THE BEACH SEINE FISHERY OF TEKNAF

by

Z A Chowdhury
Md. G Khan
S A Quayum

Marine Fisheries Survey, Management and Development Project, Department of Fisheries, Chittagong

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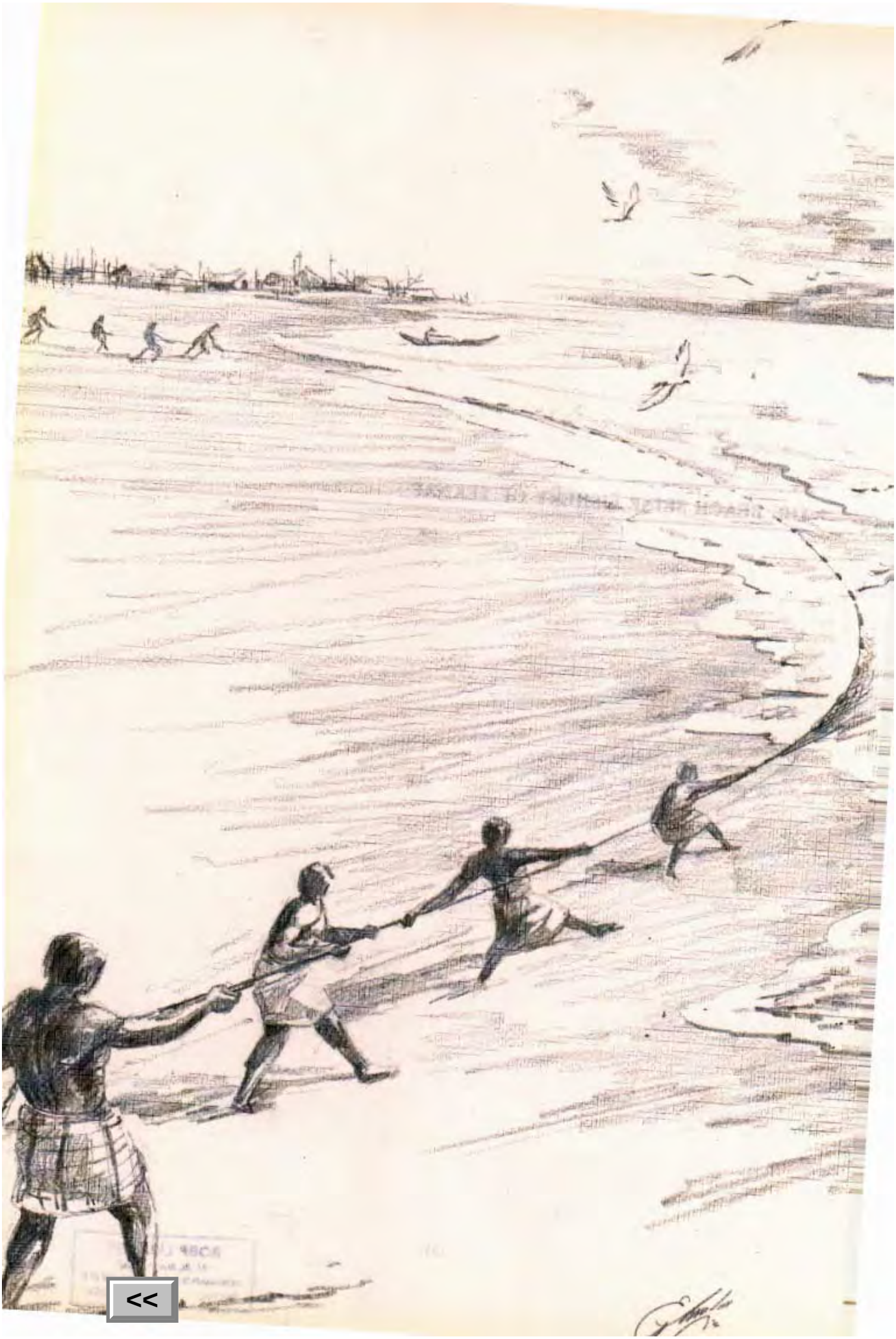

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11. *INTRODUCTION*

The numerous tributaries, tidal canals, brackishwater lagoons and estuaries, each with such distinct hydrological features as nutrient-rich soil and water, high oxygen content, low salinity, tidal current, shallow water depth etc., have naturally evolved as ideal nursery grounds for many marine fish and shrimp and some of freshwater origin. Beach seines operated in (his zone, like many other artisanal gear, use nets of very small mesh. They are mainly used to catch the juveniles and pre-adult species of Croaker, Bigeye Shad, other Clupeids. Anchovy. Ribbonfish, Brown Shrimp, Pink Shrimp and other miscellaneous fish in the estuaries and along the coast of Bangladesh.

According to the results of a frame survey of the marine artisanal fisheries (Anonymous 1984/85), there are 558 beach seines in Bangladesh. The number of nets operated in different areas is given in Table 19. There are no records of any scientific work on the beach seine fishery's production or on the biology of the species harvested by it in Bangladesh. The present study appears to be the first attempt. It reports on the species composition, catch rate, size range and predominant sizes of fish caught in Teknaf in the Cox's Bazar area.

