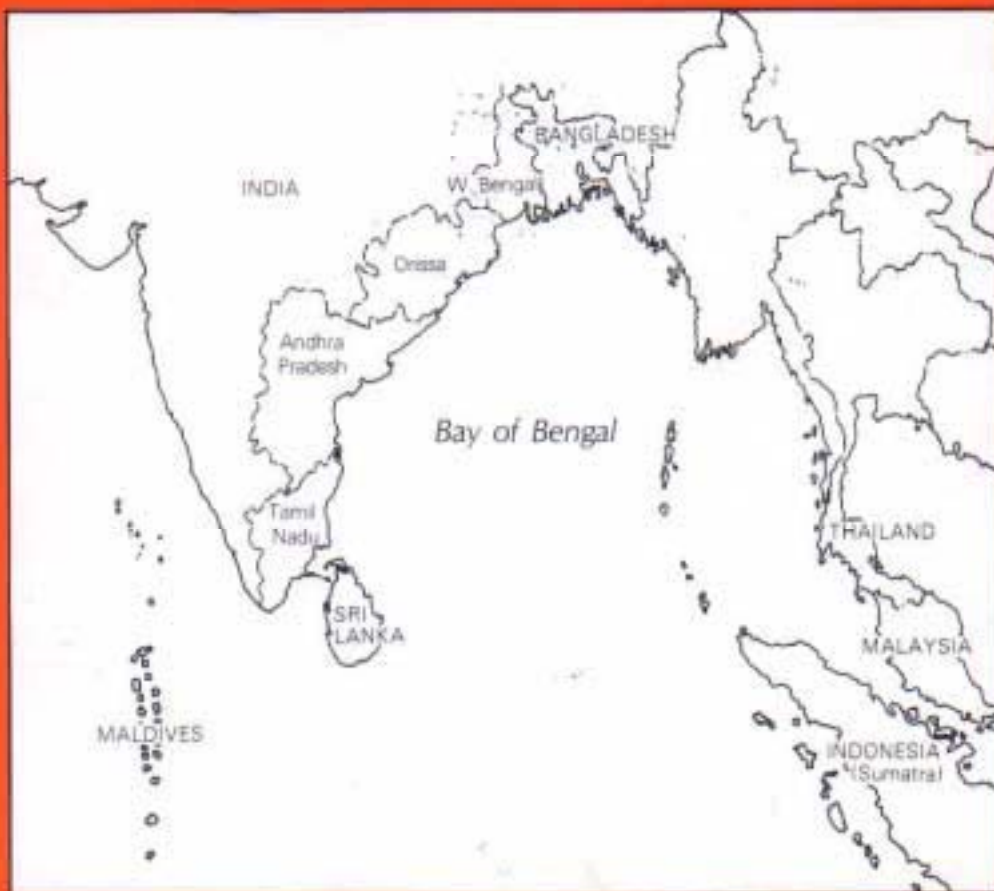


# The Coastal Set Bagnet Fishery of Bangladesh — Fishing Trials and Investigations



THE COASTAL SET BAGNET FISHERY OF BANGLADESH -  
FISHING TRIALS AND INVESTIGATIONS

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This paper reports on the conduct and findings of fishing experiments during six seasons (1980-86) to improve the economics of set bagnets (*behundi jal*) in Bangladesh. The main purposes were to reduce the costs by using cheaper materials and to increase productivity by employing nets of larger size and new designs.

The set bagnet is a traditional fishing gear widely used in the coastal area of Bangladesh. It is the second most important fishing gear after gillnets. In order to better estimate its importance, BOBP also conducted a pilot survey, the outcome of which has been published in a separate paper (BOBP/WP/34).

The work was carried out in cooperation with the Marine Fisheries Department (MFD), Chittagong. The principal national officer engaged in the work was Mr. M.A. Sabur, Fisheries Inspector, who participated on a full-time basis in the trials during the last four years.

The initial experiments (1980-81) were conducted in cooperation with the Kalidaha Fishing Project of CARITAS, a social service agency of Juldia near Chittagong, and with private fishermen at Dubla Char off the Sunderbans. From the 1981/82 season the trials were concentrated in Sonadia Island, just north of Cox's Bazaar. They were conducted in cooperation with private fishermen.

Overall planning and supervision of the work was provided by BOBP's Fishing Technologist, Mr. G. Pajot, during 1980-82 and 1984-86 and by Mr. T. Gestsson, consultant, during 1982-84. The author participated part-time in the 1983/84 and 1984/85 trials as BOBP Associate Expert in Fishing Technology and in the 1985/86 trials as full-time consultant. Dr. B.T. Antony Raja, Fishery Biologist and BOBP consultant, assisted in interpreting data collected during the last season (1985/86) and in preparing this report.

The experiments and the survey with set bagnets were sponsored by the small-scale fisheries project of the Bay of Bengal Programme. The project is funded by SIDA (Swedish International Development Authority) and executed by FAO (Food and Agriculture Organization of the United Nations). It covers five countries bordering the Bay of Bengal: Bangladesh, India, Malaysia, Sri Lanka and Thailand. It is a multi-disciplinary project, active in fishing craft and gear, aquaculture and extension. The project's main goal is to develop, demonstrate and promote appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk in BOBP's member countries.

This document is a technical report and has not been cleared by the FAO or by the government concerned.

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## 1. INTRODUCTION

The bulk (95%) of the marine and estuarine fish production in Bangladesh comes from the small-scale sector. The total yearly production in 1983/84 was estimated at about 170,000 t. The fishing fleet consists of some 13,090 boats of which about 20 per cent are motorized.

The coast (480 km long) is characterized by an extensive delta area formed by the river systems of the Ganges and the Brahmaputra. The continental shelf is thus very wide (up to 200 km) with an area of 32,000 sq. km. within the 24 m depth contour.

The predominant fishing gear used are gillnets (mainly for Hilsa) and set bagnets. The latter is locally known as behundi jal. The most common species caught are hairtail, anchovy, Bombay duck, croaker and shrimp. The set bagnets (SBN) account for a considerable portion of the total marine catch. The estimates vary between 25 and 45 per cent. All such estimates run the risk of inaccuracy, because a sound statistical system is absent, communication is difficult, and the fishing operations are scattered far and wide and cover some remote locations.

There are no records readily available of the history of the SBN fishery, but it is believed to be very old. The major changes it has undergone probably relate to the introduction of synthetic materials for netting, and motorization of craft; the latter is still in process. These changes have led to the use of larger fishing units, in terms of size and number of nets used, larger boats and an expanded area of operation.

In 1979, BOBP started to assist the Bangladesh fisheries administration in development activities for improving various fishing methods and gear; the SBN was one of them. The main feature of the gear, i.e., the utilization of tidal currents for its operation, is a special attraction from an energy-saving standpoint. During initial observations of the fishery it was noted that cheaper material could probably be used for constructing the nets, thus reducing the costs of operation; experimental nets were made and tested to confirm this. During the course of this work it was felt that the design of the nets might also be improved to better the productivity and the economics of the fishery.

Systematic fishing trials were taken up from 1981/82 and were carried out over five fishing seasons till early 1986. The trials were conducted in cooperation with private fishermen operating from Sonadia Island. This report summarizes the trials and comments on the results.

The trials during the first season (1981/82) showed some promising fishing results with a new net. To assess the implications if the improvements to the SBN fishery were adopted widely, a pilot survey was undertaken of the entire fishery. The outcome of the survey has been published in full in a separate paper (BOBP/WP/34); the salient findings are incorporated in this report.

## 2. THE SET BAGNET (behundi jal) FISHERY IN BANGLADESH

The set bagnet is a fixed tapering net, resembling a trawl net, set in the tidal stream by attaching it to hold-fasts. It has a rectangular mouth kept open by two vertical bamboo poles. The net is held in a fishing position against the current by linking the extended sides of the net (wing tips) to hold-fasts by means of long bamboo poles and steel wires. The hold-fasts are two wooden stakes embedded some distance apart in the sea bed, so that the net is parallel to the direction of the current. Fig. 1 shows how the net is operated.

The set bagnet catches species of fish which drift with the current or do not swim fast enough to stem the current and maintain a fixed position in relation to the sea bed. At each slack water period, the net comes to the surface (by means of the bamboo poles used for opening of the net, the bamboos serving as sweep-lines) when it is emptied; it is then reversed in the opposite direction ready for fishing. Because of the difficulties of embedding the wooden stakes in the sea bed, this method of fishing is restricted to a maximum water depth of about 25 m.

