of Trawling Trials from Mandapam,
October—November, 1980

(In percentages)

Type of Fish	Type of Trawl	OH-Trawl		TH-Trawl	
	Month Fishing Days	October 8	November 6	October 16	November 5
Silver belly		84	82	66	61
Sardine		6	8	15	18
Catfish		1	1	8	5
Perch		—	1	2	—
Caranx		—	—	—	1
Pomfret, Seer		—	—	6	10
Ray		6	1	—	—
Miscellaneous		3	7	3	—

Table 8
Record of Operation of Two-Boat High-Opening Bottom Trawl (TH) from
Madras, January—March, 1981

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (kg)	Average price of landing (Rs./kg)
<i>January 1981</i>								
26		3	Q32	4.30	93	21	246	2.64
27		2	S31, R31	4.30	100	22	110	1.10
28		5	S34, R35, Q35	6.00	517	86	533	1.03
<i>February 1981</i>								
11		4	R38	4.45	734	154	1990	2.71
14		6	R35	9.30	1223	129	1882	1.54
17		4	R35	11.30	1313	239	1758	1.34
20		7	R36, R38, R34, R31	8.30	677	79	1091	1.61
23		3	R38	6.00	837	139	1594	1.90
26		4	R37, R38	8.00	859	107	1590	1.85
<i>March 1981</i>								
2		5	R31	5.30	187	34	176	0.94
5		1	R31	1.30	15	10	13	0.87
	11	44		70.15	6555	93	10983	1.68

Table 9
Record of Operation of Two-Boat High-Opening Bottom Trawl (TH)
from Mallapatnam, March—May, 1981

Note: During the days marked (), the mid-water trawl was also used, the record of which is given in Table 11.*

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hr. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>March 1981</i>								
18*		2	N13	3.00	315	105	390	1.24
19		1	N13	2.00	385	192	398	1.03
20*		2	N13	3.30	140	40	176	1.26
21		1	M12	1.30	2335	1556	2604	1.12
22*		2	M12	2.45	385	140	300	0.78
26*		2	M12, M13	3.00	138	46	226	1.64
27		1	M13	0.15	65	260	65	1.00
28*		2	N13, M13	2.45	310	113	287	0.93
30*		2	N13	3.30	245	70	170	0.69
<i>April 1981</i>								
3		3	M13	4.45	192	40	398	2.07
4		3	M13	4.30	695	154	613	0.88
6		3	N13	4.15	800	188	746	0.93
8		3	N13	5.00	298	60	401	1.34
9		3	N13	5.00	446	89	776	1.74

Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
10		3	N13	6.00	453	75	525	1.16
11		3	N13, M13	6.15	285	46	306	1.07
13		3	N13, M13	5.15	575	109	1497	2.60
14		2	M13	5.00	247	49	350	1.42
15		3	M13, M12	5.30	290	53	609	2.10
24		3	M13, N13	5.30	672	122	1345	2.00
25*		1	M13	1.30	118	79	230	1.95
26*		1	M12	2.00	128	64	188	1.47
27*		2	M12	4.00	580	137	950	1.73
28*		1	M12	2.00	295	147	302	1.02
29*		3	N13	5.30	568	103	785	1.38
30*		2	N13	3.45	359	96	319	0.89
<i>May 1981</i>								
2*		1	N13	2.00	219	109	138	0.63
25*		3	M13	5.15	670	128	601	0.90
26*		3	N14	6.30	496	76	443	0.89
	29	64		111.45	12704	114	16138	1.27

Table 10

Record of Operation of One-Boat High-Opening Bottom Trawl (OH) from Mallipatnam, April/May, 1981

Note. During the day marked (*), the mid-water trawl was also used, the record of which is given in Table 11.

Date	Fishing days (nos)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>April 1981</i>								
1		1	M13	2.30	96	38	125	1.30
2		2	M13	4.30	94	21	249	2.64
23		3	M13	5.30	130	24	169	1.30
<i>May 1981</i>								
4		2	M14	5.00	191	38	226	1.18
8		3	M12	5.30	221	40	188	0.85
9		3	M12	5.30	255	46	209	0.82
11		3	M12	5.30	270	49	281	1.04
12		2	M12	5.00	151	30	96	0.64
13		3	M12	5.30	257	47	120	0.47
14		3	M12	5.15	185	35	85	0.46
20*		2	M13	1.00	80	80	60	0.74
	11	27		50.45	1930	38	1808	0.94

Table 11

**Record of Operation of Two-Boat Mid-Water Trawl (TMW)
from Mallipatnam, March—May, 1981**

Note: During the days marked (), the high-opening bottom trawl was also used, the record of which is found in Tables 9 and 10.*