Table 19: Distribution of beach seine nets in different areas

Area	*Cox's Bazar*	*Chittagong*	*Noakhali,*	*Borisal*	*Patuakhali*	*Khulna*	*All areas (Total)*
Number	346	60	24	22	0	96	558
Per cent	62	11	4	4	2	7	100

12. *THE BEACH SEiNE AND ITS MODE OF OPERATION*

The beach seine is an encircling type of net (locally referred to as b*er jal.* The specifications of the beach seine nets used in the Teknaf area are given in Figure 14,

Fig **14.** The **Bangladesh beach seine - Its specifications**

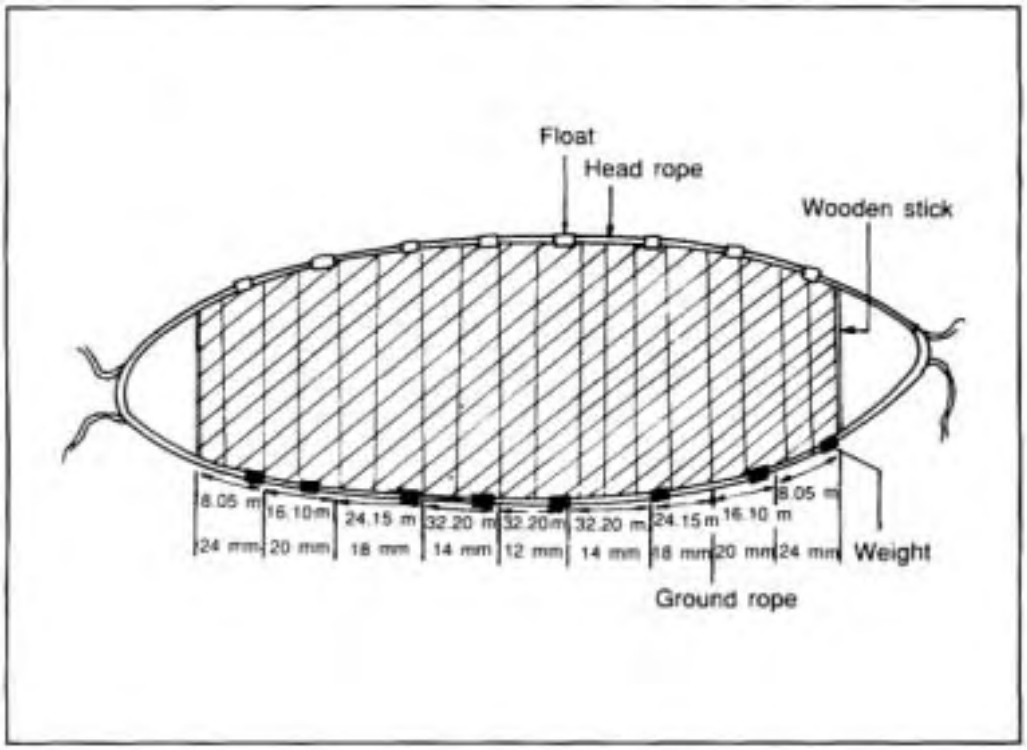

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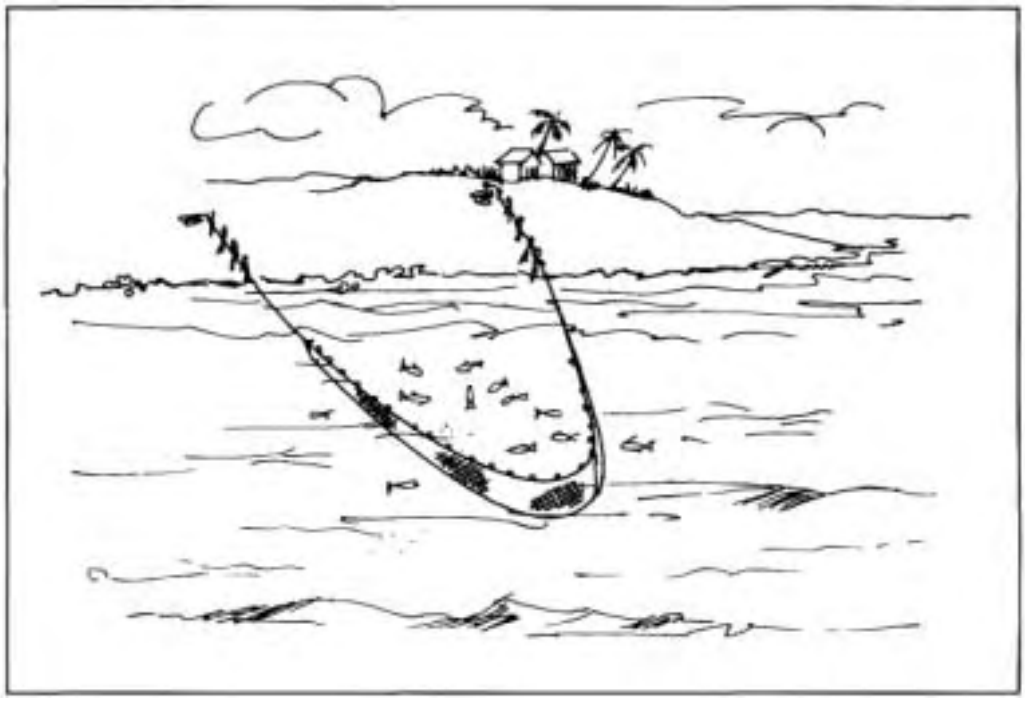
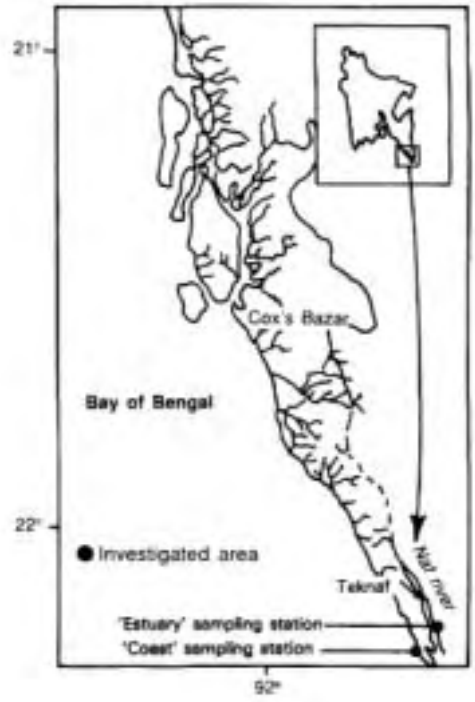
Fig 15. The Bangladesh beach seine - tts operation