The net itself consists of six sections of which two sections are made of four panels, while the remaining four sections consist of one panel each. The upper and the side panels are extended into small wings which increase the fishing efficiency by herding the fish into the mouth-opening (Fig. 2). The tapering of the net from mouth to cod end is achieved by gradually reducing the size and number of meshes. To keep the mouth of the net open, two vertical bamboo poles are fastened to the forward corners of the upper and lower panels which are reinforced by gussets of netting.

The nets are hand-braided and made mainly of nylon multi-filament (PA) and tyre cord (TC) for netting and other synthetic material for framing lines. The traditional netting sometimes also has a mixture of polyamide (PA), polyethylene (PE), and polypropylene (PP).

This method of fishing requires a small fleet of vessels. A typical unit for offshore fishing comprises one motorized fish carrier and one or two non-motorized country craft (borna or balam), each of which operates two to five nets. The country craft remains in the fishing ground as long as the nets are in operation and the weather or sea conditions permit.

The nets in the estuarine area are operated throughout the year while those in the sea are operated only during the dry fair weather season (October-February).

Larger fishing units are organized by *bahardars*, fishing entrepreneurs who arrange for boats and other equipment including material for the temporary fishing camps on the islands. The bahardar advances loans to the fishermen for the fishing season and arranges for the sale of the fish. He is usually assisted by a shore manager (changual at the fishing camp. A masterfisherman (*majhi*) is in charge of the fishing operations.

The remuneration system is based on shares of revenue, fixed salaries or a combination of the two. Systems and rates vary a great deal. Shares are divided among boats, nets, *majhis*, engine drivers, crew and shore labourers. Among the larger units, the operatives usually earn fixed salaries for the season that are agreed upon with the *bahardar* well before the start of the fishing season. Share systems are more common among the medium and small units.

A system for regular and systematic collection of data from the coastal small-scale fisheries in Bangladesh does not exist; therefore very little statistical information is available. The latest quantitative information on the SBN fishery prior to BOBP's involvement was the fisheries census of 1967/68. A fully representative survey would require considerable effort (transport facilities, staff, funds etc.) and time, given the remoteness and wide dispersal of the SBN fishing camps and villages, their seasonal character at times and the operational pattern (large units stay for weeks out in the sea). In order to update available information, BOBP undertook a pilot survey in 1983 basing it on the 1967/68 census. The survey has shortcomings (in the representativeness of sample villages surveyed) but does provide an outline of the present status of the fishery. Details are found in the survey report (BOBP/WP/34) but the major features are :

SBN are being used along the entire coast of Bangladesh with heavy concentration in some areas (Fig. 3). The three major offshore centres for large nets are Dubla Char, Sona Char and Sonadia in which one-fifth of the total number of nets are employed.

- The estimated total number of SBN is 16,090 and many of them (45%) are small-sized.
- There is a large variation in overall size, mesh size, twine thickness and material used for the nets. During the pilot survey an attempt was made to classify them by size as follows.

Size	Length (m)	Twine (denier)	Weight (kg)	Number of nets
Large	30.5 – 46	210d18 – 66	75 – 130	4,100
Medium	18.5 – 30.4	210d12 – 36	40- 75	4,500
Small	9.0 – 18.4	210d 6 – 18	20 – 40	7,100

The table gives only a rough indication of the size variation since the sample surveyed was too small and not a true random selection.

- As in the case of the nets there are great variations in the size of boats. At Sonadia the motorized carriers are 11-16 m long and 2.5-3.0 m broad and are equipped with inboard diesel engines of 15 - 22 hp. The dimensions of the country craft (borna) are length 12 · 18 m and breadth 1.5 - 2.0 m.
- The use of motorized boats is by and large limited to the Chittagong district but some of these units are fishing at Dubla Char and Sonachar.
- About 50 per cent of the nets belong the fishermen of Chittagong district,<sup>1</sup> 16 per cent each to those from Patuakhali and Khulna and 12 per cent to those from Noakhali.
- The nets are distributed among more than 800 villages.

1 District refers to the old administrative unit (before 1984).

### 3. SUMMARY OF PROJECT ACTIVITIES AND INPUTS

Fishing trials of a commercial nature were conducted during six seasons from 1980/81 to 1985/86. The season at the offshore centres lasts from October to February.

The aim of the first year's trial was to show that polyethelene (PE) is as good as the commonly used materials, polyamide (PA), and tyre cord (TC). A PE net is about 25 per cent cheaper.

In trials during the next four seasons, attempts were made to improve the catch efficiency of the nets by changes in design, rigging and operation.

During the last season, the principal aim was to determine the optimum mesh size of the cod-end with an eye on conservation of resources and the economy of the fishing units.

A summary of the operations by season is given below. This also includes specifications of the nets used (Table 1).

**Table 1**  
**Broad specifications on SBN used in the fishing trials 1982-86**

S.NO	Type	Material	Season	Twine size	Length of net (m)	Length of wing (m)	Mouth Opening			Mesh size			Hanging Ratio	Remarks
							Area (m <sup>2</sup> )	Horizontal (m)	Vertical (m)	Frame (mm)	Wing (mm)	Cod end		
1.	Conventional	PE-PA	1982/83 1983/84	380d 12-24ply	35.1	12.5	108.5	15.5	7.0	140	100	15	0.30	Fig 8
2.	Experimental	PE	1982/83	380d 18-24ply	46.6	14.5	119.0	17.0	7.0	160	160	20	0.30	Fig 6
3.	Dol net (India)	PE	1982/83 1983/84	1.01-1.5mm	56.0	None	420.0	28.0	150	200		25	0.42	Fig 7
4.	Conventional	PE	1983/84	1 0-2.0 mm	41.5	16.0	170.4	21.3	8.0	110	110	15	0.33-0.30	
5.	Dol net (local)	PE	1983/84	380d 12-36ply	47.0	14.25	363.5	22.3	16.3	200		30	0.26	
6.	Traditional	PA PE-PP Coir mixed	1984/85 1985/86	210d 12-24ply	33.9	12.7	86.9	13.9	5.5-7.0	135	140	25	0.27	
7.	Conventional	PE	1984/85	380d 12-36ply	41.6	17.9	130.0	20.0	5.5-7.0	180	155	25	0.29	
8.	Convened dol net	PE	1985/86	380d 12-36ply	47.0	14.25	112.5	18.0	5.5-7.0	200	150	30	0.24	
9.	Conventional	PE	1985/86	380d 12-36ply	41.6	18.0	112.5	18.0	5.5-7.0	180	180	30.35 40.50	0.26	

1980/81 : The first fishing trials were carried out off Chittagong from July to October 1980 in cooperation with CARITAS, a social service agency, through its Kalidaha Fishing Project (KFP) located at Juldia near Chittagong. BOBP provided two PE set bagnets of traditional design (Fig. 2) to KFP which used them along with their own PA nets for commercial fishing operations off Chittagong. The two PE nets were used together with one PA net by one unit. The fishing results of this unit were compared with three others that used three PA nets each. The actual number of fishing days was about 50. Catch data were not obtained for each net, only for daily landings by unit.

Similar trials were conducted off Dubla Char from November 1980 to February 1981. Two PE nets supplied by BOBP were compared with two TC nets – all were identical and of traditional design. One unit operated the PE nets, and another the TC nets.

In order to facilitate further development work, a study tour to Bombay, India, was organized for four bahardars and two assistant fishing technologists of the MFD. The purpose was to allow them to observe the *dol* fishery, which is very similar to the *behundi* fishery but perhaps more advanced.

The trials at Chittagong and Dubla Char and the study tour convinced many fishermen that PE was a suitable netting material. The four trial nets were paid for in full by the operators, and material for half a dozen more nets were issued to others at full cost. All the nets were made by the fishermen themselves.

1981/82 : From November 1981 onwards all fishing trials were undertaken from Sonadia Island off Cox's Bazar. During the 1981/82 season, cooperation was established with one of the bahardars who had participated in the study tour to Bombay. BOBP provided PE material for construction

of three nets. Two of them were of conventional design (Fig. 2) while the third was of a new experimental design incorporating ideas from a dol obtained during the study tour. (See Fig. 4).

The experimental net was made of two panels instead of four. Part of each panel is extended into wings in the same way as the traditional net. Another feature was the use of larger meshes in the leader and front portion of the net which reduces costs and drag resistance and facilitates easy handling. When first designed, the net frame was 17 m long horizontally and 9 m long vertically, with triangular wings of 13.70 m. Due to frequent breaking of the 9 m bamboo poles, the vertical net opening was reduced to 7 m and eventually the frame measured 7 x 17 m and the wing 14.5 m. The area of the mouth opening was then 119 m<sup>2</sup> against the conventional net's 72 m<sup>2</sup>.

