BAY OF BENGAL PROGRAMME

DEVELOPMENT OF SMALL-SCALE FISHERIES

TRIALS OF TWO-BOAT BOTTOM TRAWLING IN BANGLADESH

BOBP/WP/13

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BOBP/WP/13
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TRIALS OF TWO-BOAT BOTTOM TRAWLING IN BANGLADESH

BOBP/WP/1 3

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PREFACE

This document describes the rationale, mechanics and findings of experiments with two-boat bottom trawis in Bangladesh. The experiments were carried out between October 1980 and March 1981 near Chittagong in cooperation with the Swedish Free Mission and the Kalidaha Fishing Project of CAR ITAS.

The trials yielded the conclusion that while trawling with two-boat high-opening trawis for the capture of demersal and semi-pelagic resources is technically feasible, its commercial viability is still to be ascertained. It is recommended that the trials should be continued during next winter over a wider geographical area.

The Ministry of Fisheries and Livestock, Bangladesh, participated in the two-boat trawl project as a cooperating agency.

The two-boat bottom trawl experiments are an activity of the Programme for the Development of Small-Scale Fisheries in the Bay of Bengal, referred to in brief as the Bay of Bengal Programme. This is a regional FAO programme that seeks to develop and demonstrate appropriate technologies and methodologies in many areas of small-scale fisheries—such as craft, gear, fishing methods and utilisation and coastal aquaculture. The programme's goals are to improve the conditions of small-scale fisherfolk and the supply of fish from the small-scale sector in five countries that border the Bay of Bengal — Bangladesh, India, Malaysia, Sri Lanka and Thailand.

This document is a working paper and has not been officially cleared either by the Bangladesh Government or by the FAO.

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1. INTRODUCTION

1.1 The coastline of Bangladesh lying within Latitude 20.4 22.0°N and Longitude 85.0° 92.0°E has a continental shelf area of approximately 37,000 km² down to 50 m depth, including extensive shallow water grounds accessible to small fishing boats. Although estimates of marine fish resources vary considerably, the standing stocks of demersal fish seem to be in the range of 250,000 350,000 tonnes and of shrimp from 8,000 to 10,000 tonnes. No assessment of the pelagic resources has been made, but they are large. Total production from marine sources is estimated at 120,000 tonnes per year at present and it is believed that this figure can be considerably increased. At present about 95 per cent of the catch is taken by roughly 8,000 craft propelled by sail or oar and 1,200 motorized boats, 9-13 m in length. Fishing gears of various types and sizes are used of which the set bagnet (behundi), gillnet and bottom-set longline are the most important.

1.2 The sea areas from which much of the potential increase in catch would come are within the range of the boats operated by the local artisanal fishermen. The additional catch could be taken without resorting to the use of methods and equipment too sophisticated or expensive for these fishermen to use. At the same time, it should be possible to provide job opportunities for at least as many fishermen as at present. However, to realise the full potential, it will be necessary to employ improved methods and equipment, including methods of capture not much used at present. This will incidentally also help to increase productivity and earnings, all the more important as mechanised boats get adopted more widely.

1.3 Development work on the important traditional passive fishing gears (set bagnet and gillnets) has therefore been undertaken, but it is apparent that the introduction of appropriate active, aimed fishing methods is also desirable. Some previous experience in Bangladesh and wide experience elsewhere suggested that high-opening two-boat trawls might be particularly effective in the shallow areas where significant quantities of fish are to be found. Arrangements were therefore made by the BOBP to conduct experimental two-boat trawling in these areas, using existing mechanised boats of standard design.

2. OBJECTIVES

The trials had the following objectives:

2.1 To ascertain whether the demersal and pelagic stock could be fished by small motorized boats employing two-boat high-opening trawls.

2.2 To obtain an indication of the techno-economic feasibility of small motorized trawlers employing two-boat trawls.

2.3 In the course of carrying out fishing trials, to identify possible improvements to the fishing boats as regards fishing performance, equipment and gear handling.

2.4 During the trials, to train counterparts and fishermen in the design, construction and use of the new fishing gear, equipment and methods.

2.5 In due course and as desirable, to disseminate to local fishermen any potentially useful results obtained during the experiments, through practical demonstration and by other means.