A beach seine is operated by 11 - 15 fishermen with one boat. The net extends 600-700 m from the shore to where the depth of water is 8 - 10 m. The net is shot from the boat, to encircle a body of water (Figure 15). It is then brought ashore by the fishermen, who pull the ropes at both ends of the net from the beach. It takes 1-11/2, hours to complete a haul. The fishermen make 3-5 hauls a day, from dawn to afternoon.

Fig 16. Map showing locations of the two sampling stations



13. *METHODOLOGY*

The survey was conducted from March 1988 to February 1989. Two stations were selected, one in the Naf river estuary marked as sampling station 'Estuary' and the other on the Teknaf sea coast and marked as sampling station 'Coast' (see Figure 16). These are in the Cox's Bazar area. The fishing season in the estuary is from March to November, when the sea becomes rough, and on the coast from November to February.

At the 'Estuary' Station, operations of two beach seine nets were sampled on two consecutive days every month, for catch, species composition and size ranges.

At the 'Coast' Station, operations of three or four beach seine nets were sampled for catch, species composition and size range on three or four consecutive days every month. During the spring tide period, when the fishery is active, more nets were sampled on more days.

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As the total catch from the individual hauls were large, subsamples were taken and sorted by species or species group, the weight of which was later raised to the catch of the haul. Collection of length frequency data of major shrimp and finfish species was attempted, but, due to insufficient samples, the data were used mainly to examine size ranges and modal groups.

The shrimp species were identified using Dali (1956), George(l969), Khandakar and Pattra (1971), Shafi and Quddus (1982) and Fischer and Bianchi (1984). The finfish species were identified using Day (1989), Munro (1955), Shafi and Quddus (1982) and Fischer and Bianchi (1984).

Costs and earnings and socioeconomic information were obtained by direct observation and from discussions with the fishermen during sampling visits. The data gathered included information on operational expenditure and income, marketing of catch and prices, income distribution patterns etc.

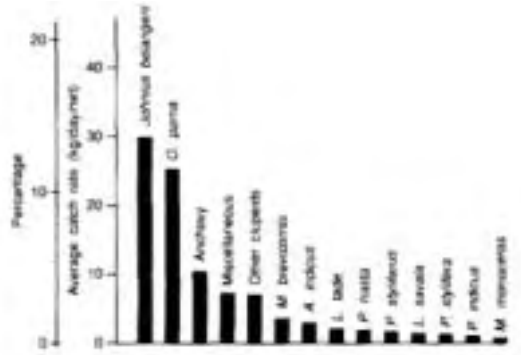
14. *RESULTS*

14.1 *Species composition*

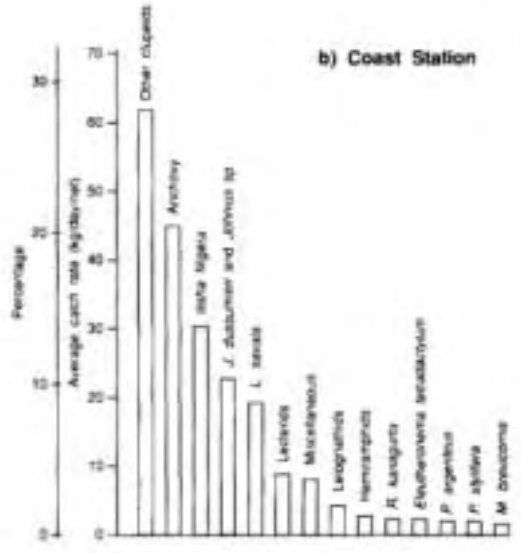
Fourteen species/groups of finfish and shellfish were identified in the estuarine and marine beach seine catches. These included seven species of penaeid shrimp, four species of Caridean shrimp, one or two species each of solenocerid, sergestid and alphid shrimp, species of crab, squilla, mollusc and starfish and 32 species/groups of finfish.

Fig 17. Overall species composition *(%)* and **catch rate (kg/day/net) in the beach seine fishery at the** two **stations**

a) Estuary Station



b) Coast Station



At the Estuary Station, the predominant species/groups were the Croaker *(John/us he/angeril* and *Otolithoides pania).* Anchovy and other clupeids (Figure l7a). These were followed by the Yellow Shrimp *(M. brevicornis)* Sergestid Shrimp *(Acetes indictis),* Grey Mullet *(Liza tade),* Grunt *(Pornadasvs hasta),* Caridean Roshna Prawn *(Pa/aenjon styliferus),* Ribbonfish *(Lepturacanthus savala),* Kiddi Shrimp *(Parapenaeopsis stylifera),* Indian White Shrimp *(P. indicus)* and the Brown or Speckled Shrimp *(M. monoceros).*

At the Coast Station. the Bigeye Shad *(Ilisha filigera)* and other clupeids and anchovy were dominant in the catches, and were followed by the Croakers *(Sciaenids),* Ribbonfish, False Trevally *(Lactarids).* Ponyfish *(Leiognathids),* Halfbeaks *(Hemiramphids),* Indian Mackerel *(Rastrelliger kanagurta),* Threadfin *(Elutheronema tetradactylum),* Silver Pomfret *(Pampus argenteus),* Kiddi Shrimp and the Yellow Shrimp (Figure 17b).

