



BAY OF BENGAL PROGRAMME  
DEVELOPMENT OF SMALL-SCALE FISHERIES



Improvement of Large-Mesh Driftnets  
for Small-Scale Fisheries in Bangladesh

BOBP/WP/5

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IMPROVEMENT OF LARGE-MESH DRIFTNETS  
FOR SMALL-SCALE FISHERIES IN BANGLADESH

BOBP/WP/5

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## PREFACE

This document is the first report of a fishing gear improvement project aimed at upgrading traditional small-scale fisheries in Bangladesh. It presents the rationale, the mechanics and the findings of experiments conducted for four months during the 1979-80 winter season to improve large-mesh driftnets, which account for about 30% of the total catch in Bangladesh. The experiments were conducted in conjunction with normal commercial operations of boats belonging to a Chittagong fisheries cooperative. The fishing was carried out in an area about 30 miles off the eastern coast of Bangladesh, a common haunt of large-mesh driftnetters.

The experiments have led to definite conclusions about ways to lower the cost and raise the catch efficiency of these nets. The document may therefore serve as a guide for specific extension work among small-scale fishermen; it may also provide a basis for further experiments to improve the performance of these nets.

The Ministry of Fisheries and Livestock, Bangladesh, participates in the fishing gear improvement project as a cooperating agency.

The fishing gear improvement project is 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 in many areas of small-scale fisheries such as fishing craft, fishing gear, fishing methods and utilization and coastal aquaculture. The programme's goals are to improve the conditions of small-scale fishermen 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.

## **SUMMARY**

Driftnets account for nearly 30 per cent of the total marine catch in Bangladesh. With the polyamide (PA) or nylon twine used for constructing the nets getting scarcer and costlier, the driftnetters tend to carry less and less gear, affecting fish catch and incomes.

It is therefore desirable to devise ways to ensure that driftnets cost less and/or produce more. This was the rationale for an experimental project conducted during the 1979/80 winter season.

The boats used three kinds of fishing gear—the traditional large-mesh driftnets (45 ply), modified nets of thinner netting twine (27 ply) and nets of polyethylene material.

Details of fish catch were recorded daily for the three types of nets with the assistance of extension workers from the Kalidaha fishing project.

A comparative study of the data obtained reveals that nylon nets of thinner twine size, which cost approximately 40% less than the traditional nets, caught about 40% more fish. Thus the thinner twine nets are clearly preferable to the traditional. Following from these results, a promotional effort to extend the merits of this net is recommended, with the Bay of Bengal Programme assisting in the effort.

As for the nets of polyethylene netting material, they also caught 45% more fish than the traditional nets, but sustained greater damages.

Further studies are recommended on the efficacy of polyethylene netting material and on the optimum mesh sizes for large-mesh driftnets. Study tours of large-mesh driftnet fisheries in other countries are also recommended for Bangladesh national officers.

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## 1 INTRODUCTION

Artisanal fishermen account for the bulk of marine fish catch in Bangladesh. They operate in shallow waters within a distance of 50 miles from the coast.

The small-scale marine fishing operations are conducted mainly during the calm winter season, October to March, on account of unfavourable weather conditions and the poor seaworthiness of craft.

The fishing methods are very traditional and limited in scope and variety. The most common fishing gears employed are set bag nets (behundi), staked gillnets (funda) and driftnets. The set bag net is the most important, yielding more than 40 per cent of the total marine catch, while, driftnets account for approximately 30 per cent. Driftnets are categorized into two main groups, the small-mesh (70-100 mm stretched mesh) driftnets which mainly capture *Hilsa*, and the large-mesh (180-200 mm stretched mesh) nets aimed at larger miscellaneous varieties such as jew fish, cat fish, triple tail, pomfret, snapper, spanish mackerel, shark, etc.

In earlier days, traditional fishing gears were mainly hand braided out of cotton and hemp; with the introduction of synthetic materials (PA multifilament nylon and tyre cord), cotton and hemp were gradually replaced. Today nylon (PA multifilament) is used for most fishing gears and it is produced both by netting machines and by hand braiding. As in some other countries, proper attention has not been given to the varying properties and strengths of different synthetic materials as compared to the less resistant natural fibre. Important fishing gears such as large-mesh driftnets are constructed with unnecessarily heavy netting material.