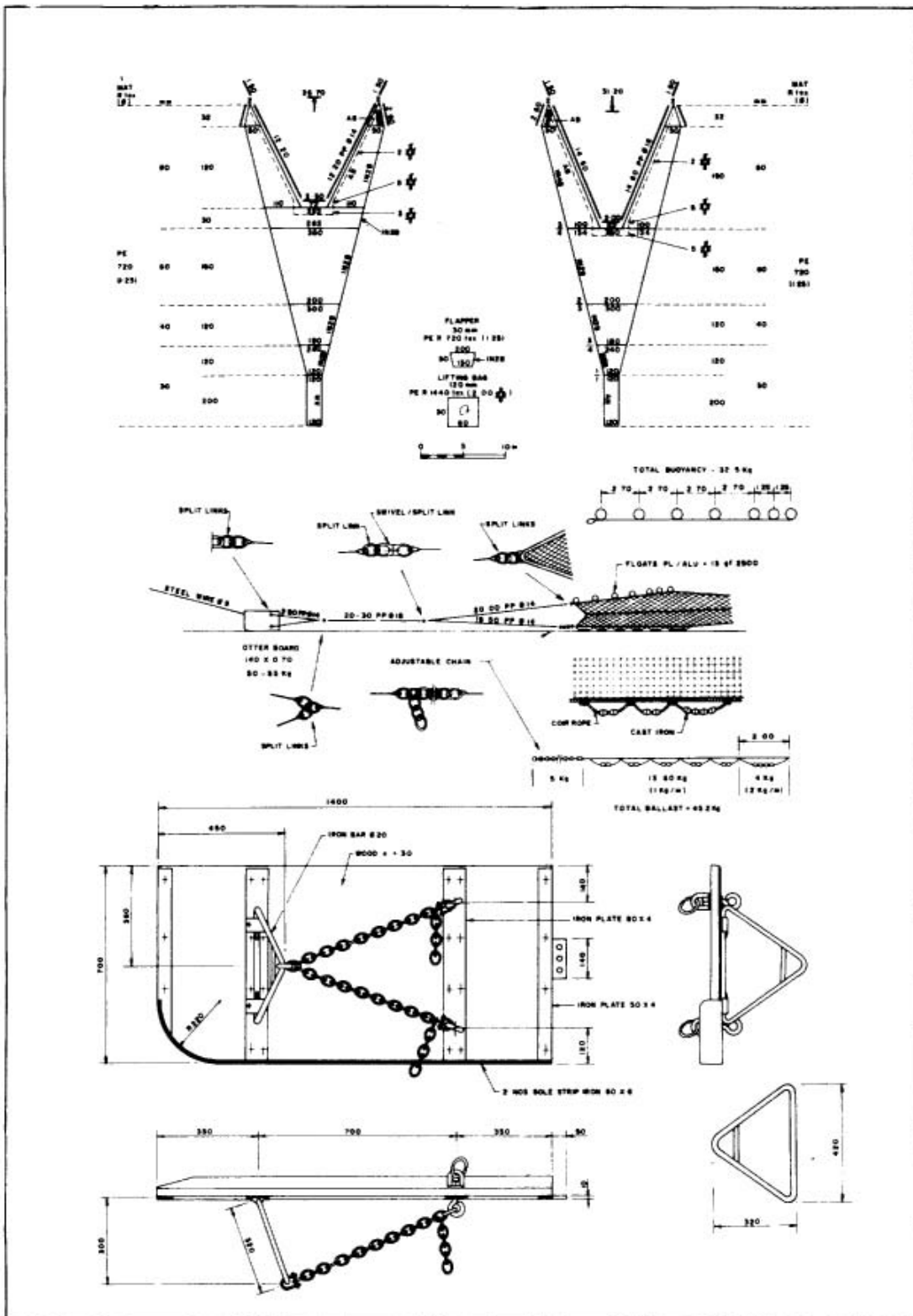
Date	Fishing days (nos.)	No. of hauls	Area (ref. map)	Fishing time (hrs. mm.)	Catch (kg)	Average catch rate (kg/hr.)	Sale value of fish (Rs.)	Average price of landing (Rs./kg)
<i>March 1981</i>								
18*		1	N13	2.00	160	80	215	1.34
20*		2	N13	1.00	145	145	151	1.04
22*		2	N12, M12	2.15	239	106	272	1.14
26*		3	N13, L13	3.30	205	59	280	1.37
28*		2	N13	3.00	218	73	260	1.19
30*		1	N13	1.15	150	120	160	1.07
<i>April 1981</i>								
25*		2	M12	3.30	787	225	1106	1.41
26*		2	M12	3.00	332	111	651	1.96
27*		1	M12	2.00	385	192	655	1.70
28*		2	M12	3.30	480	137	985	2.05
30*		1	N13	1.30	310	207	376	1.21
<i>May 1981</i>								
1		3	N13	6.30	1163	179	2094	1.80
2*		2	N13	3.30	425	121	365	0.86
5		3	M13	6.00	847	141	577	0.68
15		3	L13, M13	6.00	489	81	311	0.63
16		3	L13, M13	5.45	551	96	398	0.72
18		3	M13, M12	5.30	794	144	525	0.66
19		3	M13, M12	5.30	642	117	496	0.77
20*		2	M13, M12	4.00	285	71	161	0.56
21		3	M13, M12	6.00	490	82	368	0.75
22		3	N13	5.45	245	43	128	0.52
23		3	N13	4.30	567	126	464	0.82
27		3	N14, N13	6.30	405	62	300	0.74
28		3	N14, N13	6.15	435	70	327	0.75
29		3	M13	6.00	459	76	327	0.71
30		3	M13	6.00	450	75	351	0.78
	26	62		110.15	11658	106	12303	1.06