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The Bigeye Shad, other clupeids. anchovy and the Ribbonfish were found in the catches throughout the fishing season at the Coast Station.

14.2 *Catch rates*

The average total catch rate (kg/day/net) for all species combined and for the whole fishing season was 84 in the estuary and 213 on the coast. The catch rate was high from June to October in the estuary and during December-January on the coast (Table 20).

Table 20: Sample catch, effort, catch rates at the two stations

Sampling station! Month	*Total sample (kg)*	*Hauls in sample (No)*	*catch craft (kg) haul/net)*	*Eflout (hauls day (No*	*Catch craft (kg/day) net)*	*A ctive fishing time days month)*	*Monthly production cal h gear (net) (kg /net)*
Estuary Station							
March'88	7	1	7	3	51	20	020
April'88	38	2	19	4	76	20	1520
May'88	20	1	20	4	80	20	1600
June'88	47	2	23.5	4.5	06	20	2120
Sept.'88	27	I	27	4	108	20	2160
Oct.'88	54	2	27	4	108	20	2160
Nov.'88	5	1	15	4	60	16	960
Coast Station							
Nov.'88	96	3	32	3	96	16	1536
Dec.'88	335	3	112	1	447	20	8940
Jan.'89	180	3	60	4	240	20	4800
Feb.'89	92	4	23	3	69	16	1104

The Indian White Shrimp and the Brown Shrimp peaked in April-June. and the Yellow Shrimp, Kiddi Shrimp and the Rainbow Shrimp *(P.sculptilis)* catch rates showed a peak in November (Figures 18a and b, facing page). The Sergestid Shrimp and the Caridean Roshna Prawn had high catch rates in September.

Of the finfish, the Grey Mullet showed peak catch rates in the first quarter of the year (Figure 18b. facing page). Among the Croakers, *J. belangerii* had high catch rates in June and in the second half of the year, while O. *pama* had high catch rates in the first half of the year and in September at both stations. The other Croakers, Bigeye Shad and the Ribbonfish showed peak catch rates in the second half of the year. Anchovy recorded peak catch rates in June and December at the Estuary and Coast Stations respectively (Figure l8b, facing page).

14.3 *Production*

The number of nets that operated at the two stations and the number of days the nets were operated showed monthly variations. Monthly production per net was estimated using the average catch rate (kg/day/net) and the number of fishing days (Table 20). In estimating the total monthly production

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Fig 18a. Monthly catch rate (kg/day/net) for shrimp species or species group

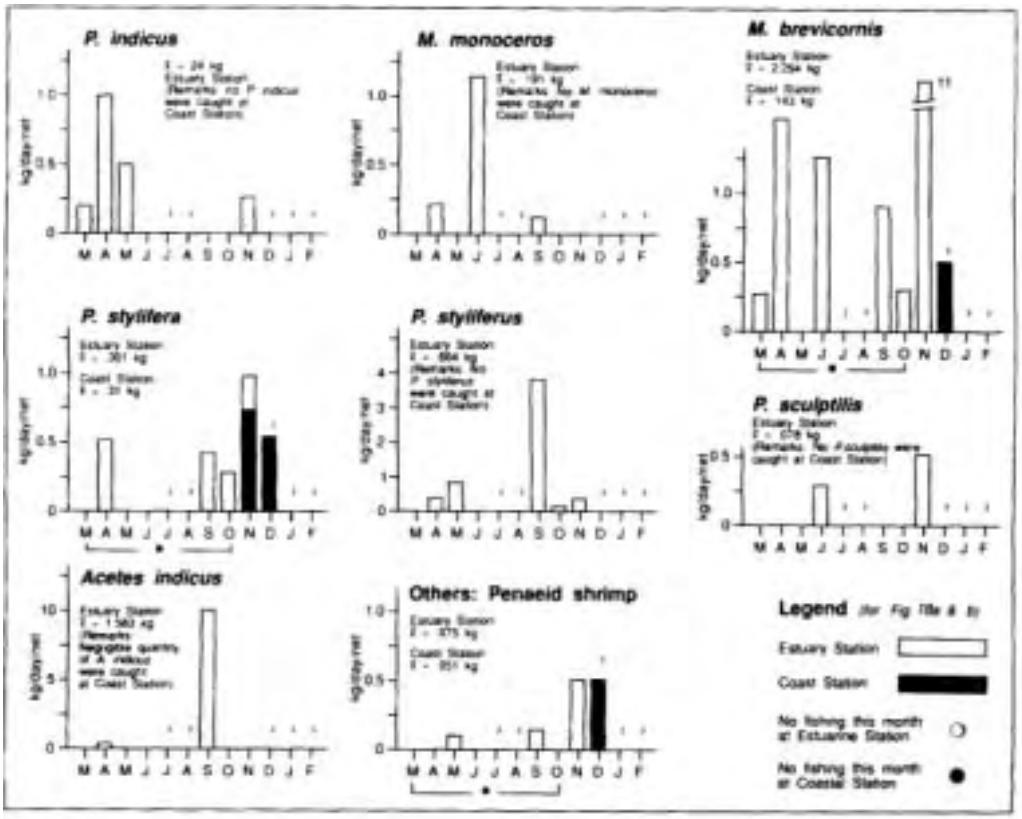
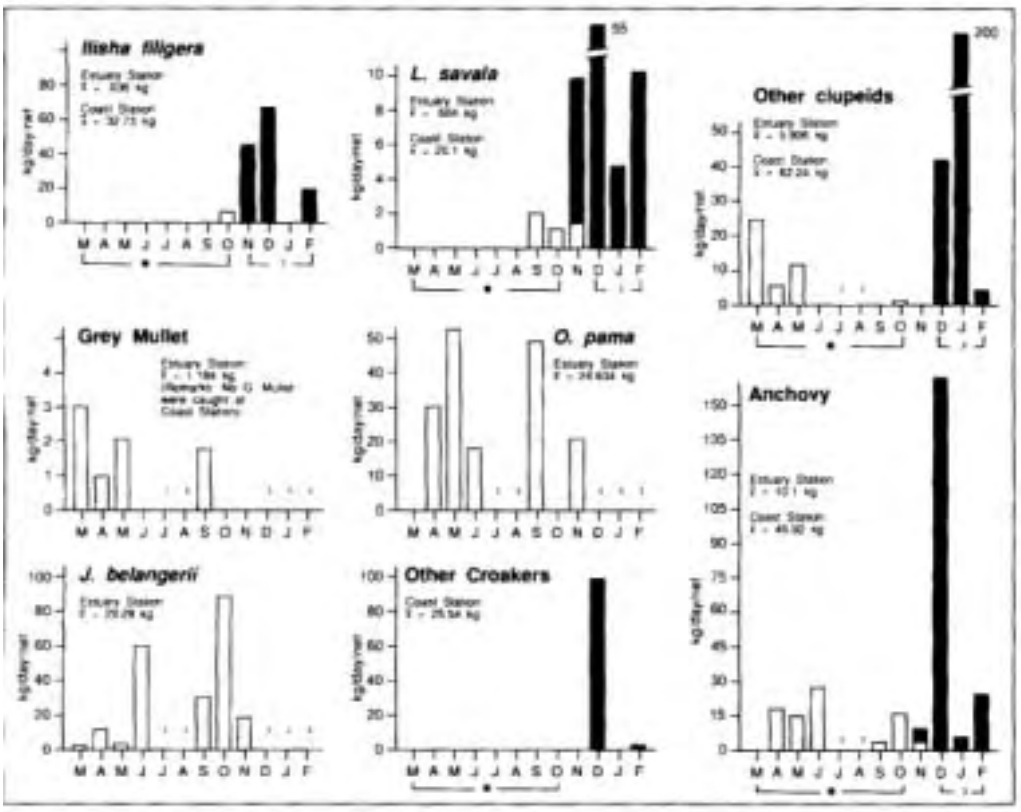