3. PLANNING AND CONDUCT OF TRIALS

3.1 Arrangements for trials

3.1.1 Active planning began in June 1980. The Swedish Free Mission Fishing Project (SFMFP) undertook to provide two motorized fishing boats of standard design and crews. The Directorate of Fisheries provided one counterpart official and store facilities. The BOBP undertook to pay for the necessary modification of the two boats; to supplement the proceeds of fish sales if they fell short of an agreed monthly amount; to provide necessary equipment: echo sounder, short range portable radio telephone ("walkie-talkie"), trawl gear accessories. BOBP also agreed to provide consultancy services as required for the duration of the trials. The first series of trials began on 27 October 1980 and was intended to go on for six months.

3.1.2 SFMFP's two boats suffered breakdowns and operations were suspended from 1 to 17 December. Meanwhile, the BOBP were approached by the Kalidaha Fishing Project (CARITAS) in early December; they undertook to provide two motorized fishing boats of standard design and crews. The BOBP undertook to provide one high opening bottom trawl and accessories and also consultancy services for approximately one week in order to get the KFP fishing operations under way.

3.2 Boats and gear

3.2.1 The fishing boats made available by the Swedish Free Mission Fishing Project and Kalidaha Fishing Project (Appendices 1 and 2) were locally constructed by the Danish boatyard and BJMSS Ferro Cement Boatyard of Chittagong respectively and to the design commonly used for commercial gillnetting. of which the principal characteristics are:

	1	2
Type	Gilinetter	Gillnetter
Material	Wood	Ferro Cement
LOA(m)	11.50	12.00
Beam (m)	2.70	3.00
Draft (m)	0.80	1.00
Horsepower (hp) max installed	30	33
Rev/min	1500	1500
Gearratio	2:1	2:1
Cruising speed (knot) approx.	6	6

3.2.2 Small portable echo sounders for fish finding and depth measurements were fitted to the boats for the purpose of the trials.

3.2.3 Designs of trawls were selected on the basis of experience in previous fishing trials in India, Bangladesh and other similar tropical areas. Full particulars of the trawl design, the material used, their construction, rigging, etc., can be obtained from BOBP. (See also Appendices 3 and 4.) The designs were all of the two panel type, simple to construct, easy to use and adjust and particularly suited to the smooth bottom of the Bangladesh shelf.

3.3 The trials

3.3.1 Practical work began early in August 1980. The trawls were constructed at the BOBP headquarters in Madras, India and airfreighted to Chittagong, Bangladesh. The boats were made available in mid-October. The series of trials which form the principal subject of this report commenced on October 27, 1980 and continued until February 28, 1981. The SFMFP boats were initially based at Cox's Bazar, later at Chittagong.

3.3.2 Trawling operations were conducted in areas known to be good fishing grounds: there was no real attempt to explore new grounds (see Appendix 5). Except for a few occasions, fishing operations were conducted during daylight; this reduced any possible interference with the operations of the gilinets, longlines and set bagnets.

3.3.3 The trials were conducted along commercial lines to the extent that as much time as possible was spent at sea actively fishing, and catches were sold or auctioned in the normal way to local buyers at current ruling market prices. This was to allow tentative estimates to be made of the costs and earnings of commercial fishing boats using two-boat bottom trawls.

3.3.4 The following information was recorded for each haul: date, chart grid area, type of trawl, fishing depth, fishing time, total catch, species composition, etc. For each trip, total running costs and sales proceeds were recorded. Data were subsequently processed and analysed by staff of the Directorate of Fisheries and the BOB P.

4. RESULTS AND COMMENTS

4.1 Fishing operations

4.1.1 Tables 1 and 2 summarize the fishing operations with two-boat medium opening trawls and high opening trawls carried out by SFMFP and Kalidaha respectively. From 27 October to 28 February the two boats of SFMFP attained a total of 37 fishing days during which 123 hauls were made yielding a total of 21,439 kg of fish and a gross income of TK 59,091. The poor condition of the boats and engines seriously affected the conduct of the trials.

From 1 2 December to 25 February the two boats of the Kalidaha Project attained a total of 32 fishing days during which 108 hauls were made yielding a total of 14,026 kg of fish and a gross proceeds of sale of TK 76,194.

In Tables 1 and 2, the definition of fishing hours is the time for which the trawl was actually towed along the sea bed. This allows direct comparison of the intrinsic fishing performance of various designs of trawls. To arrive at catch per day on the fishing grounds, allowances have to be made for time spert shooting, hauling, mending and adjusting the trawl, and for time spent not fishing. These allowances will be substantially the same for all types of two-boat trawl used in similar conditions.