Arrangements were also made to use ropes instead of bamboo to link the wings and the stakes and to use floats for control of the fishing depth.

The three PE nets were operated together with one PA net of conventional design. Data collection left a lot to be desired as it did in the trials at Chittagong and Dubla Char. It requires two persons to be engaged full time (24 hours) one at sea and another ashore. The data and the information obtained were therefore mainly of a qualitative nature.

1982/83 : Encouraging results during the previous season led to the renewal of arrangements with the cooperating bahardar. Just before the start of the fishing season another study tour to Bombay was organized for five fishermen as a preparation for the coming fishing trials. A temporary BOBP residential hut was constructed to enable constant monitoring of the operations. The season started off with technical problems with the boats, and two extra boats had to be hired by BOBP. It was only during the latter half of the season (Jan.-Feb.) that the trials were regular and properly monitored. The fleet of nets used was as follows :

- Five conventional nets (3 of PE, 1 of PA and 1 of PE/PA). These nets are of conventional design but somewhat larger than the traditional nets. (See Fig. 6).
- One experimental net (Fig. 4) as used in the 1981/82 trials but operated in the traditional way with bamboo poles instead of ropes and floats.
- One dol net (Fig. 5) imported from India. This net is constructed on the same principle as the Behundi net. Its shape is achieved by taking in meshes and gradually reducing its mesh size, from the mouth-opening with 300 mm meshes to the cod-end with 25 mm meshes. It has a rectangular mouth opening but is without wings. Its framing is 27 m horizontal and 18 m vertical, the length is approximately 56 m. The opening of its mouth is achieved by means of floats and sinkers.

The Indian way of operating this net is to attach it to four rope-bridles, two on each side. The bridles are linked directly to wooden stakes embedded in the sea bed. Each time the net is hauled it is released from the bridle and the whole net taken into the boat.

The net could not however be operated the Indian way due to the lay out of the boats used. Only the cod-end was taken into the boat, and the net was turned in the water and floats and sinkers were shifted on the framing line. This had to be done just before and during the slack water period. Because of these complications the operation of the dol net was more time-consuming than that of the behundi net.

1983/84 : The plan for this season's trials was to operate one behundi unit and one dol unit for comparison. The behundi unit consisted of the five conventional nets used in the previous season (Serial No. 1 in Table 1). The dol unit had the imported net and two locally made dol nets (No. 5) together with the experimental net from the previous year (No. 2). The latter was however lost in bad weather and replaced by a large net of conventional design (No. 4).

To facilitate the operation of the dol nets, two new motorized craft of modified design were constructed and put into operation.

Also this year, prior to the fishing trials, four fishermen visited the Bombay area to study and learn the operation of the dol nets.

The trials were not conducted as planned with two completely separate units but useful catch data for different types of nets were obtained.

The five conventional nets were taken over by the bahardar at the end of the season against reimbursement of the full cost of the material.



The survey of the SBN fishery referred to in Chapter 2 was conducted during this season 1984/85 : As a result of the positive experience with the large net of conventional design (No. 4) and problems of handling the dol nets, the next trials were conducted with one unit of existing (traditional) nets (No. 6) and one unit of large conventional nets (No. 7). Five of the larger nets were fabricated for the trials by the cooperating bahardar's (new for this season) netmakers.

The unit of small nets operated three boats and 7-8 nets at a time. The unit of large nets had only two boats and kept 3-4 nets in operation at a time. Another difference was that the crew of the large net-unit were given fixed salaries while the other crew worked on a share basis.

The 1984/85 period produced what is believed to be reliable data for 100 days of fishing for both the units.

1985/86 : A new orientation was given to the fishing trials conducted in 1985/86. The principal aim was to determine the optimum cod-end mesh size which would ensure escape of small juveniles but at the same time would not sacrifice the profitability of the operator. The cod-end of the experimental nets had mesh sizes of 30,35,40 and 50 mm. The cod-end covers (Fig. 7) with mesh size of 13mm were also fabricated for attaching to the cod-end to carry out studies on mesh selectivity. The studies were made both in the experimental nets and in the traditional nets.

The bahardar operated the same eight traditional nets of the previous season; BOBP converted the old locally fabricated dol nets into ordinary behundi nets (No. 8) of sizes similar to those of the existing nets and thus operated eight nets. However, one of them was lost early in the season when a ship sailed over it.

Two fishery biologists of the MFD were added to the team to collect and analyze the mesh selectivity data.

#### 4. PRODUCTION RESULTS OF FISHING TRIALS

While testing the PE material in nets of conventional design in the first season no emphasis was given to the collection of catch data. Reports received from the fishermen indicate that the nets were catching as well as the nets made of PA and other materials were at that time considered sufficient, particularly since the fishermen wanted to buy the PE nets at full cost.

During the second season (1981/82) an attempt was made to collect catch data, enabling a comparison between different types of nets. It did not materialize – the difficulties in such an attempt had been underestimated.

The shortcomings were eventually rectified and data were obtained for the last four seasons 1982/83 – 1985/86; they are summarized in the table below :

**Table 2**  
**Set Bagnet Catches during Fishing Trials from Sonadia Island 1982-85**

Season	Fishing days (no.)	Type of net (material)	Nets (no.)	Area of mouth opening (m <sup>2</sup> )	Hauls (no.)	Total catch (kg)	Catch/ haul (kg)	Catch haul/area (kg/m <sup>2</sup> )
1982/83	26	Conventional (PE)	5	108.5	312	36,540	117	1.08
	16	Experimental (PE)	1	119.0	43	6,501	151	1.27
	14	Dol net (PE)	1	420.0	44	8,490	193	0.46
1983/84	76	Conventional (PE)	5	108.5	1,108	75,930	69	0.63
	33	Conventional (PE)	1	170.4	89	12,570	141	0.83
	71	Dol net (PE)	3	382.6 <sup>1</sup>	426	64,155	151	0.39
1984/85	99	Traditional (MX)	8	86.9	1,571	89,595	57	0.66
	99	Conventional (PE)	6	130.0	1,017	78,870	78	0.60
1985/86	94	Traditional (MX)	8	86.9	1,810	105,412	58	0.67
	94	Conventional (PE)	7 <sup>2</sup>	112.5	1,711	102,821	60	0.53

PE = Polyethylene      MX = PA, PE, PP and coir mixed

1 Average of one imported and two locally made nets.

2 Started with 8 nets but after a month only seven were used.

### Catch rate

The primary criterion used to compare the performance of different nets is catch/ haul versus the area of the mouth opening of the net. By plotting the trial data and using the lower catch values the following preliminary relationship can be established.

	Conventional	Experimental	Dol net
Mouth area (m <sup>2</sup> )	100	200	400
Catch/haul (kg)	60	100	160
Catch/haul/area (kg/m <sup>2</sup> )	.60	.50	.40

The catch rate will vary from one fishing ground to another and by season but it may be assumed that the relative difference for varying mouth openings would remain similar.

A source of error besides the catch records themselves could be the measuring and recording of the mouth openings of the four principal types of nets (traditional, conventional, experimental, dol net); many of the dimensions are undergoing changes from year to year.

A secondary performance criterion would be the frequency of hauls during a certain period (day). The number of hauls per day and per net can easily be calculated from the data in Table 2. The reason for not presenting them in a column is that many factors have affected the frequency during the trials.

- The number of nets given were not always in operation; some were kept in reserve.
- The same priority was not given to different nets in the same operating unit.
- The cooperating bahardars were two different persons, and the second one (1984/86) was reported to be more resourceful - he had more money, more power and more control over the crew team than the first.
- Differences in the pattern of remuneration paid to the crew members.

The only tentative conclusion that can be drawn is that the frequency of hauls goes down as the size of net increases. But it is not possible to quantify it. Some problems were experienced with the dol nets, also with the large experimental net. Some of these problems, however, may have been caused by the inexperience of the operators in handling new types of nets. After the last season it was felt that a net about 115 m<sup>2</sup> mouth area would be the maximum that could be operated at the same frequency as the smaller traditional nets.

According to the above area-catch relationship, five nets of 100 m<sup>2</sup> used in three hauls/day would produce 900 kg/day. A hypothetical alternative could be four nets of 200 m<sup>2</sup> used in 2.5 hauls/day. They would produce 1000 kg/day and offer a better alternative. However, the larger nets are more vulnerable to damage caused by handling, rough weather and big catches - all of which will reduce the efficiency of the larger nets. Further investigations are required to establish whether the nets can be made to yield a higher catch even when used less frequently.