Fig 18b. Monthly catch rate (kg/day/net) for finfish species or species group



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in Cox's Bazar, the ratio of number of nets that operated to the number available at the sampling stations was applied to the total number of nets in Cox's Bazar (see Table 21).

The estimated production was 5010 t. Assuming similar catch rates and production levels in other areas, the total production by the beach seine fishery in 1988/89 was estimated at 8080 t.

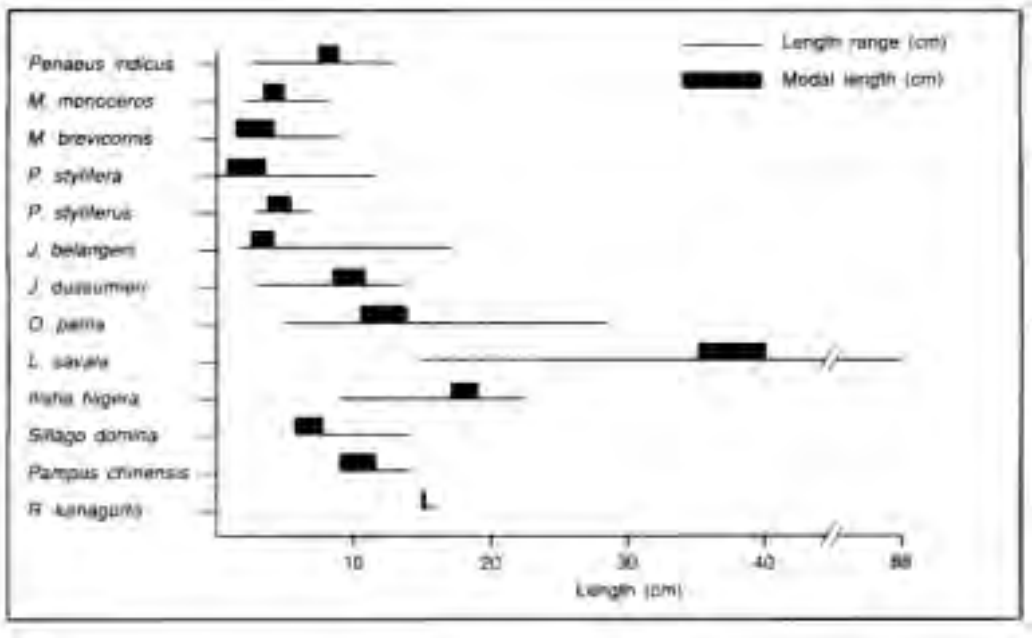
Table 21: Estimation of annual total catch in Cox's Bazar area by beach seine net (1988-89)

	Arerage no. of nets operated per day at station (no)	*Total no. of nets operated per day in Cox's Bazar (no)*	*Monthly catch/net (kg)*	*Monthly catch in Cox's Bazar (t)*
Estuary Station				
Mar. '88	10	138	1020	140.8
Apr. '88	10	138	1520	209.8
May '88	10	138	1600	220.8
Jun. '88	11	152	2120	322.2
Sept. 88	11	152	2160	328.3
Oct. '88	11	152	2160	328.3
Nov. '88	7	97	960	93.1
Total				1643.3
Coast Station				
Nov. '88	12	166	1536	255.0
Dec. '88	16	221	8940	*1975.7*
Jan. '89	15	208	4800	998.4
Feb. 89	9	125	1104	138.0
Total				3367.1
Total catch in Cox's Bazar				5010.4

14.4 *Size of major species*

The size ranges of major shrimp and finfish species caught are illustrated in Figure 19.