4.1.2 The catch per hour of fishing and species composition varied with the design of the trawl, its rigging, the location, the time of fishing and the season. While the catches of the high opening trawl include as much of the bottom-dwelling species (catfish, rays, etc.) as the medium opening trawl, it takes more good quality and high market value species — Indian salmon, large jew fish, etc.

4.1.3 The surveyed shelf area down to a depth of 20 metres was generally found favourable for trawling. The bottom was very even, consisting mostly of soft mud. However, the set bagnets (behundi) are dispersed over large areas of shallow waters, down to 20 metres depth, and this renders bottom trawling practically impossible in these areas because of the stakes projecting out of the sea bed.

The surface current is generally strong, reaching 3 to 4 knots. This renders bottom trawling almost impossible in any other direction than with the current. Nevertheless, the trials indicate that with the use of appropriate designs of trawl, the demersal and semi-pelagic stocks on the Bangladesh shelf can be fished by small motorized trawlers.

4.2 Economics

4.2.1 On the basis of the commercially oriented experimental work, tentative costs and earnings calculations suggest that two boats of standard design using medium and high opening bottom trawl as the prime method of capture will not pay their way. The method may however be

useful as a supplement to gillnetting. Nevertheless, boats of better design and more experienced crews would be capable of greater earnings than those enjoyed during the trials: (see 4.3.1, 4.3.3 below).

4.2.2 Although the trials were conducted along commercial lines to the extent that catches were sold or auctioned in the normal way, it was occasionally felt that the best prices were not realized specially for species such as rays, small catfish, when landed in large quantities.

4.3 Vessels and crews

4.3.1 The vessels provided were of a design widely used in the commercial gilinet fishery and adapted as simply and cheaply as possible for two-boat trawling; hauling of the gear was done by hand. In the course of the trials it became evident that the standard designs leave a lot to be desired as regards seaworthiness (freeboard), carrying capacity, propulsion gear (engine gear reduction ratio), deck layout and gear handling. These matters could be the subject of investigation.

4.3.2 The echo sounders used for ascertaining bottom depth and for fish finding during the trials were of the type that records the signals on paper as well as indicates echoes by flashes on a screen calibrated in depths. A cheaper, easy to use flashing echo sounder would be more than adequate in such shallow waters.

4.3.3 The crews of the SFMFP boats were unfamiliar with the motion and wetness of a small mechanised boat as compared with a traditional sailing craft (country boat) and were uneasy even in moderate weather. The poor condition of the boats and engines were contributory factors in the unimpressive results; a certain lack of enthusiasm is not surprising in these Circumstances.

4.4 Local expertise

The national fishing assistant attached to this project for the duration of the trials participated in the use of the fishing gear and equipment. He will require further extensive specialised training if he is to conduct further work in this field.

4.5 Local facilities

If trawling by mechanised boats were to develop, consideration would have to be given to provision of jetties for loading and unloading; and of supplies of ice, fresh water, fuel, etc.

5. **PROVISIONAL** FINDINGS AND CONCLUSIONS

Although the results outlined above do not seem very promising, any conclusions drawn at this stage can only be tentative: the trials lasted for only a few months and were more experimental than commercial. However, the following provisional conclusions seem justified:

5.1 The demersal and semi-pelagic resources available in the shallow areas of the continental shelf (down 20 metres depth) are accessible to the existing standard motorized boats using suitable two-boat high opening trawls.

5.2 Although trawling is technically feasible, its commercial viability is still to be ascertained. It seems a more effective method than the traditional fishing gearforharvesting bottom-dwelling species such as skate, rays and catfish.

5.3 Skates, rays and catfish formed by far the greatest proportion of the catch. These species at present have a very low market value in Bangladesh, being unfamiliar to the consumer.

6. RECOMMENDATIONS

6.1 Trials should be continued during the next winter season in order to:

6.1.1 extend geographical coverage and

6.1.2 provide further data on economic viability of the method.

6.2 Such trials should be conducted in combination with driftnetting trawling during the day time and driftnetting at night.

6.3 For maximising the catches of high value species and hence improving the viability of two boat trawling, the work should concentrate upon high-opening designs of trawl.

6.4 Work should be done on simple methods of improving handling and operation of fishing gear.

6.5 If seen to be justified and desirable, consideration should be given to developing an improved design of mechanised boat for trawling. In particular, it should be superior to the existing designs in the following respects:

- propulsive thrust at towing speeds (i.e. size of trawl that can be towed); fuel efficiency; endurance; seaworthiness; carrying capacity; crew accommodation; deck layout and gear handling.