Table 12
Catch Composition of Trawling Trials from Mallipatnam,
March—May 1981

(In percentages)

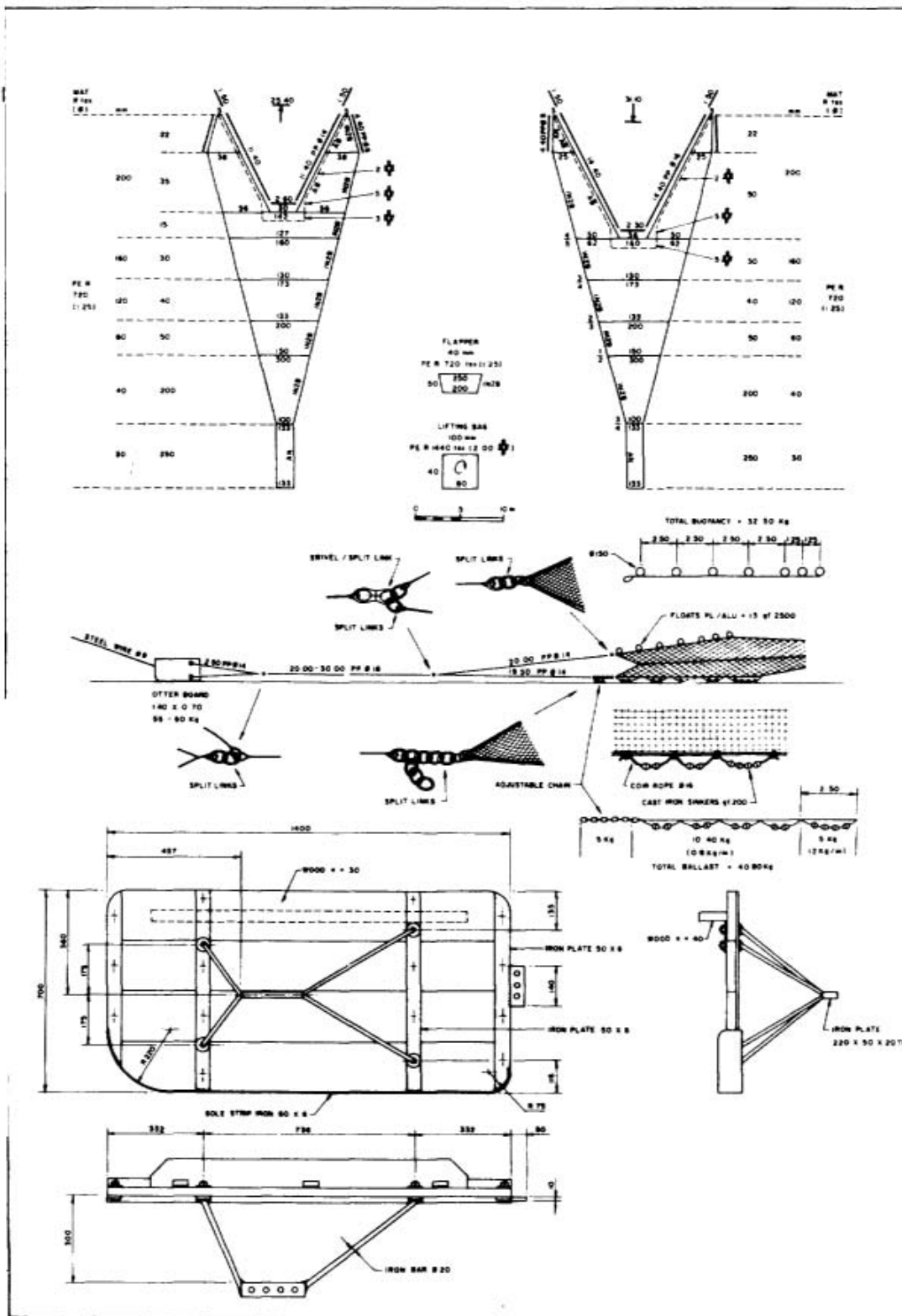
Type of Trawl	OH-Trawl			TH-Trawl			TMW-Trawl		
	March	April	May	March	April	May	March	April	May
Fishing Days		3	8	9	17	3	6	5	15
<i>Type of Fish</i>									
Silver belly		16	47	15	33	4	21	11	15
Sardine		19	5	18	16	70	66	14	52
Catfish		—	6	3	3	3	2	26	5
Perch		—	1	—	2	1			
Ca ran x						1	1	—	1
Pomfret, Seer		17	5	2	13	5	3	15	4
Ray		19	12	58	8	7	5	4	9
Miscellaneous		29	24	4	25	9	2	30	14