Fig 19. Exploited length ranges and predominant length groups of major shrimp and tinfish species in beach seine catches



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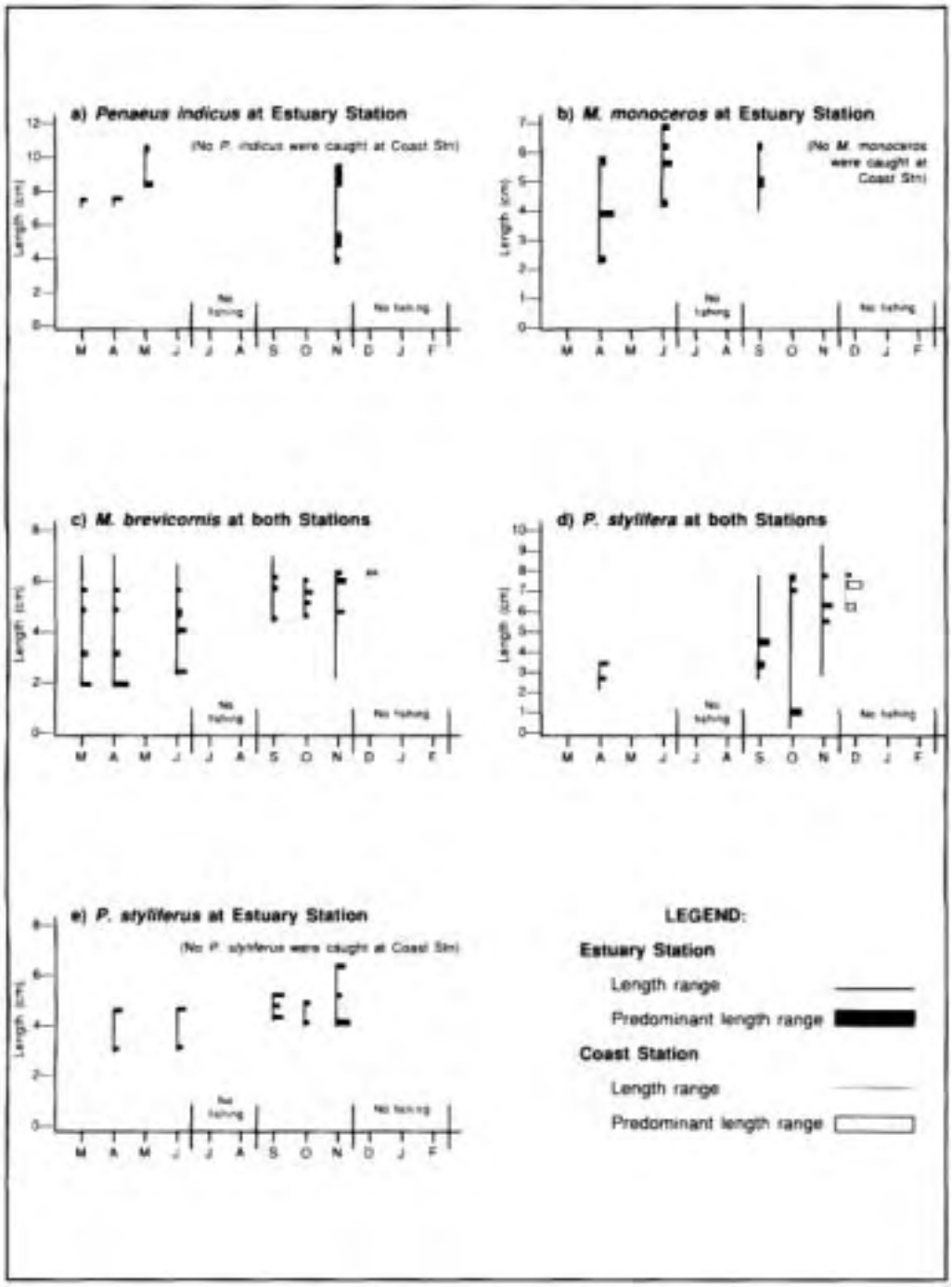
The penaeid shrimps were mostly between 0.4 and 10 cm length. The predominant size ranges of Indian White Shrimp, Brown Shrimp and Yellow Shrimp were highest in April. The size range was lowest in March for Indian White Shrimp and in September for Brown and Yellow Shrimp. (Figures 20a, h and c). The predominant size range of Kiddi Shrimp and Caridean Roshna Prawn was highest in November and lowest in April (Figures 20d and e).

Fig 20 (a, b, c, d, e). Relative proportions of different sizes of shrimp species caught by beach seine in different months