Table 1

Record of fishing operations (SFMFP)

Date	Area (Ref. map)	No. of hauls	Fishing hours Hrs.Min.	Daily catch (kg)	Catch per hr. (kg)	Species or group of species										
						Cat fish	Ray	Cock-up	Bombay duck	Indian salmon	Large jew fish	Small jew fish	Red Snap-per	Porn-fret	Prawn	Mixed species
27-10-80	B8, B9	5	5.20	448	84.00	208	60	—		20	80	15	—	30	—	35
30-10-80	B8, B9	5	6.00	116	19.50	45	28	—	—	10	—	10	—	—	—	23
2-11-80	B8	1	1.30	130	86.50	100	15	—	—	—	—		—	—		15
6-11-80	A9,B9	3	5.30	640	116.50	160	450	—		—	—	—	—	—	—	30
7-11-80	A9	2	4.00	465	116.50	80	360	—	—	—		—	—	—	—	25
9-11-80	E6, E7	4	6.30	260	40.00	75	35	—	50	50	20	20	—	—	—	10
10-11-80	E7	1	2.00	302	151.00	100	—		40	60	30	40	—	—	2	30
13-11-80	B7	1	1.30	105	70.00	40	20	—	—	10	15	10	—	—	—	10
19-11-80	AIO	3	4.30	100	22.00	40	50	—	—	—	—	—	—	—	—	10
24-11-80	E8, F7	4	5.30	1598	290.00	470	245	—	—	23	190	280	—	80	—	310
28-11-80	E8, F7, F8	5	6.50	847	125.00	260	150	—	—	20	90	30	—	85	2	210
29-11-80	08, E6, E7	4	4.45	195	71.00	35	115	—	—	—	—	10	—	5	—	30
1-12-80	F7, F8	4	5.50	468	80.00	160	20	—	—	—	50	30	—	30	3	175
17-1-81	F6	4	7.30	193	25.50	40	48		80	10	—	—	—	—	4	11
18-1-81	F7	4	6.15	855	137.00	22	565	—	200	18	8	—	—	—	2	40
19-1-81	F7	1	1.15	130	104.00	25	60	—	40	—	—	—	—	—	—	5
21-1-81	E7	4	6.00	979	163.00	10	665	—	20	—	5	75	—	—	4	200
22-1 -81	E8, F8	6	9.30	771	81.00	10	240	15	50	—	65	190	—	—	1	200
23-1-81	F8	3	5.00	2860	572.00	1800	850	10	—	—	10	100	—	—	—	90
27-1 -81	G5, G6	3	5.30	235	42.50	5	130	—	25	—	—	35	—	—	—	40
28-1-81	G8	4	6.30	2465	379.00	115	130	—	—	—	90	300	—	—	—	1830

Table 1 — *(Contd.)*

Record of fishing operations (SFMFP)

Date	Area (Ref. map)	No. of hauls	Fishing hours Hrs.Min.	Daily catch (kg)	Catch per (hour (kg)	Species or group of species: Cat fish	Ray	Cock-up	Bombay duck	Indian salmon	Large Jew fish	Small jew fish	Red snap-per	Porn-fret	Prawn	Mixed species
29-1 -81	G7, G8	4	5.30	980	178.00	620	180	—		—	60	—	—	—	—	120
30-1-81	D5	2	3.30	335	95.50	100	—	28	170							37
1-2-81	05	1	0.30	—	—	—	—	—	—	—	—	—	—	—	—	10
3-2-81	E6	1	0.45	22	29.50	—	—	—	—	12	—	—	—	—	—	10
8-2-81	D6, D7	4	6.00	430	63.50	105	260	5	20	10	5	—	—	—	—	25
9-2-81	*El*	2	3.00	675	225.00	45	60	—	—	—	200	—	—	—	—	370
14-2-81	CS	3	4.45	340	71.50	255	30	—	5	30	—	—	—	—	5	15
15-2-81	C5, 05	5	6.45	179	26.50	60	10	—	55	17	—	—	—	—	5	32
16-2-81	CS, 05	2	1.00													
17-2-81	D7, E7	3	4.00	118	29.50	—	**20**	—	—	49						49
18-2-81	E7	1	0.30	15	30.00	10	—	—	—	—	27	—	—	—	—	5
21 -2-81	E7	5	8.30	678	80.00	170	175	—	70	164	27	—	—	—	2	70
22-2-81	E7	5	8.45	772	91.50	170	215	—	30	132	65	80	25	—	—	55
26-2-81	E7	4	6.15	613	97.50	75	190	—	100	65	115	—	5	—	3	60
27-2-81	E7	5	8.30	1080	127.00	5	275	—	55	90	280	200	20	—	—	155
28-2-81	E7	5	8.15	1040	108.00	225	150	—	—	130	73	20	22	—	—	420
Total for the reported period		123	183.45	21439	116.66	5640	5801	58	1010	920	1478	1445	72	230	33	4752