ONE-BOAT HIGH-OPENING FISH-CUM-SHRIMP TRAWL



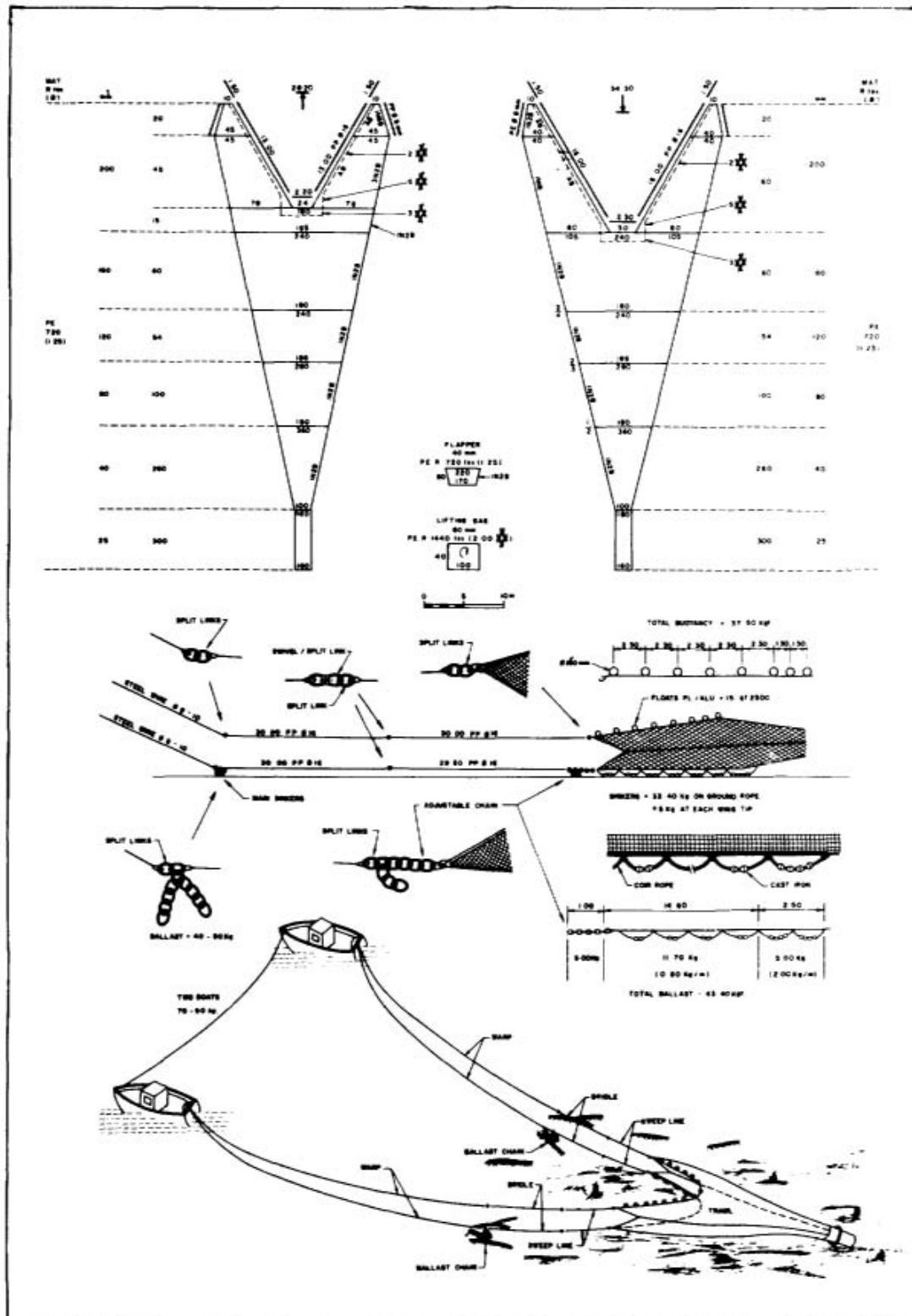
Appendix 2