The sharply rising costs of petro-chemical products make the synthetic nets an increasingly expensive component of the fishing unit. Considerable savings can however be effected by reducing the weight of the netting material. Nets of thinner twine are also generally more effective — they catch more fish — since they entangle the fish easier.

In view of these factors, an experimental fishing project was initiated under the auspices of the Bay of Bengal Programme with the following objectives:

- (i) comparison of the catching efficiency of nylon driftnets of different twine (yarn) sizes.
- (ii) study of the suitability of cheaper netting materials such as polyethylene (PE).
- (iii) identification of other ways and means to further improve the productivity and profitability of large-mesh driftnet fishery.
- (iv) demonstration to small-scale fisheries operators of conclusive results achieved during the experiments.

This working paper describes initial work related to objectives (i), (ii) and (iii).

## 2 THE DRIFTNETS

Detailed below is descriptive data on the traditional nets being used in the commercial fishery and the experimental nets introduced by the large-mesh driftnet improvement project.

### 1. *Traditional large-mesh driftnets* (Design in Appendix 1).

Netting material	Nylon (PA multifilament)
Length of net	380-400 meshes
Depth of net	40-55 meshes depending on mesh size
Mesh size	180-200 mm (7"-9") stretched mesh
Twine size	R 1135 tex- R1515 tex (210d 45-210 d 60), the smaller being more common
Float line	6-10 mm diameter of PA or PP
Sinker line	8-12 mm diameter of jute waste or similar
Floats	Large PVC (oval, cylindrical or spherical) or bamboo, fastened with pendant lines of 1-3 m length.
Sinkers	Clay stones fastened with pendant lines.
Hanging	Webbing fastened to framing line every 1 -2 m with hanging ratio 0.50-0.60 (length of framing line/stretched length of webbing).
Number of nets	A fleet of nets — between 25 and 35 per fleet, depending on boat size and on economic and operational factors. Nets are joined by float and sinker lines, and by loosely lacing nettings together.

### 2. *Experimental large-mesh driftnets* (Designs in Appendices 2 and 3).

The experimental nets differed from the traditional nets in netting material and yarn size. In other characteristics, the traditional and the experimental nets were identical.

#### 1. *PA multifilament net* (design in Appendix 2)

Netting material	: Nylon (PA multifilament)
Twine size	: R 680 tex (210 d 27)

#### 2. *Polyethylene (PE) net* (design in Appendix 3)

Netting material	Polyethylene (PE)
Twine size	R 570 tex-720 tex (ø1 .00-1 .25)

### 3 CONDUCT OF EXPERIMENTS

The fishing experiments were carried out in cooperation with CARITAS, a social service agency, through its Kalidaha Fishing Project near Chittagong. Under an agreement between BOBP and CARITAS, BOBP provided the experimental nets; CARITAS used them along with their own traditional nets in normal commercial fishing operations, and recorded the catches from the different types of nets. All proceeds from the sale of fish catch went to CARITAS as compensation for responsibilities undertaken and services rendered in the course of the experimental project.

*Fishing area.*- The fishing trials were carried out with Chittagong as base in a traditional Kalidaha fishing area, located about 30 miles off the eastern coast of Bangladesh between Chittagong and Cox's Bazar. The geographic location is shown in Appendix 4.

*Duration:* Fishing trials with the fishing boat Miriam No. 4 effectively commenced end October 1979, but were suspended end November due to loss of fishing gear. The operations were resumed mid-December 1979, using two fishing boats (Miriam 8 and Miriam 18), and extended until end February 1980. In all, the experimental nets were used for 92 fishing days.

*Fishing boats:* The fishing boats used for the trials belonged to the Kalidaha Fishing Project. Photographs of two of the boats are given in Appendix 5. Their characteristics:

Length (m)	: 12.00-13.00
Breadth (m)	: 3.00- 3.50
Draft( m)	: 1.00
Gross tonnage	: 10
Engine (hp)	: 22-33

*Fishing gears:* The experimental nets were placed in between the existing nets so that the soaking time for nets of different material and yarn size was about equal. The total number of nets per fleet varied from 25 to 35. The traditional nets outnumbered the experimental ones throughout the fishing trials.

*Data collection:* Data for comparing the catches and the relative efficiency of different nettings were collected daily by the head fishermen and extension workers of the Kalidaha Fishing Project. There were no means available for weighing the fish; only the number of fish, by major species caught in the different nets, were recorded.