### Species composition

The most common species caught in the SBN operated from Sonadia island are hairtail, anchovy, Bombay duck, shrimp and miscellaneous fish. Some details are given below :

**Table 3**  
**Composition of SBN catches during the fishing trials 1983/84 to 1985/86** (in %)

Variety	1983/84	1984/85		1985/86	
	All nets	Conventional nets	Traditional nets	Conventional nets	Traditional nets
Hairtail	40	30	31	69	43
Anchovy	22	31	29	13	10
Bombay Duck	10	15	16	3	15
Croaker	4	1	1	3	4
Shrimp	2	7	7	3	15
Miscellaneous	22	16	16	9	13
	100	100	100	100	100

\* Mostly bony fishes; some pomfret, shad, catfish, and eel have also been included in some seasons.

Although the composition has varied somewhat between seasons, the order of dominance has not changed.

### Mesh size selectivity

In view of a general feeling that the SBN might endanger resources because of its small mesh size, the project made an attempt with determining the ideal cod-end mesh size for off-shore set bagnets. Trials were conducted with various experimental gears (cod ends of 30,35, 40 and 50 mm mesh size); their performance was compared with one another and also with the traditional units (cod-end of 20-25 mm mesh size). The study undertook the following tasks :

- Comparison of quantity and species composition of equal sized nets with different mesh sizes in the cod-end, against traditional nets;
- Length-frequency analysis of some dominant species from nets of different cod-end mesh sizes;
- Collection of random samples of catches from a number of different cod-ends simultaneously;
- Conduct of trials with cod-end cover (Fig. 7) to determine the retention rate of different mesh size cod-ends.

From the tabulated results (Table 4), it would appear that due to highly variable day-to-day catches, in terms of both quantity and species composition, no definite pattern could be noticed. It is also possible that the number of observations were few and that the catches between two successive mesh size cod-ends got mixed sometimes.

**Table 4**  
**Catch records of mesh selectivity trials**

Net	Traditional**		Conventional*		
	20-25	30	30-35	35-40	40
Mesh/size (mm)					
1.12.85 to 10.12.85					
Hauls (no)	218	—	137	—	65
Catch/haul (kg)	58.5	—	53.9	—	58.4
Catch/haul/area (kg/m <sup>2</sup> )	0.67	—	0.48	—	0.52
15.1.86 to 31.1.86					
Hauls (no)	185	63	—	92	—
Catch/haul (kg)	34.9	60.0	—	49.4	—
Catch/haul/area (kg/m <sup>2</sup> )	0.40	0.54	—	0.44	—

\* Area of experimental net is 112.5 m<sup>2</sup>

\*\* Area of traditional net is 87.5 m<sup>2</sup>

The length frequency data collected on two species – Croaker (*Pennah* sp.) and hairfin anchovy (*Setipinna taty*) – did not show any significant difference in the modal or mean length between the mesh sizes 30-40 mm and 20-25 mm.

For the trials with cod-end covers, cod-ends of 30, 40 and 50 mm were selected from the conventional nets, and a 25 mm cod-end from a traditional net. Two covers with a 13 mm mesh size were used simultaneously at two different cod-ends in January-February 1986.

The average retention in the 40 mm cod-end was 82 per cent and that in the 30 mm 85 per cent, thus indicating that the fish which managed to escape from the 40 mm cod-end were only fractionally more than those which escaped from the 30 mm cod-end. But in the trials between 40 mm and 25 mm cod-end mesh sizes, the average retention in the latter was as high as 96 per cent and the one in the former, 56 per cent. Two sample trials with 50 mm cod-end showed that the ratio between escapement and retention was almost 50/50; many of the medium sizes of the most common varieties managed to escape.

## 5. DISCUSSION

The progress of the BOBP's activities on the SBN fishery started with testing the suitability of PE netting material as an alternative to nylon multifilament (PA) and tyre cord from the standpoint

of cost effectiveness. As the initial trials showed positive results, the approach shifted towards experimenting with new designs and riggings and also with proven designs and methodology for a similar fishery in the adjacent country. Simultaneously it was also found desirable to undertake a survey of the SBN fishery to update the data base and to assess the requirements of material, if fishermen switch over to PE nettings.

As it was found that the Dol net may not be operationally adaptable to the traditional craft and also that large versions of conventional design would not be easily adapted, it was concluded that perhaps a net with an 18 m horizontal opening would be suitable – a size in between the one used in the traditional sector (12-14 m) and the largest experimental size (21 m). Meanwhile the traditional sector, having realised the advantage of larger nets, also gradually started increasing its sizes from a maximum of 12 m before the start of BOBP's work.

A beginning was made in trying out increased cod-end mesh size to prevent harmful effects on the resource. Experiments with different mesh-sized cod-ends and conversations with the fishermen have resulted in a consensus, according to which fishermen may accept the 40 mm mesh cod-end provided the PE netting material (360d) is of 36 ply.

It can thus be concluded that the objective of improving the set bagnet fishery has been satisfactorily achieved. It would be worthwhile to recapitulate the events and opinions encountered during the course of the project. This would facilitate conclusions about various aspects of the SBN fishery, also about needed follow-up action.

#### **Suitability of polyethylene**

The fishing trials clearly establish that the PE material is definitely suitable as an alternative to the conventional material used so far. Since the material is 25 per cent cheaper, it constitutes a saving. Since PE monofilament has a lower specific gravity, its buoyancy tends to keep the nets close to the surface, especially when the tidal flow is weak or moderate. The traditional nets of heavier PA twine go down more easily. As a result, more ballast in fishing depth adjustment is required.

It was found that if an enlarged mesh size for the cod-end is to be accepted by the fishermen for PE netting material, it has to be thicker (36 ply). This makes the meshes more fixed (as against the flexibility of 24 ply which allowed fish to squeeze through the meshes).

The change to thicker twine may perhaps quell complaints in some quarters that PE material is more susceptible to damage than PA material, and consequently requires higher maintenance cost. The constant demand from fishermen for supply of PE netting material should also discount such complaints. A certain negligence of damaged portions of the net and failure to repair them promptly could have spurred such complaints.

With the distinct possibility of the SBN using PE netting material, a private firm has set up a factory with the ability to produce PE twine. It is also reported that the firm has produced twine of acceptable quality. However, it is learnt that its initial production may concentrate on thicker qualities (for producing PE ropes) till the demand becomes pressing. Meanwhile, the State-run Bangladesh Fisheries Corporation has also installed a plant. Both these developments were influenced by the results of BOBP activities and the fishermen's response to them.

#### **Size of the net and of cod-end mesh**

With the trend towards enlargement of the net, a word of caution is necessary. If the mesh size at the codend is not increased simultaneously, there is a danger of damage to resources. While acceptance in principle by the fishermen for enlarging the mesh size of the cod-end is a healthy sign, more methodical and carefully planned studies are necessary, both in offshore and inshore areas, in order to monitor the fisheries.

#### **Modification of the net**

It has been felt that the overall mesh sizes are unnecessarily small, particularly in the mid-sections of the nets, and the hanging ratio is also too low (below 0.30). There would be substantial material saving by increasing the hanging ratio to 0.40 and the overall mesh sizes.

On BOBP's advice, the cooperating bahardar tried a new bridle system by replacing two of the three pairs of bridle bamboos by rope and a plastic buoy. It worked well and was less laborious

than the traditional system. It will also reduce recurring expenditure. It is the shortage of suitable bouys and ropes and the risk of theft of unguarded buoys which is responsible for the method not getting popular.

### Study tour

The first study tour was indeed a successful one. It served to educate the principal target group of the tour – the fisherman-cum-fleet owner (bahardar). There were meaningful discussions with and among them at the end of the tour; the objective of technology transfer was seriously pursued through follow-up effort.

However, the success of the first study tour was not replicated in the succeeding two study tours by nine fishermen. They belonged to the secondary target group. It is suspected that there was no follow up of their activities subsequent to their return; it is learnt that all of them have stopped work with SBN and have taken to gillnetting or longlining.

### Production estimate

The total production of the SBN fishery appears to have been underestimated. The highest estimates were in the order of 50,000 t, while the findings of the pilot survey and the fishing trials suggest a production of 72,000 – 83,000 t. Details are given in the table below :

**Table 5**  
**Estimated landings from SBN in the marine and estuarine sectors of Bangladesh.**

Size of net	Catch/day/ net (kg)	Nets (no)	Days of operation (no)		Estimated catch (t)	
			high	low	high	low
Large	130	4,065	100	90	52,845	47,561
Medium	14	4,489	250	200	15,712	12,569
Small	8	7,142	250	200	14,284	11,427
Total		15,696			82,841	71,557

The estimates are based on a sample of 3 per cent of the SBN and 172 bahardars only, and should therefore be regarded only as indicative.