ONE-BOAT HIGH-OPENING BOTTOM TRAWL

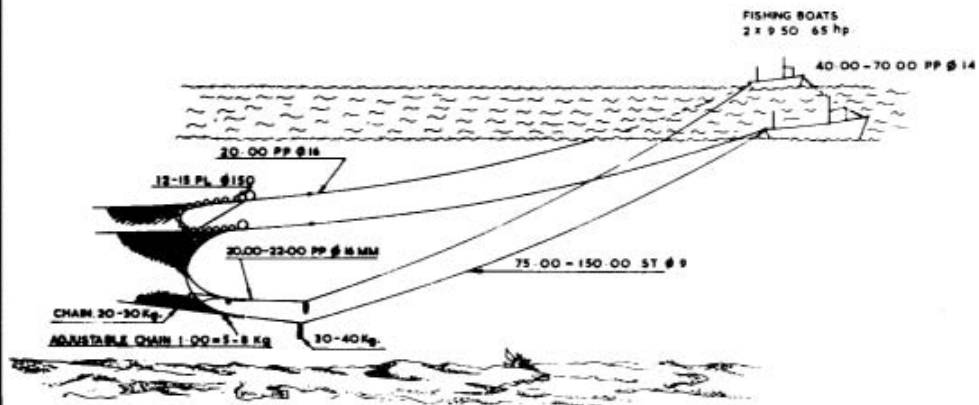
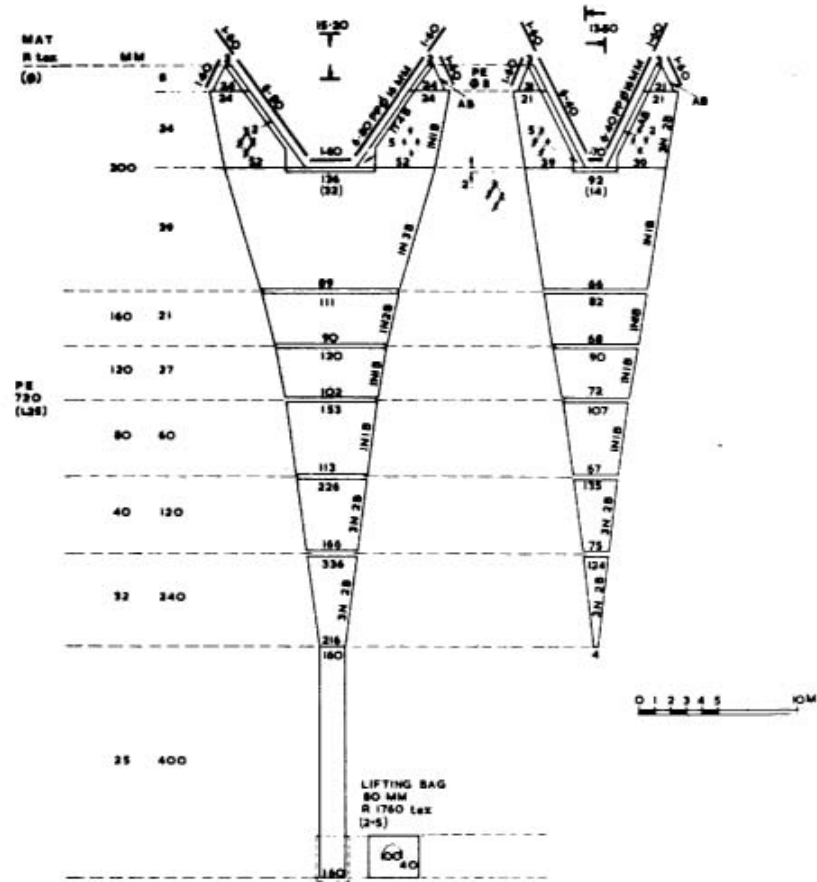