## 4 FINDINGS

### *(a) Nylon nets of thinner yarn*

The fishing trials clearly showed that the experimental nets made of thinner twine (27 ply) are far superior to the traditional nets (45 ply twine). In addition to being about 40% cheaper, they catch much more fish. (During the trials, they caught as much as 43% more).

The average catch per netset was 0.43 pieces for the 27 ply net and 0.30 pieces for the 45 ply net. Table 1 gives the data recorded during the trials. There is no apparent difference in the catch composition. The value of catch from the two different nets can therefore be assumed to be about the same.

Damages sustained to the nets during fishing operations were closely observed. It was revealed that the lighter nets needed only slightly more repair than the heavier nets; this was easily repaired by using small quantities of mending yarn.

### *(b) Polyethylene nets*

The polyethylene nets caught more fish (about 45% more) than the 45-ply nylon nets—0.32 pieces per netset against 0.22. Table 2 gives the details.

Considerable damages to the polyethylene nets were observed. They needed extensive repair work and replacement. Such damages add to costs and hamper the fishing operations.

The polyethylene nets therefore compare unfavourably with the lighter (27 ply) nylon nets in spite of being about 20% cheaper and equally catch efficient.

### *(c) Other observations*

*Mesh size:* The mesh sizes now being used, 180-200 mm, appear to be too large for the mixed varieties of fish caught. A more appropriate mesh size would be 120-160 mm; it may catch more fish of the commercial size.

*Supply of nets:* Large mesh driftnets are in short supply and many boats operate without the full complement of gear. This seriously affects the efficiency and profitability of the fishery.

*Thefts:* Nets were stolen at sea once during the experiments. Such thefts occur frequently in the commercial fishery and are not likely to stop as long as nets remain a scarce and expensive commodity.

*Boats:* The fishing boats commonly used in Bangladesh leave a lot to be desired, the most serious deficiency being their poor seaworthiness. This has to be improved in order to extend the operational areas and fishing season beyond the calm weather period. The design and lay-out of the boats could also be improved at marginal cost, resulting in more effective fishing operations.

*Fishermen:* The fishing trials conducted in cooperation with the Kalidaha Fishing Project using their boats, crew and fishing gear were educative experiences. They highlighted the technical shortcomings of the fishery which are not easily overcome because of the low skills of the fishermen and their reluctance to change. Any effort to improve large-mesh driftnet fishery through demonstration and extension must consider these problems. The only feasible approach toward improvement is to work intensively and directly with fishermen in experiments such as these. Even so, the process of development is likely to be slow.

*Extension:* Much needed development and extension work for improvement of small-scale fishing technology—including large-mesh driftnetting and other important methods such as the behundi fishing—is virtually non-existent.

## **5 RECOMMENDATIONS**

- Substantial benefits to the large-mesh driftnet fishery can be derived by reducing the twine size of the large-mesh driftnets. The use of thinner twine should be promoted through a demonstration and extension programme in the major fishing centres where the traditional heavy twine driftnets are in use. Information should also be disseminated to manufacturers and importers of nets.
- To accelerate development, extension officers/workers need to be given short term specialized training within the country and an opportunity to study similar fisheries in neighbouring countries.
- The mesh size now used in the large mesh driftnet fishery of Bangladesh is probably too large for optimum performance. Further commercial experiments should be undertaken to investigate this.