Table 2

Record of fishing operations (KFP)

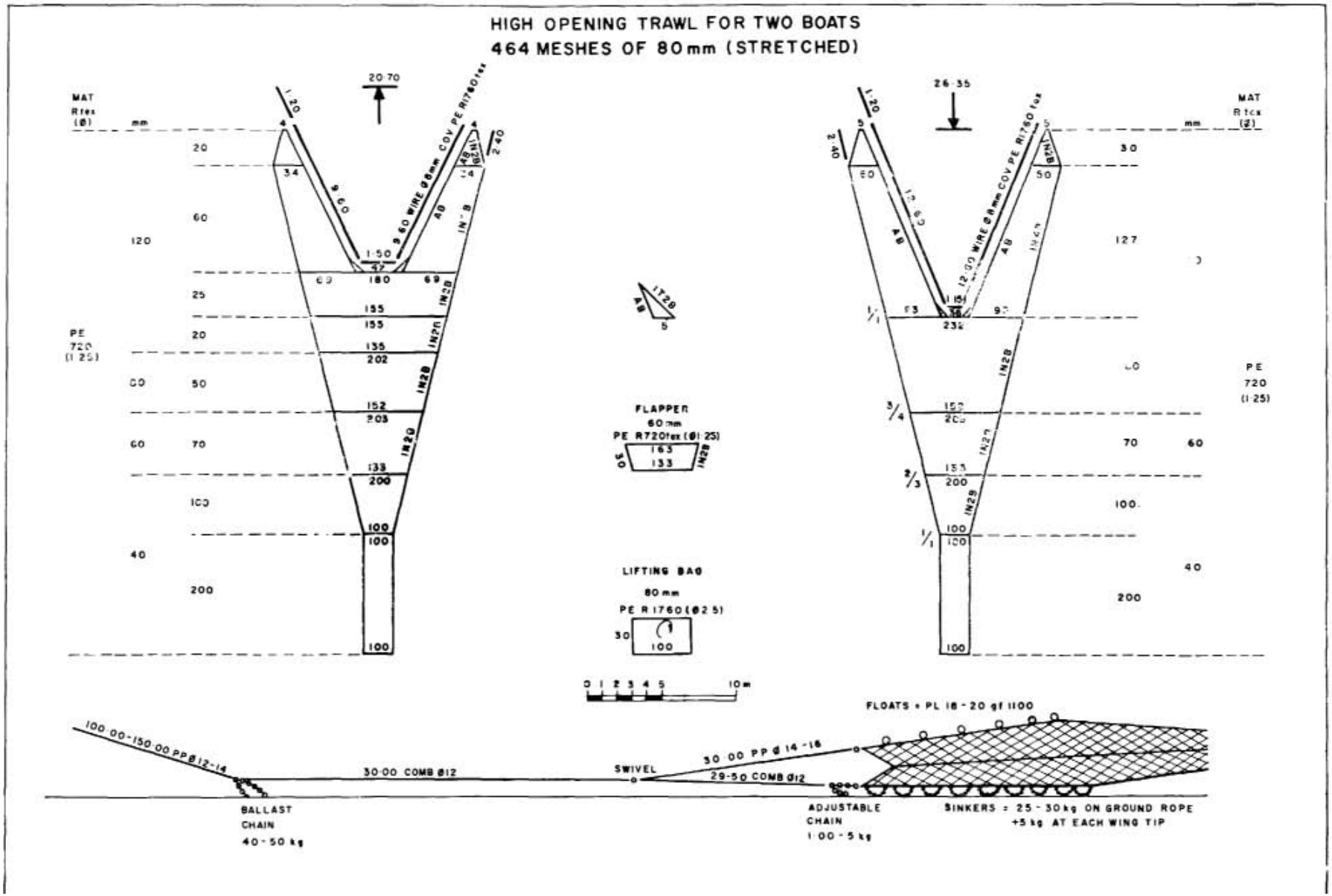
Date	Area (Ref. map)	No. of hauls	Fishing hours Hrs.Min.	Daily catch (kg)	Catch per hour (kg)	Species or group of species										
						Cat-fish	Ray	Cock-up	Bombay duck	Indian salmon	Large jew fish	Small jew fish	Red snap-per	Porn-fret	Prawn	Mixed species
12-12-80	G6	2	3.30	146	41.50	—	20	10	56	22	24	—	10	—	—	4
13-12-80	G6, G7	3	5.00	330	66.00	5	25	45	55	65	45	—	25	—	—	65
19-12-80	G7	2	4.00	110	27.50	30	43	—	12	—	—	—	12	—	—	13
20-12-80	G8	4	8.30	253	30.00	22	20	—	27	41	37	50	4	—	—	52
21-12-80	G8	5	10.00	856	85.60	29	210	—	135	55	225	60	12	—	—	130
22-12-80	F7, F8	5	10.00	404	40.50	63	66	—	62	73	17	30	3	—	—	90
23-12-80	F7	5	10.30	731	69.50	—	200	—	180	11	90	170	—	—	—	80
5-1-81	F7	1	2.00	101	50.50	40	15	—	30	—	12	—	—	—	—	4
8-1-81	F7	1	2.00	17	8.50	12	—	—	5	—	—	—	—	—	—	—
10-1-81	F7	1	2.30	408	163.00	400	—	—	—	—	8	—	—	—	—	—
12-1-81	F7	1	2.00	10	5.00	4	—	—	—	—	—	—	6	—	—	—
16-1-81	F5	2	5.00	62	12.50	17	—	—	13	12	20	—	—	—	—	—
17-1-81	F5	3	8.30	302	35.50	142	80	—	**10**	**28**	**32**	**10**	—	—	—	—
18-1-81	F5	3	2.00	303	33,50	16	100	—	15	140	—	18	14	—	—	—