Appendix 3

TWO-BOAT HIGH-OPENING BOTTOM TRAWL

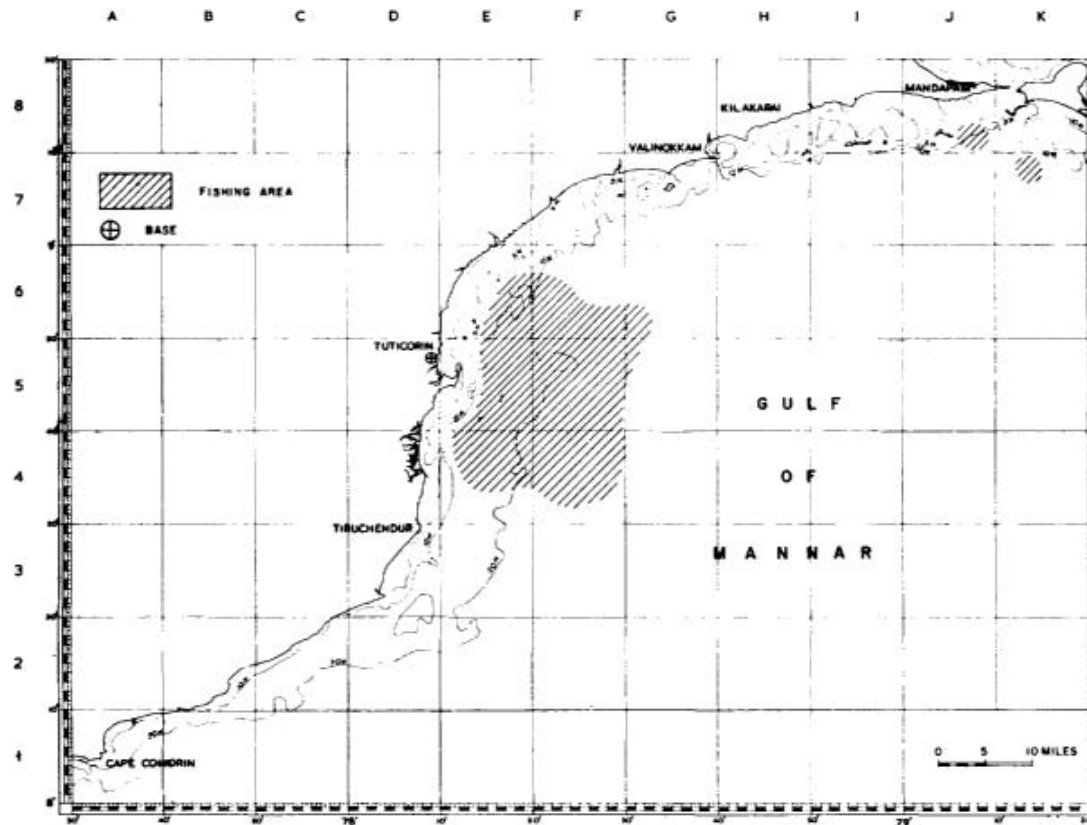


Appendix 4
TWO-BOAT MID-WATER TRAWL



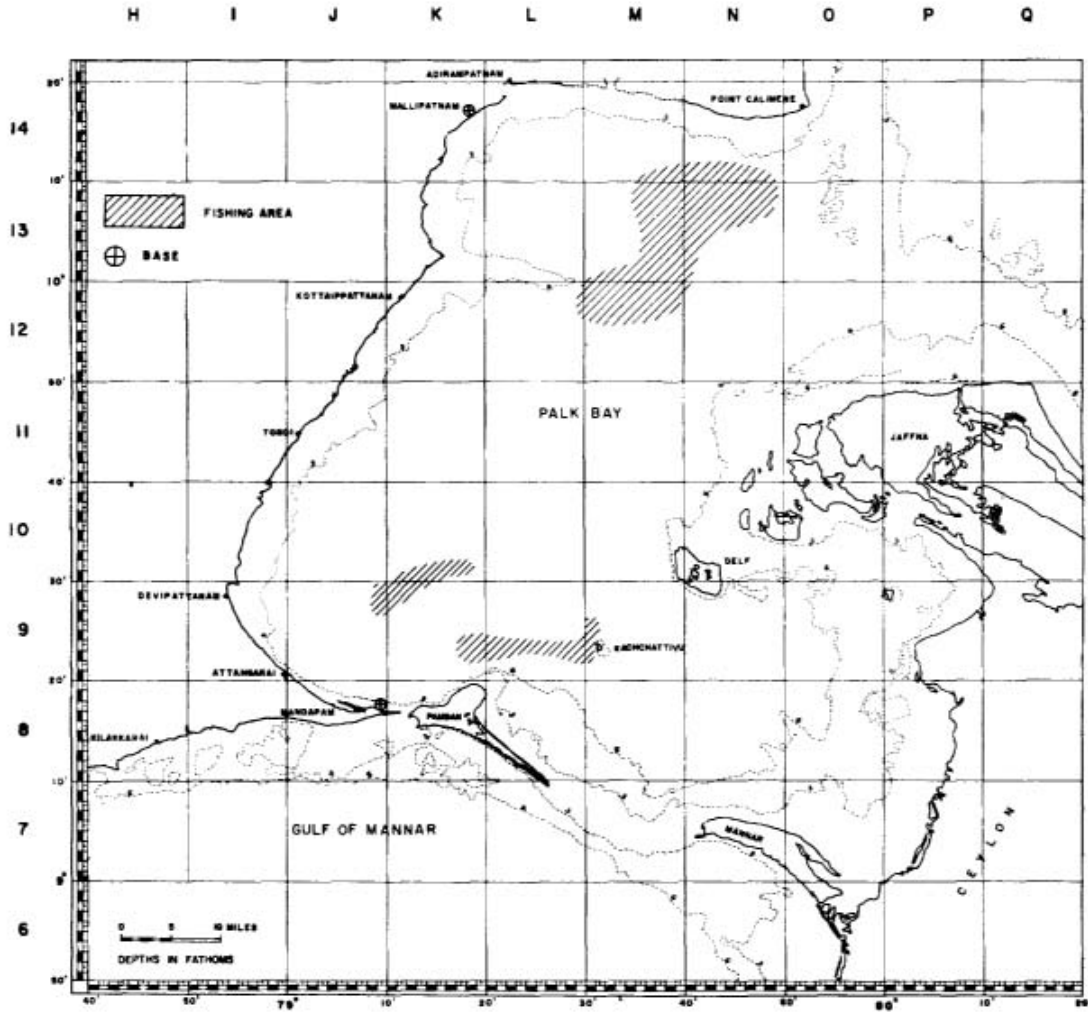
Appendix 5

LOCATION OF FISHING AREAS. GULF OF MANNAR



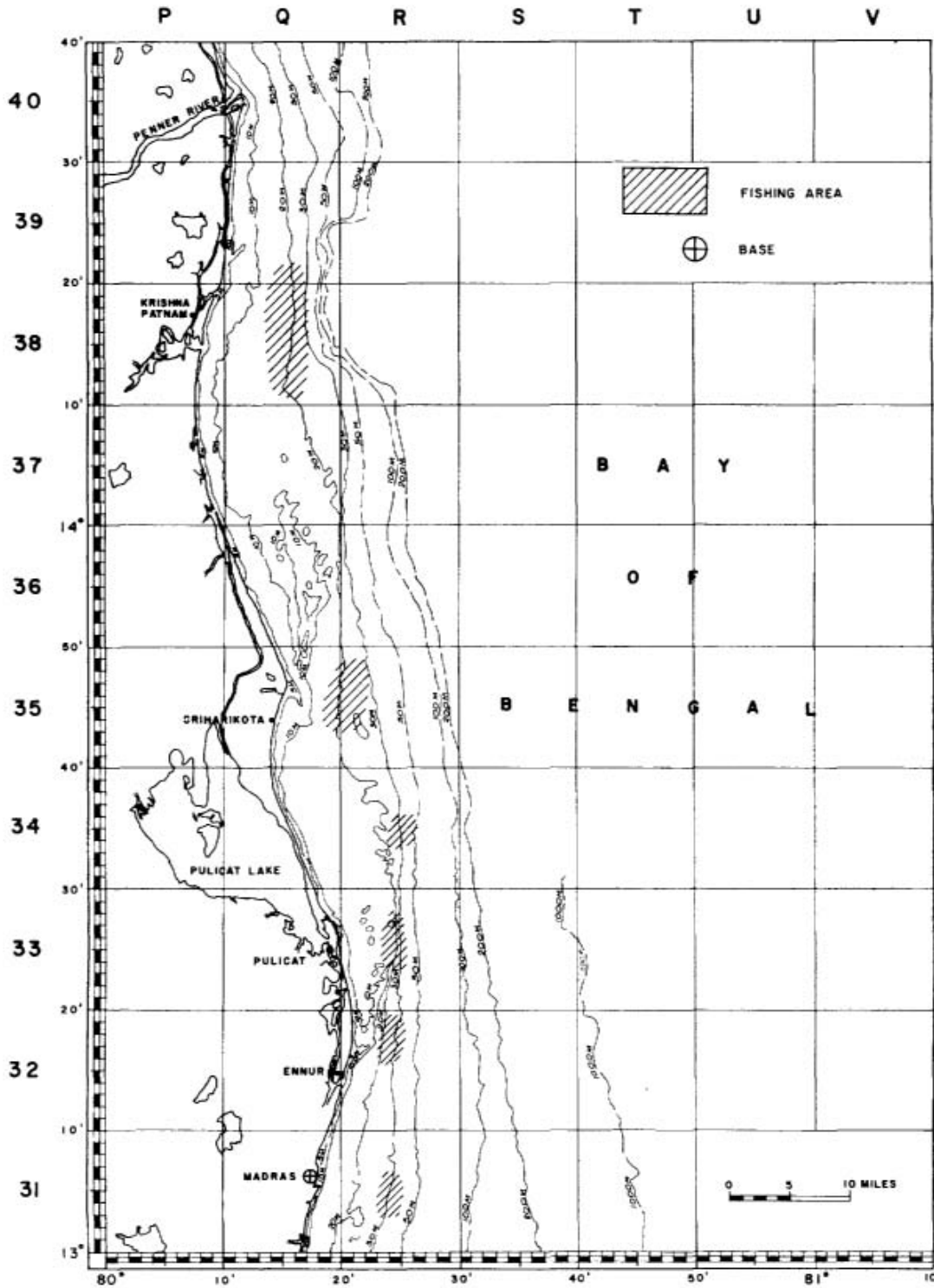
Appendix 6

LOCATION OF FISHING AREAS, PALK BAY



Appendix 7

LOCATION OF FISHING AREAS, COROMANDEL COAST



Publications of the Bay of Bengal Programme (BOBP)

Development of Small-Scale Fisheries (GCP/RAS/040/SWE)

Reports (BOBP/REP/)