**Table 1**

**CATCH RECORDS OF EXPERIMENTAL FISHING WITH LARGE-MESH  
DRIFTNETS IN KALIDAHA**

*Nylon Nets of Thicker Twine (Traditional) vs. Nylon Nets of Thinner Twine*

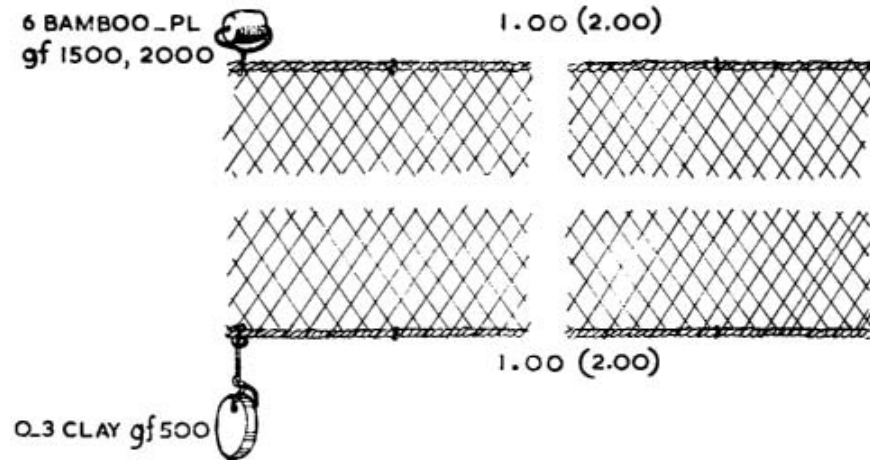
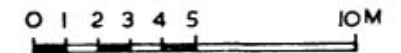
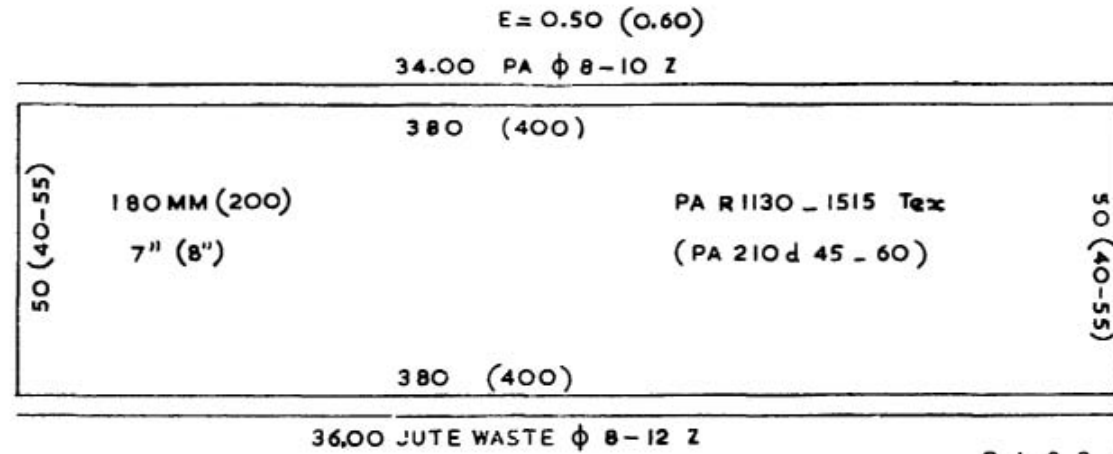
Boat:	FB Miriam No.14-18	Fishing Ground: Kalidaha	Period:31-10-79--26-2-80
Unit	(experimental net) 1	(traditional net) 2	—
Netting material	Nylon multifilament (PA)	Nylon multifilament (PA)	
Mesh size	180mm (7")	180mm (7")	
Twine size	R 680 tex (210 d 27)	R 1135-1515 tex (210 d 45-60)	
Fishing days	55	55	
Net set (Hung 30m)	1115	1757	
Species — Group of Species	Pieces	%	Pieces
Triple tail	84	18	63 12
Pomfret	74	15	70 13
Jew fish	74	15	124 23
Catfish	71	15	82 15
Snapper	46	10	36 7
Spanish mackerel	45	9	39 7
Four thread tossel	26	5	10 2
Shark	29	6	58 11
Sawfish	7	1	6 1
Cock-up			9 2
Indian Salmon			10 2
Skate	—	—	2 —
Miscellaneous	28	6	19 4
Total	484	100	528 100
Catch per net set (pieces)		0.43	0.30