As far as Sonadia Island is concerned, on the basis of an average catch of 140 kg per net per day from the traditional net of the cooperating bahardar, and on an approximate count of 350 nets in the island and 90 fishing days in the season, the catch amounts to about 4,400 tonnes.

### Fish handling

An area of the SBN fishery that needs a closer look concerns post-harvest activities. There is no supply of ice to the fishing areas, not even for fish that is to be sold fresh. Ice supply should be possible to arrange as there are many ice plants in nearby Cox's Bazaar. At present a few small companies keep some ice boxes at Sonadia for fresh fish and shrimps purchased from SBN boats. Quite often, boatloads of half-rotten fish are landed. Sometimes catches are kept in the hold for up to 48 hours. But such fish will also be dried as usual. The hygiene at shore and on the boats is poor. Fish holds are rarely cleaned or emptied completely – this means that decomposing fish get mixed with fresh fish. The nets are operated for weeks without proper cleaning. Larger fish specimens are often gilled in the wing meshes or in the main nets. After a few days such fish will be in such a state of decomposition that they will get loose and mix with fresh catch in the cod-end. This affects the quality of the catch. It is therefore emphasized that proper handling of the catches will considerably improve the quality of both fresh and dried fish.

### Economics

In fishing units organized by a bahardar, the nets and boats used are often his own property. Sometimes the boats and other equipment are rented for the fishing season.

The bahardar incurs greater financial risk with a remuneration based on fixed salaries than with a share system, since the fixed costs – of which the salaries are a part – are higher. But if the fishing season is good and catches are high, the first system may give the bahardar higher profits.

In a share system, the risks as well as the profit-making opportunities are equally shared between the bahardar and the labourers. The gross earnings minus the general operating costs are shared according to the system agreed upon. Some specific operating costs will be borne by the bahardar.

The polyethylene (PE) set bagnet which were tested during the trials are 25% cheaper than nylon and tyre cord. This is a sizable saving in the investment cost of nets, but it is boats that usually constitute the main part of the investment. Therefore, the lower cost of nets does not reduce the total investment cost or boost the rate of return on investment substantially. Improvement in catch efficiency, on the other hand, will push up profitability quite a bit, as compared to a reduction in the investment cost of nets.

Appendices 1 and 2 detail the costs and earnings of a set bagnet unit based on a share system and a unit based on fixed salaries. No deeper analysis has been made on the economics, and Appendix 1 only illustrates the system and its components. As the earnings vary considerably from season to season with the costs of different units, the figures should only be regarded as indicative.

#### Shortcomings/problem areas

*Identity* : The specific identity of at least the major components of the SBN catch was not established. This posed a handicap when it was decided to undertake mesh selectivity experiments. For example, many species of hairtails, croakers, anchovies and shrimps are economically important. Some of them may not be juveniles when they are caught in the SBN. Unless the species identity is known, it is not possible to say whether that species required protection or conservation. In other words the input was inadequate from the biological standpoint.

*Estimation of catch* : The eye estimation of species composition of the catch is subject to criticism because it is highly subjective.

*Dissemination of results* : The positive results of BOBP's SBN activity became known to the community at large mainly through word of mouth. In fact it was reported that fishermen in neighbouring and far-flung areas were inquisitive about the happenings in Sonadia. It would help the fishermen if at the end of the season a short account of the outcome of the activity is translated into Bengali and distributed throughout the country. This might, for example, encourage the private entrepreneur who has set up a plant for production of PE twine, to cater to the needs of fishing nets rather than for ropes.

## 6. CONCLUSIONS AND RECOMMENDATIONS

1. PE twine has been fully accepted as SBN material by the fishermen and they are eager to buy it if it is made available locally.

The two factories recently established for producing PE twine may be persuaded to cater more to the needs of net making.

2. The maximum horizontal opening of the set bagnet without changes in the operational pattern is about 18 m with a vertical opening between 6.0 and 7.0 m.

The catch per haul increases by size of net but the frequency of hauls (no. of nets and no. of hauls per net) decreases for nets larger than the maximum stated above (18 m). The feasibility of using larger nets at lower frequency has not been established.

With the trend towards enlargement of the net there is danger of increased damage to the resources if the cod-end mesh size is not enlarged simultaneously. Hence a careful monitoring of the development is essential.

3. Early consideration should be given to stipulating a minimum mesh size of 40 mm in the cod-end of the offshore SBN fishery.

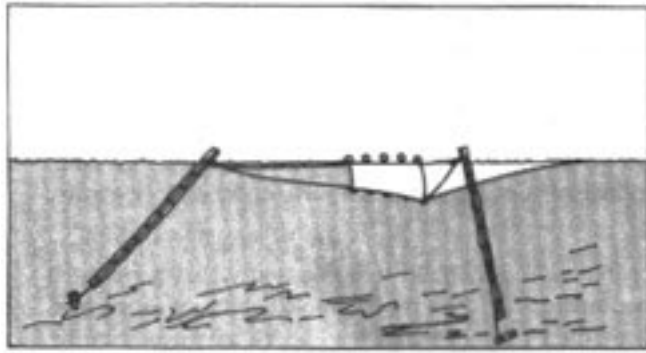
Mesh selectivity experiments were too few to draw any definite conclusions. But the provisional finding that increasing the cod-end mesh size from 25 mm to 40 mm will not lower the revenue of the fishermen but will save the young fish appears to have convinced the fishermen to the extent of making them agree to the change.

4. The new bridle system of replacing two of the three pairs of bridle bamboos with rope and plastic buoy would reduce the recurring expenditure and will also be less laborious.

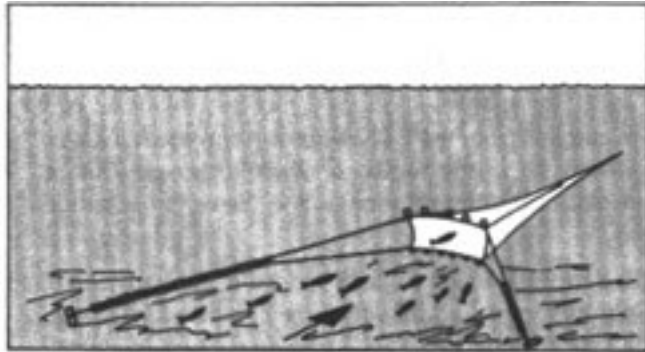
5. The Dot net used in the Indian northwest coast for set bagnet fishery does not appear to hold promise for Bangladesh. Its manoeuvrability is difficult in Bangladesh conditions, where currents are much stronger. This is also valid for the dol-behundi hybrid experimented with during trials.
6. One of the three successive study tours was successful in educating the target group of fishermen-cum-fleet owners (bahardars). The other two tours failed in the sense that none of the fishermen-trainees is reported to be engaged in SBN fishery at present. The lesson is that such tours/training should be arranged only for the principal target group and not for secondary or tertiary ones.
7. In fishing trials to improve fishing gear or innovate new gear, it is necessary that a biologist be involved in the project right from the beginning, so that the biological impact is studied simultaneously and inputs are modified or diversified whenever necessary. Absence of such an arrangement was markedly felt.
8. The handling and preservation of fish in the SBN fishery leaves a lot of room for improvement. Better quality would, at least for some types of fish, lead to higher prices. The possibility of remedial measures would be worth investigating.
9. It has been provisionally estimated that the catches from the SBN fishery in the coastal areas of Bangladesh (marine and estuarine sectors) may be in the region of 75,000 tonnes. This is significantly higher than earlier estimates and places the importance of the fishery in a better perspective.
10. The pilot survey of the fishery helped to update data which were 15 years old and may serve as a reference material for planners and administrators for some years to come until results of more intensive studies become available. In view of the importance of the fishery, such studies (widened to include biological aspects) should be undertaken to cover all the major geographical areas of the SBN fishery.

Figure 1

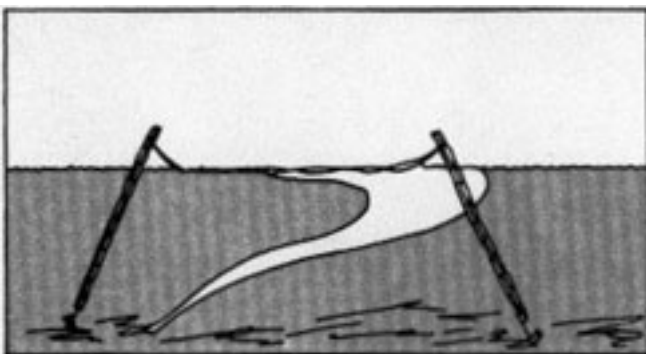
### HOW THE SET BAGNET (BEHUNDI JAL) IS OPERATED.