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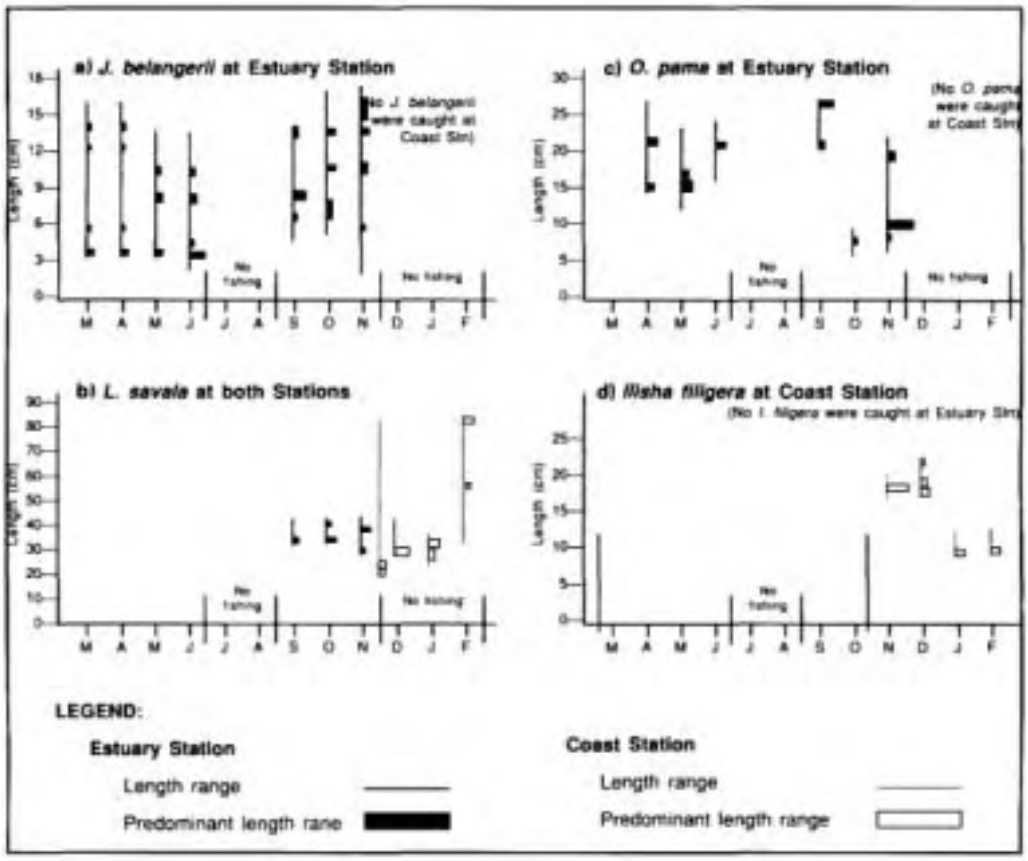
The predominant size ranges of both *O. pama* and Bigeye Shad were highest in November, but lowest in October for *O. pama* and in December for Bigeye Shad (Figures 2Ic andd). The predominant size range of *J. belangerii* and Ribbonfish were highest in June and December and lowest in November and September respectively (Figure 2la and b).

Flg **21 (a, b, c, d). Relative proportions of different sizes of finfish species caught by beach seine in different months**



14.5 *Costs and earnings analysis*

The beach seine owners earn less income in the Naf river estuary in most months than on the Teknaf sea coast fishery. Their maximum gross earning is Tk 21,253 in October, with a net profit of Tk 3,855. Their minimum gross earning is Tk 10,242 in March with a net profit of Tk 185.

Seasonal gross earning per unit was Tk 113,029 over seven active fishing months and the net profit to the owner was Tk 15,083, after reducing the cost of production.

US $ I = Tk 31 appx. (1989-91)

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Owners of gear on the Teknaf sea coast, on the other hand, earn a reasonable income from their fishing units during most months of the year. The highest monthly gross earning was Tk. 101,453 per unit, with a profit of Tk 30,589, in December and the lowest monthly gross earning was Tk 12,262, with a net profit of Tk 859, in February.

Gross earning per unit was Tk 171,619 during a season of four active fishing months, while the total profit to the owner during this period was Tk 44,292 after deducting the cost of production.

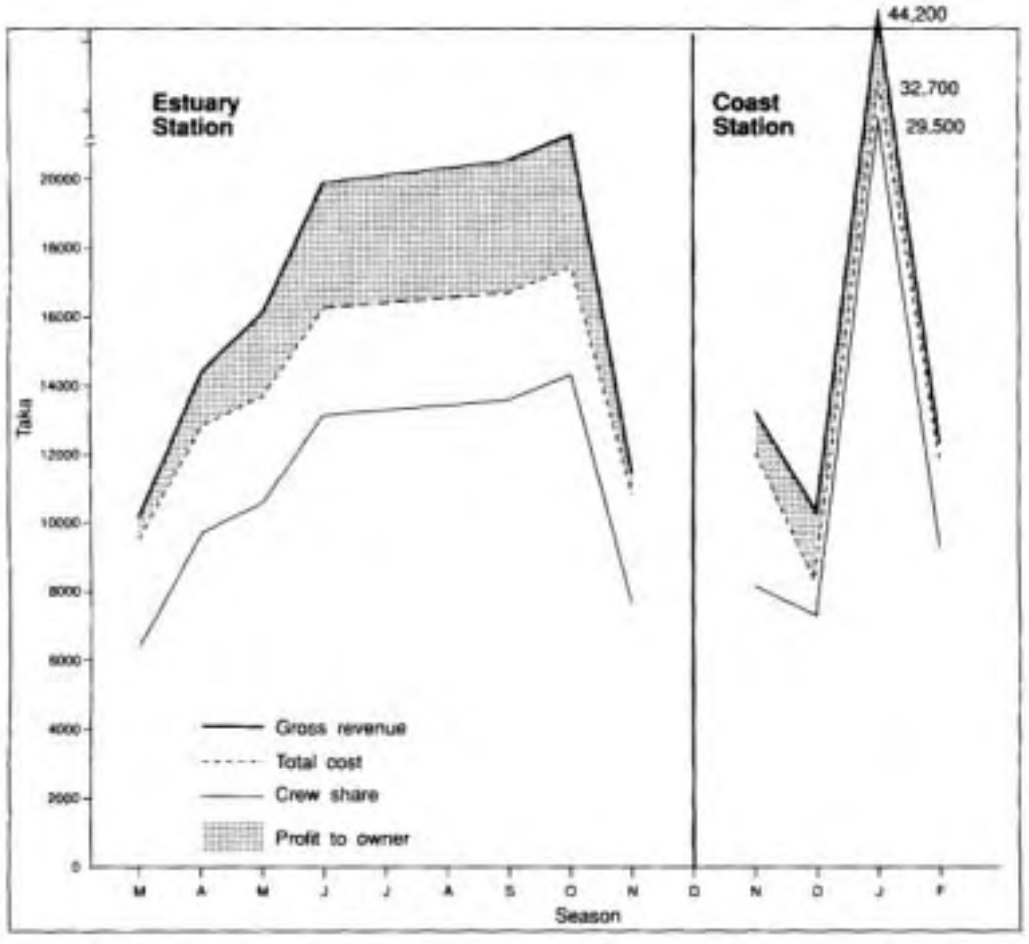
The average monthly gross revenue, profit and average monthly costs for the operations in the estuary are given alongside, along with similar values for the sea coast operation.