**Table 2**  
**CATCH RECORDS OF EXPERIMENTAL FISHING WITH LARGE-MESH**  
**DRIFTNETS IN KALIDAHA**

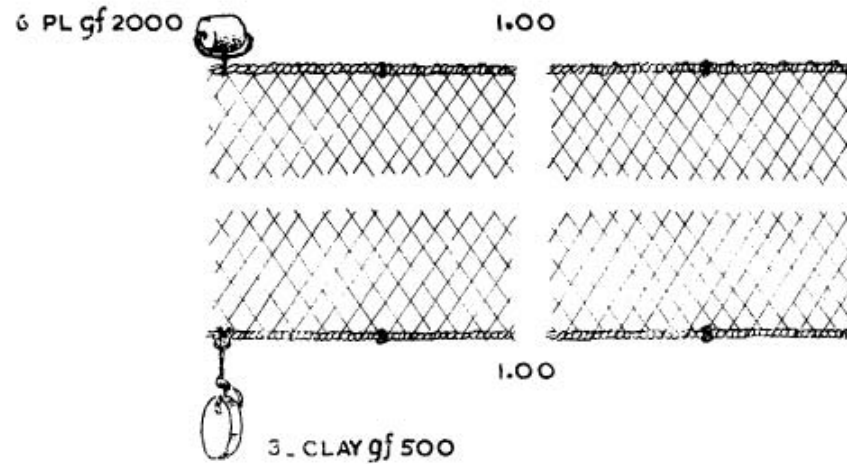
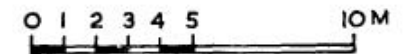
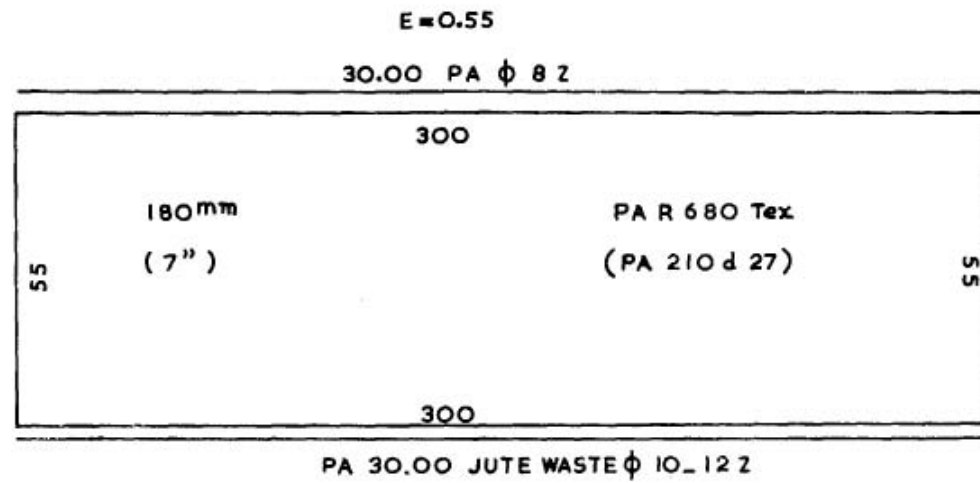
*Polyethylene Nets vs. Nylon (Traditionai) Nets*

Boat: FB Miriam No. 9-18	Fishing Ground: Kalidaha		Period:21-12-79 -26-2-80	
Unit	(experimental net)		(traditional net)	
	1		2	
Netting material	Polyethylene (PE)		Nylon multifilament (PA)	
Mesh size	180mm (7")		180mm (7")	
Twine size	R 570-720 tex (d 1.00-1.25)		R1 135-1515 tex (210 d 45-60)	
Fishing days	37		37	
Net set (Hung 30m)	1360		2498	
Species — Groups of Species	Pieces	%	Pieces	%
Triple tail	66	15	69	12
Pomfret	37	8	39	7
Jew fish	58	14	105	19
Cat fish	89	20	74	13
Snapper	39	9	99	18
Spanish mackerel	21	5	24	4
Shark	24	6	54	10
Sawfish	14	3	10	2
Cockup	18	4	29	5
Indian Salmon	7	2	36	6
Skate	16	4	3	2
Miscellaneous	18	4	10	2
Total	434	100	562	100
Catch per net set (pieces)	0.32		0.22	