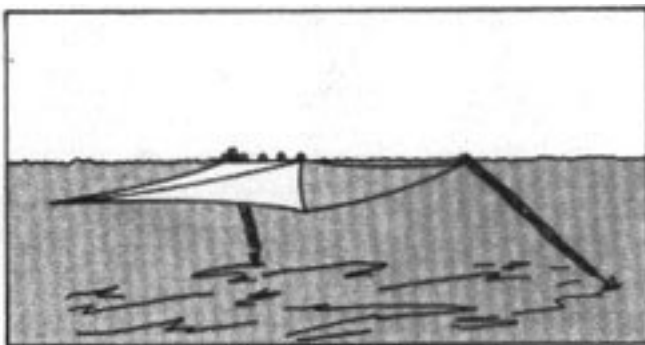
During the intertidal period the net is set in the current by attaching it to holdfasts. The net floats on the water surface.



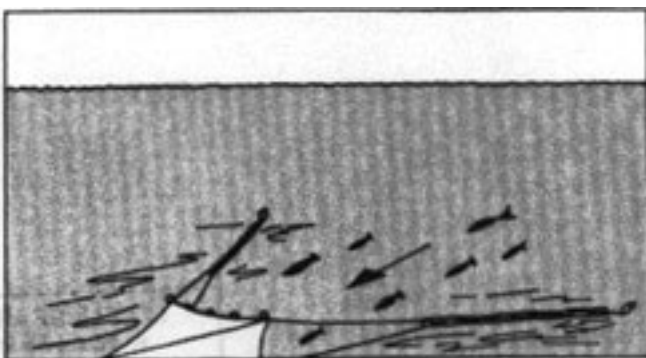
2. When the current gets strong, the net sinks and stretches. Fish drift in with the current.



3. During a subsequent intertidal period the net comes up to the surface and is emptied of catch.



4. The current reverses itself, and the net is set in the opposite direction.



5. As the current gains strength, the net once again sinks and stretches, this time in the opposite direction.

The sequence of operations may be repeated as long as

- (a) satisfactory catches are attained
- (b) the gear remains undamaged, and
- (c) the weather remains fair.



Figure 2 TRADITIONAL SET BAGNET (CHITTAGONG)