19-1-81	F5	5	13.00	1809	139.00	44	644	—	—	—	115	945	61	—	—	—
20-1-81	F7	6	15.30	2529	163.00	1132	420	—	—	—	292	615	10	—	—	60
21-1-81	F7	3	8.30	742	87.50	510	60	—	—	10	—	112	—	—	—	50
22-1-81	F7	2	6.00	605	101.00	400	—	—	—	—	25	65	15	—	—	100
30-1-81	F5, F6	3	7.30	153	20.50	52	—	—	29	—	41	—	—	—	—	31
31-1-81	F6, F7	4	9.30	553	58.50	5	—	—	12	6	18	178	—	6	—	328
1-2-81	F5, F6	3	7.00	386	54.00	78	230	—	20	—	—	48	—	—	—	10
2-2-81	F6, F7	5	11.30	253	22.00	—	160	—	8	22	18	—	—	—	—	45
11-2-81	E5, F5, F7	6	13.30	208	15.50	6	16	54	—	20	—	—	—	23	—	89
12-2-81	ES	5	11.45	771	65.50	52	5	—	—	255	149	51	—	24	—	235
13-2-81	F6, F7	5	12.00	238	20.00	30	10	—	—	—	80	—	—	43	—	75
14-2-81	F5, F6	3	8.30	196	23.00	—	20	—	—	—	45	40	—	31	—	60
20-2-81	F5	2	5.00	52	10.50	6	15	—	10	11	—	—	—	—	—	10
21-2-81	F7	S	12.00	301	25.00	23	—	—	—	10	—	200	—	48	—	20
22-2-81	E8, F8	4	10.00	758	76.00	353	—	—	—	45	150	70	—	—	—	140
23-2-81	E8	5	13.00	178	13.50	30	—	—	—	10	60	25	—	3	—	50
24-2-81	E8	3	7.30	154	20.50	7	—	—	—	—	69	50	—	3	—	25
25-2-81	E8	1	2.30	113	45.00	7	—	—	—	25	18	40	—	3	—	20
Total forthe reported period		108	240.45	14032	56.16	3515	2359	109	679	861	1590	2777	172	184	—	1786