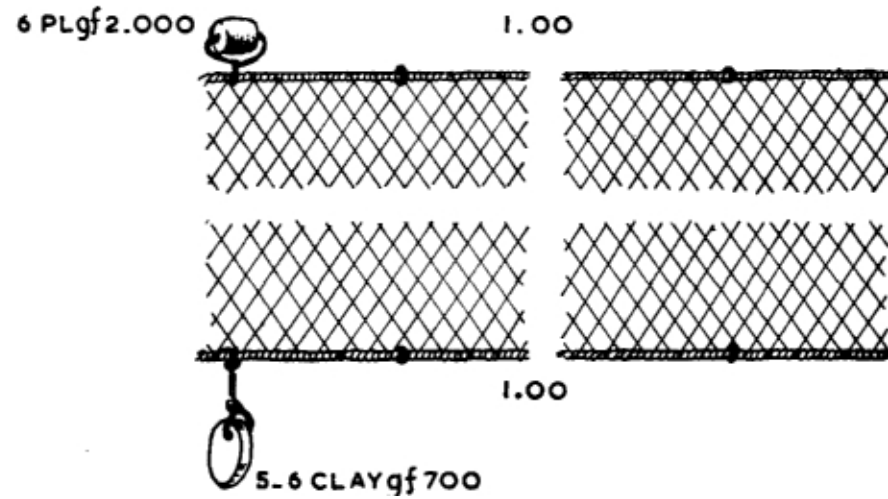
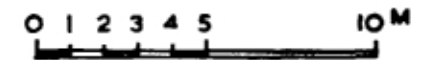
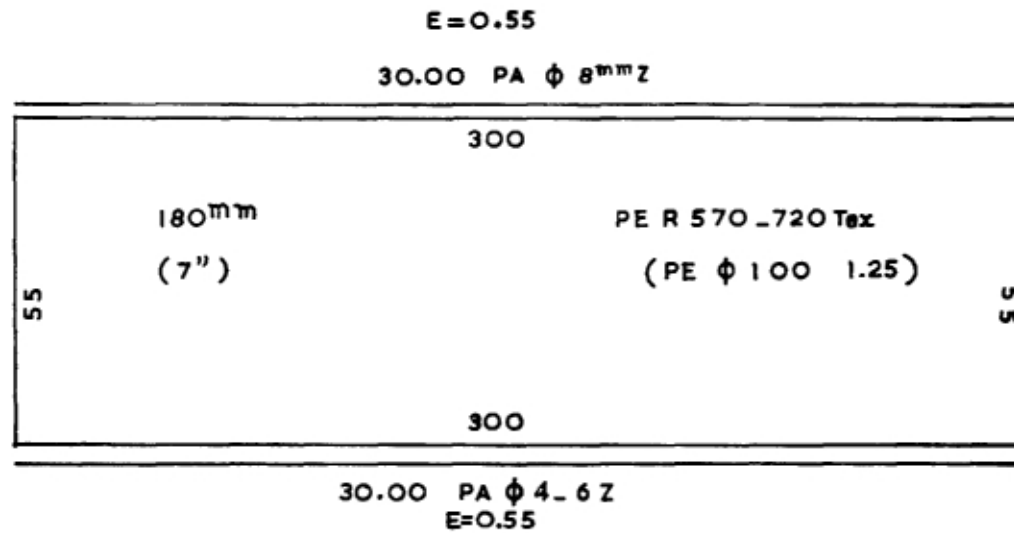
# APPENDIX I - DESIGN OF THE TRADITIONAL LARGE MESH DRIFTNET



APPENDIX: 2 DESIGN OF THE EXPERIMENTAL DRIFTNET (NYLON)