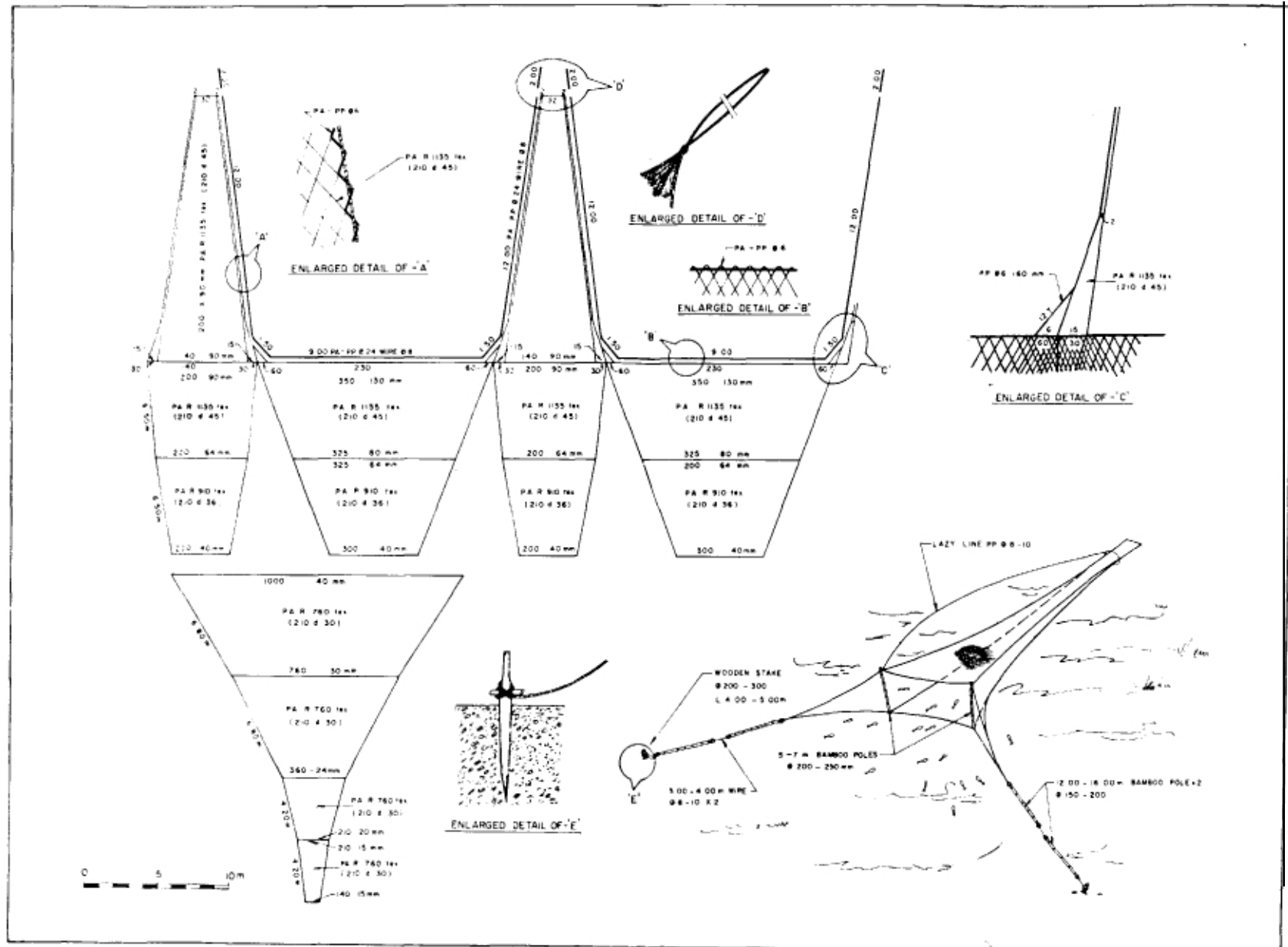


Figure 3 LOCATION OF COASTAL AND OFFSHORE SET BAGNET OPERATIONS

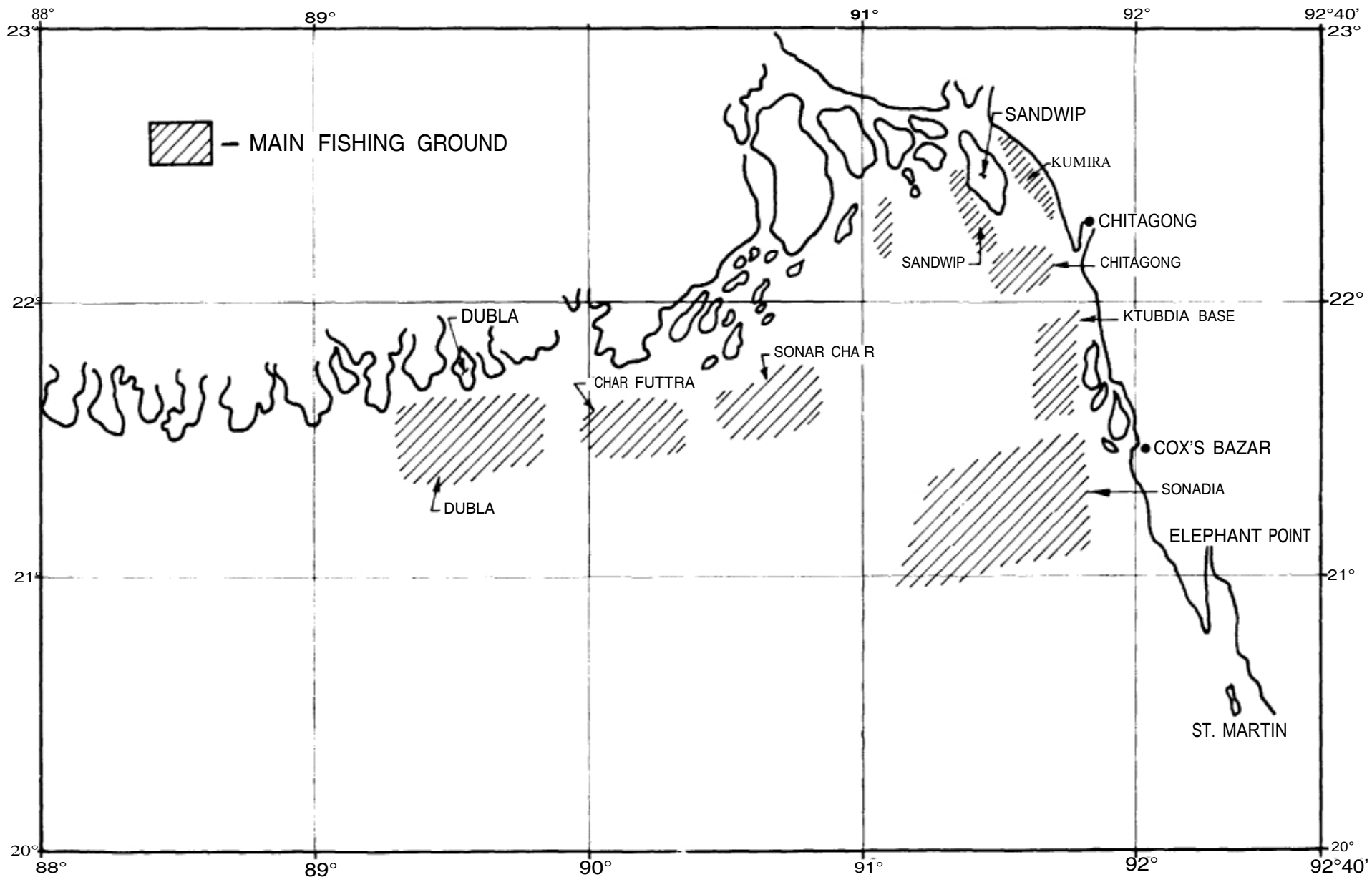






Figure 6 ENLARGED SET BAGNET OF CONVENTIONAL DESIGN MADE OF PE

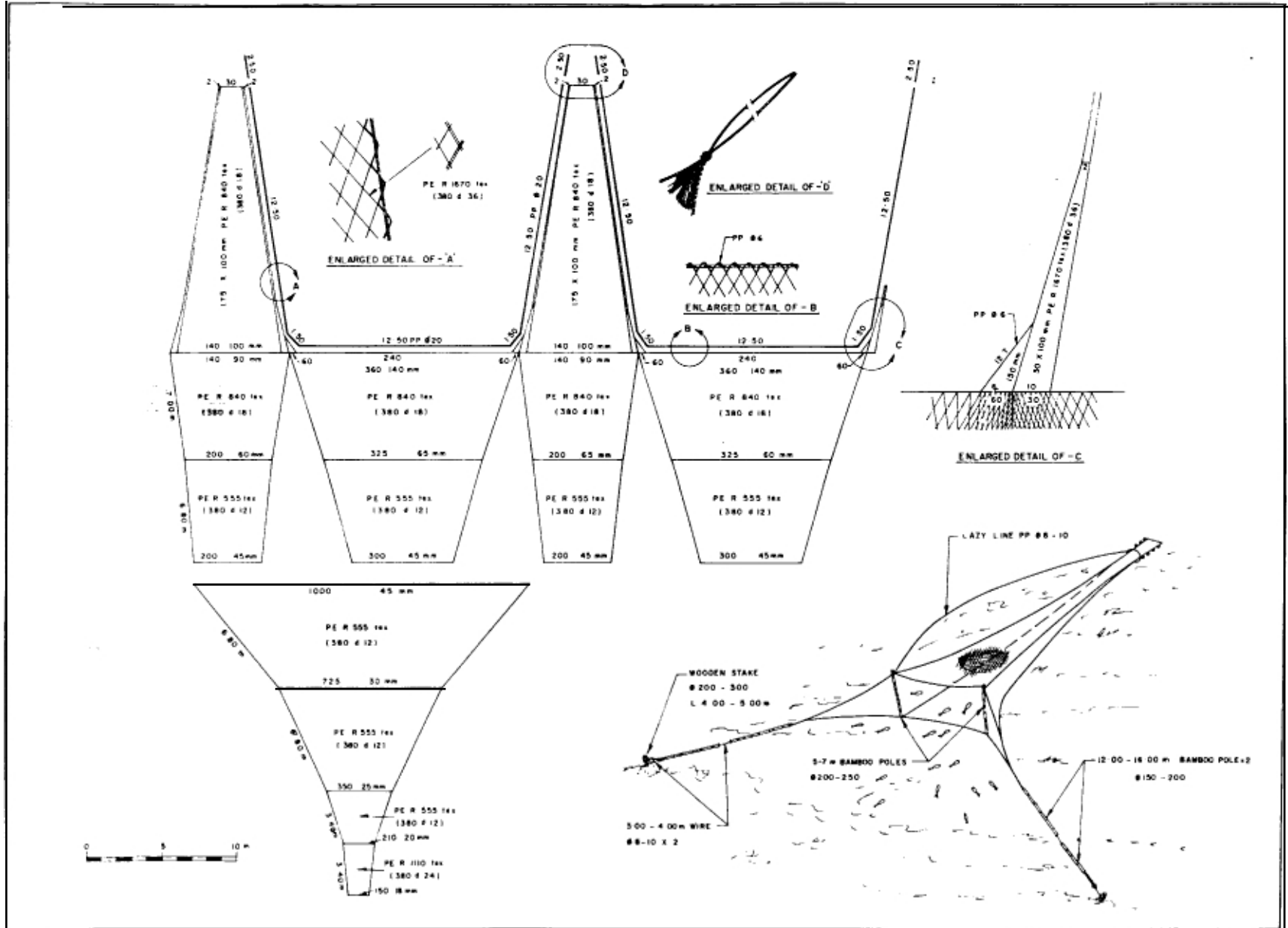
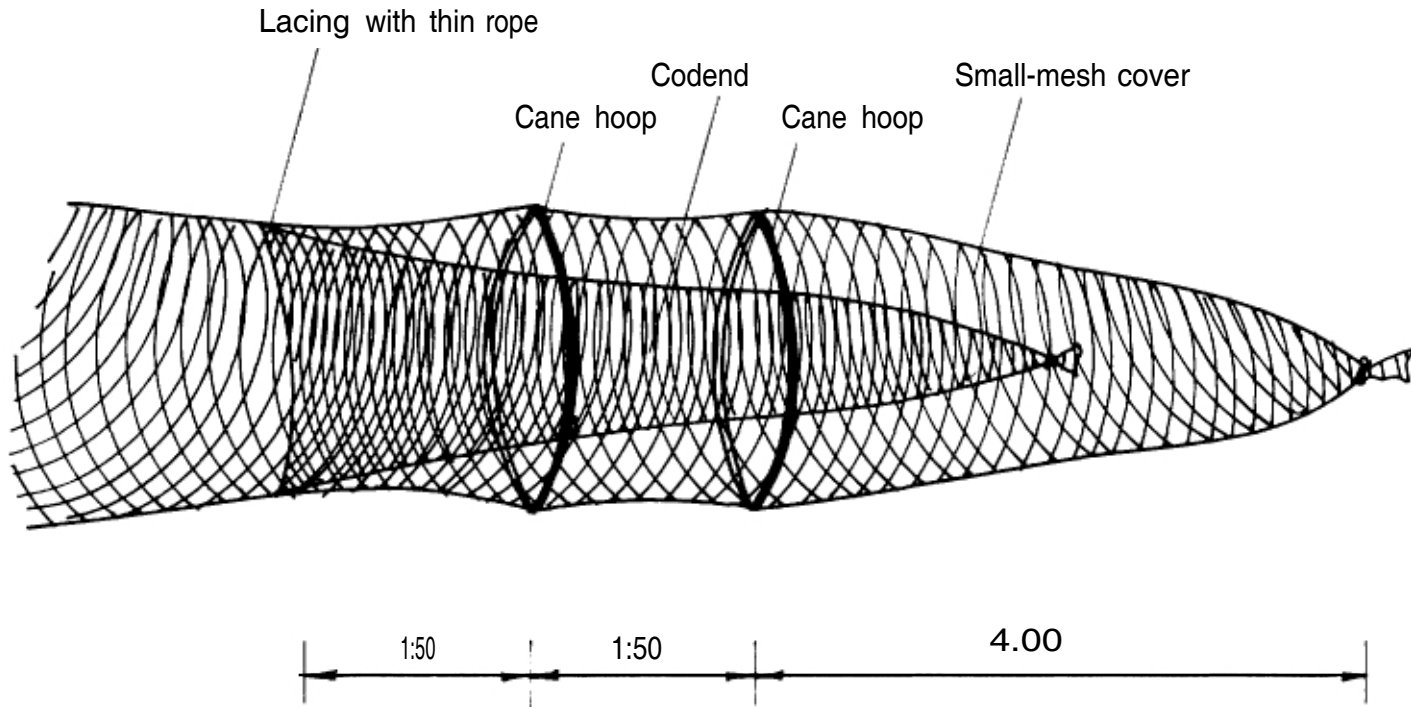


Figure 7 DESIGN OF COD-END COVER



GENERAL SPECIFICATION    CODEND COVER

Twine	PA white 210d 6
Mesh size	12—13mm stretched mesh
Cane hoop diameter	= 1:25 m
Length of cover	700m
Stretched circumference of cover	4.50m

The function of the hoops is to expand the cover net to get some distance between cover and codend—thus enabling easier passage for fish/shrimp through the codend into the cover.