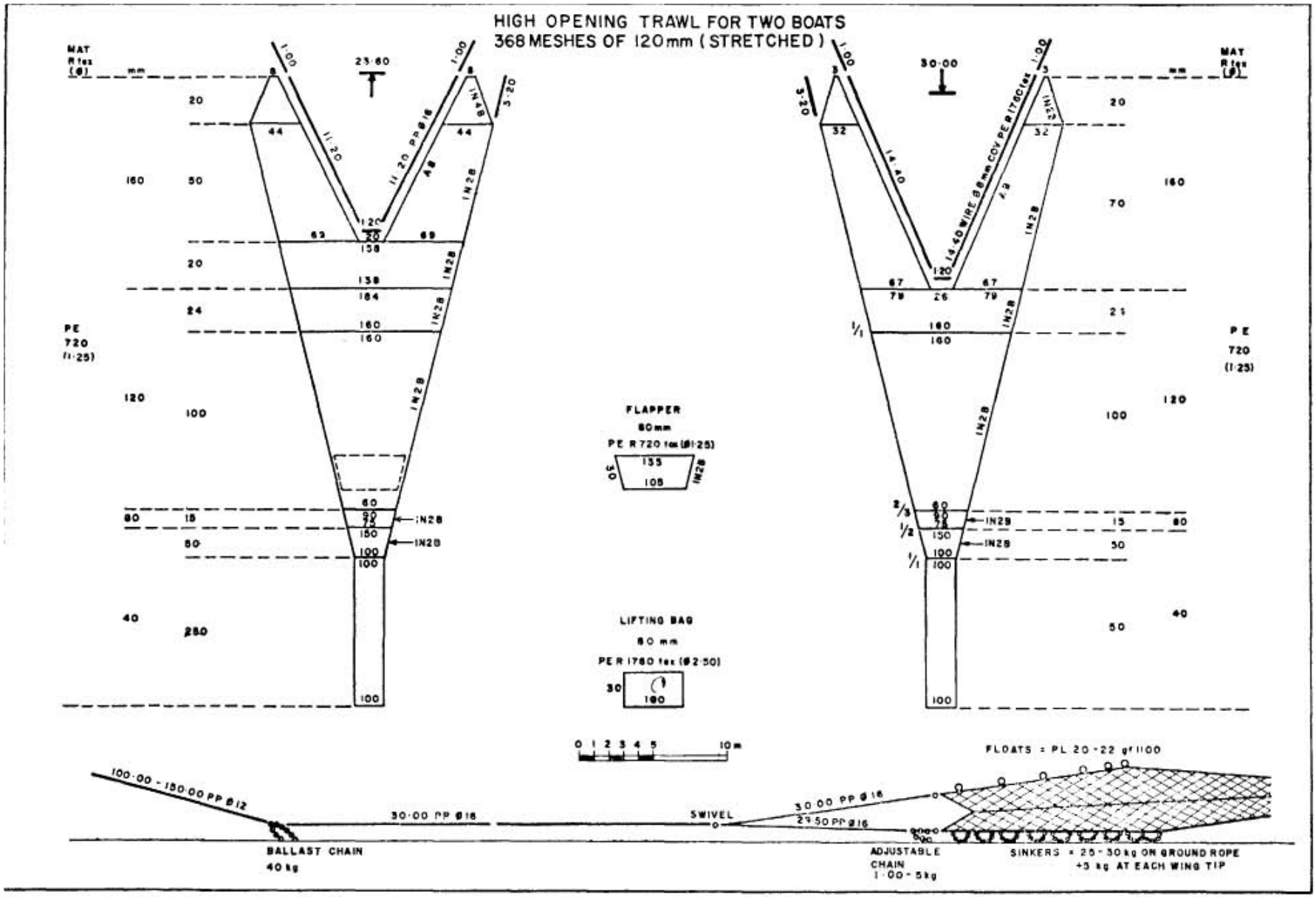
APPENDIX-1

SFMFP boats used for the high-opening bottom trawl experiments

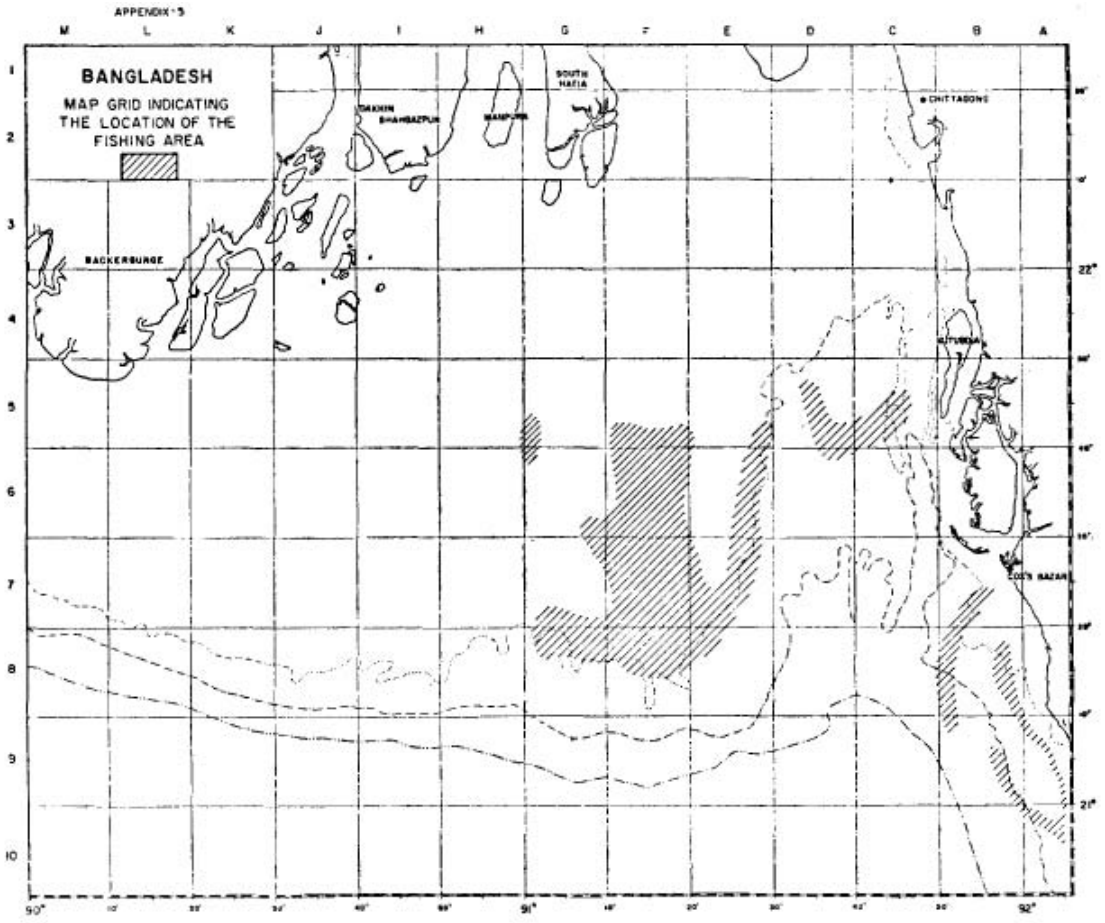
APPENDIX-2

KFP boats used for the high-opening bottom trawl experiments


HIGH OPENING TRAWL FOR TWO BOATS
464 MESHES OF 80 mm (STRETCHED)
MAT
Rtex
(Ø)
mm
PE
720
(1·25)
20·70
1·20
9·60
3·60 WIRE Ø8mm COV PE R1760tex
2·40
1·50
IN28
IN20
FLAPPER
60 mm
PE R720tex (Ø1·25)
LIFTING BAG
80 mm
PE R1760 (Ø2·5)
26·35
12·00 WIRE Ø8mm COV PE R1760 tex
0 1 2 3 4 5 10m
FLOATS = PL 18 - 20 gf 1100
100·00-150·00 PP Ø12-14
30·00 COMB Ø12
SWIVEL
30·00 PP Ø14-16
29·50 COMB Ø12
BALLAST
CHAIN
40 - 50 kg
ADJUSTABLE
CHAIN
1·00 - 5 kg
SINKERS = 25 - 30 kg ON GROUND ROPE
+5 kg AT EACH WING TIP


HIGH OPENING TRAWL FOR TWO BOATS
368 MESHES OF 120mm (STRETCHED)
MAT
PE 720 (1·25)
23·60
30·00
FLAPPER
80mm
PE R 720 tex (Ø1·25)
LIFTING BAG
80 mm
PE R 1760 tex (Ø2·50)
0 1 2 3 4 5 10m
100·00 - 150·00 PP Ø12
30·00 PP Ø16
SWIVEL
29·50 PP Ø16
FLOATS = PL 20 - 22 gr/100
BALLAST CHAIN
40 kg
ADJUSTABLE CHAIN
1·00 - 5kg
SINKERS = 25 - 30 kg ON GROUND ROPE
+5 kg AT EACH WING TIP

APPENDIX-5


BANGLADESH
MAP GRID INDICATING
THE LOCATION OF THE
FISHING AREA
BAKERGUNGE
SOUTH HATIA
CHITTAGONG
M L K J I H G F E D C B A
1 2 3 4 5 6 7 8 9 10
90° 91° 92°
22°
21°

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