1. Report of the First Meeting of the Advisory Committee.
Colombo, Sri Lanka, 28-29 October 1976.
(Published as Appendix 1 of IOFC/DEV/78/44. 1, FAO, Rome, 1978)
2. Report of the Second Meeting of the Advisory Committee.
Madras, India, 29-30 June 1977
(Published as Appendix 2 of IOFC/DEV/78/44.1, FAO, Rome, 1978)
3. Report of the Third Meeting of the Advisory Committee.
Chittagong, Bangladesh, 1-10 November 1978. Colombo, Sri Lanka, 1978.
(Reissued Madras, India, September 1980)
4. Role of Women in Small-Scale Fisheries of the Bay of Bengal.
Madras, India, October 1980.
5. Report of the Workshop on Social Feasibility in Small-Scale Fisheries Development.
Madras, India, 3-8 September 1979. Madras, India, April 1980
6. Report of the Workshop on Extension Service Requirements in Small-Scale Fisheries.
Colombo, Sri Lanka, 8-12 October 1979. Madras, India, June 1980.
7. Report of the Fourth Meeting of the Advisory Committee.
Phuket, Thailand, 27-30 November 1979. Madras, India, February 1980.
8. Pre-Feasibility Study of a Floating Fish Receiving and Distribution Unit for Dubla Char, Bangladesh. G. Eddie, M.T. Nathan. Madras, India, April 1980.
9. Report of the Training Course for Fish Marketing Personnel of Tamil Nadu.
Madras, India, 3-14 December 1979. Madras, India, September 1980.
- 10.1 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16-21 June 1980.
Volume 1 : Proceedings. Madras, India, September 1980.
- 10.2 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal, Chittagong, Bangladesh, 16-21 June 1980.
Volume 2 : Papers. Madras, India, October 1980.
11. Report of the Fifth Meeting of the Advisory Committee,
Penang, Malaysia, 4-7 November 1980. Madras, India, January 1981.
12. Report of the Training Course for Fish Marketing Personnel of Andhra Pradesh.
Hyderabad, India, 11-26 November 1980. Madras, India, September 1981.
13. Report of the Sixth Meeting of the Advisory Committee.
Colombo, Sri Lanka, 1-5 December 1981. Madras, India, February 1982.
14. Report of the First Phase of the "Aquaculture Demonstration for Small-Scale Fisheries Development Project" in Phang Nga Province, Thailand. Madras, India, March 1982.
15. Report of the Consultation-cum-Workshop on Development of Activities for Improvement of Coastal Fishing Families. Dacca, Bangladesh, October 27-November 6, 1981. Madras, India, May 1982.

Working Papers (BOBP/WP/.. ..)

1. Investment Reduction and Increase in Service Life of Kattumaram Logs.
R. Balan. Madras, India, February 1980.
2. Inventory of Kattumarams and their Fishing Gear in Andhra Pradesh and Tamil Nadu. T.R. Menon. Madras, India, October 1980.
3. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Sri Lanka.
G. Pajot. Madras, June 1980.
4. Inboard Motorisation of Small G.R.P. Boats in Sri Lanka.
Madras, India, September 1980.
5. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Bangladesh.
G. Pajot. Madras, India, September 1980.
6. Fishing Trials with Bottom-Set Longlines in Sri Lanka.
G. Pajot, K.T. Weerasooriya. Madras, India, September 1980.
7. Technical Trials of Beachcraft Prototypes in India.
Gulbrandsen, G.P. Gowing, R. Ravikumar. Madras, India, October 1980.
8. Current Knowledge of Fisheries Resources in the Shelf Area of the Bay of Bengal.
B.T. Antony Raja. Madras, India, September 1980.
9. Boatbuilding Materials for Small-Scale Fisheries in India.
Madras, India, October 1980.
10. Fishing Trials with High-Opening Bottom Trawls in Tamil Nadu, India.
G. Pajot, John Crockett. Madras, India, October 1980.
11. The Possibilities for Technical Cooperation between Developing Countries (TCDC) in Fisheries. E.H. Nichols. Madras, India, August 1981.
12. Trials in Bangladesh of Large-Mesh Driftnets of Light Construction.
G. Pajot, T.K. Das. Madras, India, October 1981.
13. Trials of Two-Boat Bottom Trawling in Bangladesh.
G. Pajot, J. Crockett. Madras, India, October 1981.
14. Three Fishing Villages in Tamil Nadu.
Edeltraud Drewes. Madras, India, February 1982.
15. Pilot Survey of Driftnet Fisheries in Bangladesh.
M. Bergstorm. Madras, India, May 1982.
16. Further Trials with Bottom Longlines in Sri Lanka. Madras, India, July 1982.
17. Exploration of the Possibilities of Coastal Aquaculture Development in Andhra Pradesh. Soleh Samsi, Sihar Siregar and Martono of the Directorate General of Fisheries, Jakarta, Indonesia. Madras, India, August 1982.
18. Review of Brackishwater Aquaculture Development in Tamil Nadu. Kasemsant Kasemsant Chalayondeja and Anant Saraya of the Department of Fisheries, Thailand. Madras, India, September 1982.
19. Coastal Village Development in Four Fishing Communities of Adirampattinam, Tamil Nadu, India. F.W. Blase. Madras, India, December 1982.
20. Further Trials of Mechanised Trawling for Food Fish in Tamil Nadu.
G. Pajot, J. Crockett, S. Pandurangan and P. V. Ramamoorthy. Madras, India, December 1982.

Miscellaneous Papers (BOBP/MIS/....)

1. **Fishermen's Cooperatives in Kerala : A Critique.**
John Kurien. Madras, India, October 1980.

Newsletter.

Bay of Bengal News. January 1981, May 1981, September 1981, December 1981,
March 1982, June 1982, September 1982, December 1982.

Information Documents . (BOBP/INF/....)

1. Women and Rural Development in the Bay of Bengal Region
Information Sources. Madras, India, February 1982.
2. **Fish Aggregation Devices : Information Sources.**
Madras, India, February 1982.