Appendix 1

**Costs and Earnings of a Traditional Set Bagnet Unit  
at Sonadia Island 1984/85 – Share System**

<b>1. Investment Cost</b>			
1. One motorized fish carrier hull <sup>1</sup>	Tk	85 000	
Engine & installation		88000	
2. 10 set bagnets (at Tk 14 000)		<u>140000</u>	
Total	Tk	313 000	Tk 313 000
 <b>II. Gross Earnings</b>			
1. Ribbon, Bombay duck, anchovy etc.	Tk	379 015	
2. Small miscellaneous fish		19 970	
3. Jewfish, catfish, pomfret, shark, Indian salmon		<u>20 000</u>	
Total	Tk	418 985	Tk 418 985
 <b>III. Operating Costs</b>			
A. General			
1. Piling (70 nos. )	<b>Tk</b>	5600	
2. Bamboo (bridle 1/3 90 nos)		3 330	
3. Jute ( 1/3)		2 000	
4. Wire ( 1/3,4.5 mds)		2 333	
5. Miscellaneous (rope, nut, bolt, GI, wire etc., 1/3)		8 000	
6. Food items (veg. oil, firewood etc.)		26 871	
7. Diesel and lub. oil		50 041	
8. Boat hire charge (2 boats)		<u>40000</u>	
Total	Tk	138 175	
 8. Bahardar			
1. Bamboo (bridle phung 44 2/3 180 nos. Tk 4467; bridle Tk 700; fish drying 1750 nos. Tk 3050)	Tk	8 417	
2. Jute (2/3)		4000	
3. Wire (2/3 10.6 mds)		11 020	
4. Miscellaneous (rope etc. 2/3)		16 000	
5. Utensils		3 500	
6. Mat (140 nos.)		7 000	
7. Boat and net repair		6 000	
8. Longi (crew members)		2 850	
9. Miscellaneous		9 000	
10. Store labourers		<u>10 000</u>	
Total	Tk	77 787	
 C. Crew members etc. 29 shares <sup>2</sup> (51-22) at Tk 4918 per share <sup>3</sup>			
	Tk	142 622	
Total			Tk 358 584

**IV. Fixed Costs**

Depreciation		Tk	8 500		
Hull (10 years)			17 600		
Engine Et Installation (5 years)			28 000		
	Total	Tk	<u>54 100</u>	Tk	54 100

**V. Total Costs (III + IV)**

Tk 412 684

**VI. Net Earnings (II - IV)**

Tk 6 301

1The other two boats, one motorized fish carrier and one non-motorized boma, were rented.

**2 Total shares of the unit**

		<i>Bahardar shares</i>	
Boat (1 motorized)	2	Boat	2
Net (10 nos.)	20	Net	20
Bahardar	1	Bahardar	1
Majhi (3)	1	Shore labourers	2
Engine Drivers (2)	2	Total	25
Other Crew (21)	21		
Shore labourers (4)	- 4	<i>Less :</i>	
Total shares of the unit	51	Majhi	2.5
Bahardar shares		Engine Driver	<u>0.5</u>
(see column at right)	22	Total	3.0
Total crew shares (51-22)	29	Balance	22

**3 Value of each share**

## Gross Earnings

Tk 379 015 (100% of II. 1)		
Tk 9 985 (50% of II. 2)	Tk	<b>389 000</b>
Operating costs, General (III.A)		<u>138 175</u>
Total share amount	Tk	250 825
Each share (Tk 250 825/51 shares)	Tk	4 918



**Appendix 2****Costs and Earnings of Experimental Set Bagnet Unit  
at Sonadia Island 1984/85 – Fixed Salary System**

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<b>I. Investment Cost</b>			
5 Set Bagnets (at Tk. 18000)			Tk 90 000
<b>II. Gross Earnings</b>			
1. Ribbon, Bombay duck, anchovy etc.	Tk	275 109	
2. Small fish		15 375	
3. Jewfish, pomfret, shark, etc.		20 000	
		<hr/>	
Total			Tk 310 484
<b>III. Operating Costs</b>			
1. Piling (70 nos.)	Tk	4 000	
2. Bamboo (fish drying, 1750 nos. Tk 3050; Phung 32, bridle 1200, Tk 2850)		5 900	
3. Jute		6 000	
4. Wire (11 mds)		5 760	
5. Miscellaneous (rope, nut, bolt, GI Wire, anchor etc.)		22 880	
6. Utensils		2 500	
7. Mat (100 nos.)		5 200	
8. Rice		24 685	
9. Food items (oil, species, vegetables, firewood etc.)		21 221	
10. Boat hire charge (2 boats)		30 000	
11. Diesel and lub. oil		44 810	
12. Miscellaneous		2 500	
		<hr/>	
Total	Tk	175 456	
<b>IV. Fixed Costs</b>			
Crew wages	Tk	100 000	
Shore labourers		9 000	
Depreciation : Nets (5 years)		18 000	
		<hr/>	
Total	Tk	127 000	
<b>V. Total Costs (III + IV)</b>			Tk 302 456
<b>VI. Net Earnings (II - IV)</b>			Tk 8 028

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## ***Publications of the Bay of Bengal Programme (BOBP)***

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The BOBP brings out six types of publications :

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

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

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

*Miscellaneous Papers* (BOBP/MIS/ ) concern work not originated by BOBP staff or consultants but which is relevant to the Programme's objectives.

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

*Newsletters* (*Bay of Bengal News*), issued quarterly, contain illustrated articles and features in non-technical style on BOBP work and related subjects.

A list of publications follows.

### *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.
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- 10.2 Report of the Consultation of 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.
16. Report of the Seventh Meeting of the Advisory Committee. New Delhi, India, January 17-21, 1983. Madras, India, March 1983.
17. Report of Investigations to Improve the Kattumaram of India's East Coast. Madras, India, July 1984.
18. Motorization of Country Craft, Bangladesh. Madras, India, July 1984.
19. Report of the Eighth Meeting of the Advisory Committee. Dhaka, Bangladesh, January 16-19, 1984. Madras, India, May 1984.
20. Coastal Aquaculture Project for Shrimp and Fish in Ban Merbok, Kedah, Malaysia. Madras, India, December 1984.
21. Income-Earning Activities for Women from Fishing Communities in Sri Lanka. Edeltraud Drewes. Madras, India, September 1985.
22. Report of the Ninth Meeting of the Advisory Committee. Bangkok, Thailand, February 25-26, 1985. Madras, India, May 1985.
23. Summary Report of BOBP Fishing Trials and Demersal Resource Studies in Sri Lanka. Madras, India, March 1986.

24. Fisherwomen's Activities in Bangladesh : A Participatory Approach to Development. Patchanee Natpracha. Madras, India. May 1986.
25. Attempts to Stimulate Development Activities in Fishing Communities of Adirampattinam, India. Patchanee Natpracha, V.L.C. Pietersz. Madras, India, May 1986.
26. Report of the Tenth Meeting of the Advisory Committee. Male, Maldives, 17-18 February 1986. Madras, India, April 1986.
27. Small-Scale Aquaculture Development Project in South Thailand : Results and Impact. E. Drewes. Madras, India, May 1986.
28. Activating Fisherwomen for Development through Trained Link Workers in Tamil Nadu, India. Edeltraud Drewes. Madras. India. May 1986.
29. Towards Shared Learning : An Approach to Nonformal Adult Education for Marine Fisherfolk of Tamil Nadu, India. L. S. Saraswathi and Patchanee Natpracha. Madras, India, July 1986.
30. Summary Report of Trials with Large-Mesh Driftnets in Bangladesh. Madras, India, May 1986.
31. In-Service Training Programme for Marine Fisheries Extension Officers of Orissa, India. U. Tietze. Madras, India, August, 1986.
34. The Coastal Set Bagnet Fishery of Bangladesh – Fishing Trials and Investigations. S.E. Akerman. Madras, India, November 1986

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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, India, June 1980.
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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. O. 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.
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