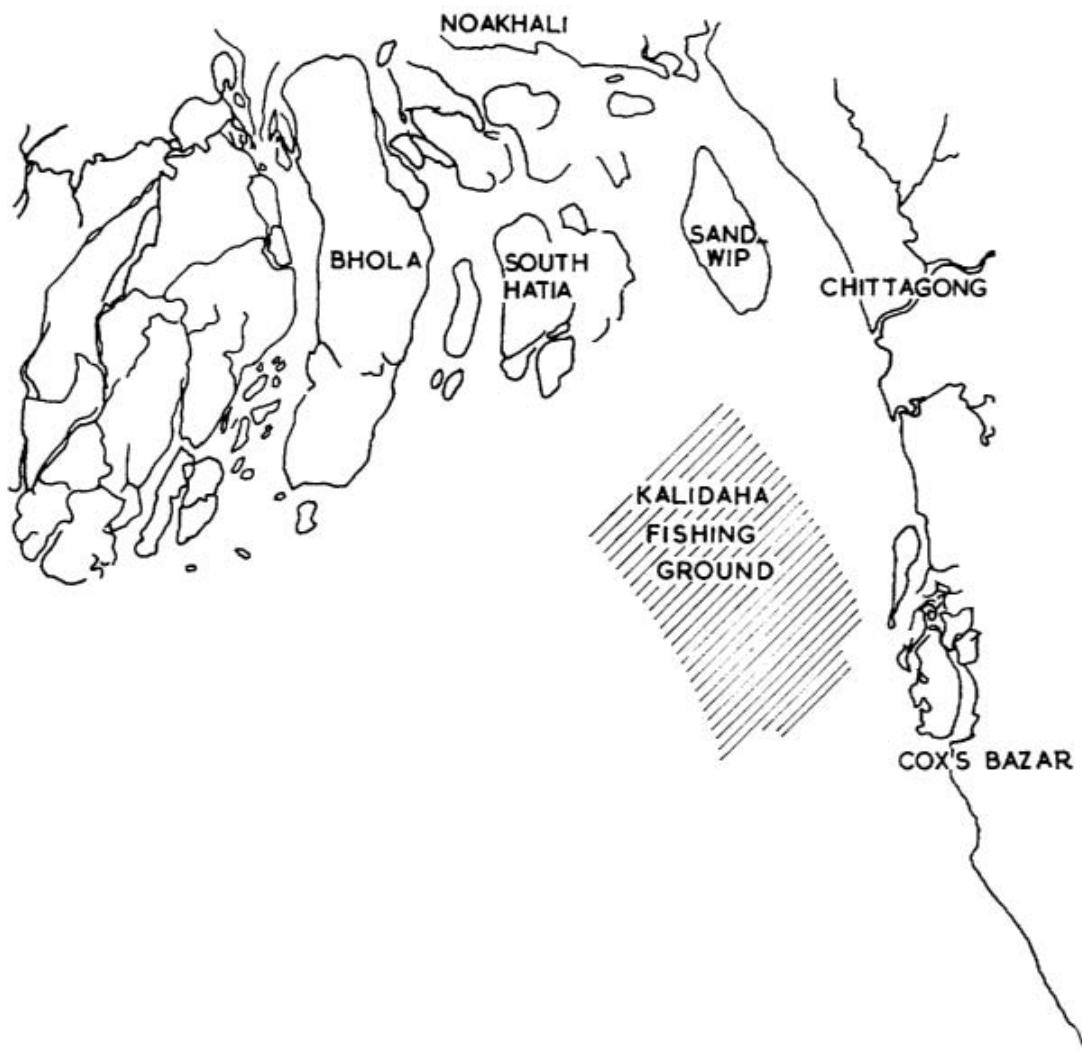


# APPENDIX DESIGN OF THE EXPERIMENTAL DRIFTNET (POLYETHYLENE)



APPENDIX: 4

MAP INDICATING THE LOCATION OF THE FISHING AREA





## APPENDIX 5

### PHOTOGRAPHS OF BOATS USED FOR THE LARGE-MESH DRIFTNET IMPROVEMENT PROJECT IN BANGLADESH



Miriam 9 (top) and Miriam 18, both fishing boats belonging to the Kalidaha fishing project, were used for the experiments to improve the large-mesh driftnets. Miriam 9 is a 12-m wooden boat driven by a 22-H.P. engine; Miriam 18 is a 13 m ferro-cement boat with a 33 H.P. engine.

## **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 7-10 November 1978. Colombo, Sri Lanka, 1978.  
Reissued Madras, India, September 1980.
4. Role of Women in Small-Scale Fisheries of the Bay of Bengal. (In preparation)
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. 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.

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

1. Investment Reduction and Increase in Service Life of Kattumaram Logs. Balan, R. Madras, India, February 1980.
2. Inventory of Kattumarams and Their Fishing Gear in Andhra Pradesh and Tamil Nadu, India. (In preparation)
3. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Sri Lanka. Madras, India, June 1980.
4. Inboard Motorisation of Small F.R.P. Boats in Sri Lanka. (In preparation)
5. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Bangladesh. Madras, India, September 1980.

6. Fishing Trials with Bottom-Set Longlines in Sri Lanka (In preparation)
7. Technical Trials of Beachcraft Prototypes in India (In preparation)
8. Current Knowledge of Fisheries Resources in the Shelf Area of the Bay of Bengal, Madras, India, September 1980.
9. Boatbuilding Materials for Small-Scale Fisheries in India. (In preparation)
10. Fishing Trials with High-Opening Bottom Trawls in Palk Bay, Tamil Nadu, Madras, India, September 1980.

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

1. Fisheries Cooperatives in Kerala: A Critique (In preparation)