item	Estuary (Tk)	Coast (Tk)
Gross revenue	16.150	42.904
* Fixed cost	2,130	2,130
Variable cost	1.100	1.100
Fishermen's share	10.760	28,600
Total cost	**13,990**	**31,830**
Net income	2,155	11,074
Income/fisherman	446	2,200

* Craft value Tk 70.000 and avg. life 7 years. Gear value 1k 100.000 and avg.life *10*years.

Monthly analysis of the costs and earnings of the beach seine operation at the two stations are illustrated in Figure 22.

Fig 22. Monthly costs and earnings analysis for the beach seine fishery in the Estuary Station and the Coast Station



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14.6 *Shares and wages*

Most beach seines and operating boats are owned by *bahardars,* better off people belonging to the fish landing/operating localities. The fishermen get paid on a share basis after incidental expenses, generally small amounts, are deducted.

When net revenue from each haul exceeds Tk 400, one-third of it goes to the owner of the unit and the remaining two-thirds is equally distributed among the fishermen. If the gross revenue is between Tk 200 and 400, a fixed amount of Tk 200 is shared among the fishermen and the rest of the money goes to the owner. When the gross revenue falls below Tk 200, all of it is distributed equally among the fishermen, without anything going to the owner. The beach seine fisherfolk community generally follow this traditional sharing system.

Seasonal income and average income per month to fishermen when operating in the Naf river estuary was 1k 5,795 and Tk 445 respectively and Tk 8,800 and Tk 2,200 respectively when operating on the Teknaf sea coast.

14.7 *Fish and shrimp prices*

The catch is sold on a wholesale basis to middlemen or on a retail basis to traders, at the landing centre. Middlemen sell to retailers who, in turn, sell the fish at the local market.

Prices of mixed species of finfish and shrimp are in the range of 9-20 1k/kg, with some seasonal variations (see Appendix II). Prices of shrimp/finfish species are somewhat higher during December-February, because the quality of the fish/shrimp is better due to the air temperature being low and the spoilage, as a consequence, being less. Prices are lower in March-November when temperatures are high and spoilage likely, due to the lack of well-developed processing, transportation and marketing facilities.

14.8 *Employment*

The number of fisherfolk engaged in beach seine fishing in Cox's Bazar was estimated to be 15,000. In all Bangladesh. the figure was thought to be in the region of 29,000. These estimates are based on the total number of gear units and the average number of persons engaged in operating a unit.

15. ***DISCUSSION***

It was observed during this study that the average catch rates of penaeid, Caridean shrimp and Croaker were higher in the Naf river estuary than off the Teknaf coast. But the average catch rate of Bigeye Shad, other Clupeids, Anchovy and Ribbonfish were higher on the coast (see Figure l8a and b).

The seasonality of the beach seine fishery in the Hugli estuary off the northeast coast of India, as well as the species composition in it described by Dutta *eta!.* (1973), are similar to the findings in this study.

A large proportion of immature shrimp and finfish were found in the beach seine catch during the period of investigation. It is assumed that this may occur in other areas of Bangladesh too. This could result in the reduction in yield per recruit, destruction of juveniles and reduced recruitment of the larger sizes of these species to other fisheries, such as the trawl, longline or trammelnet.

Considering the number of beach seines (558) in the estuarine and marine subsectors of Bangladesh, the catches by this gear need to be taken into consideration when management of penaeid shrimp and other major finfish species is examined.

The present study is more qualitative than quantitative, the' numerical estimation being limited to only one area. Systematic and quantitative estimations in all beach seine fishing areas are necessary for a better assessment of the impact of the beach seine fishery on the shrimp and finfish resources of Bangladesh.

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APPENDIX II

Monthly average price (Tk/kg) of selected species or species group in the beach seine catch at the two stations

Species name	*Station* *	*Mar. '88*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Jan. '89*	*Feb.*
Shrimp (mixed)	1	-	-	-	-	-	-	-	-	9	13	13	13
	2	10	10	9	8	-	-	8	8	9	-	-	-
Penaeus indicus	1	-	-	-	-	-	-	-	-	18	20	20	20
	2	20	18	18	18	15	-	-	15	15	18	-	-
Metapenaeus monoceros	1	-	-	-	-	-	-	-	-	18	20	20	20
	2	20	18	18	15	-	-	15	15	18	20	20	20
Croaker	1	-	-	-	-	-	-	-	-	10	13	13	13
	2	13	10	10	10	-	-	10	10	10	-	-	-
Ribbonfish and Sillago	1	-	-	-	-	-	-	-	-	10	13	13	13
(Whiting)	2	10	10	10	10	-	-	10	10	10	-	-	-
Bigeye *ilisha* and	1	-	-	-	-	-	-	-	-	10	13	13	13
Threadfin bream	2	13	10	10	10	-	-	10	10	10	-	-	-
Grey Mullet and Pomfret	1	-	-	-	-	-	-	-	-	15	20	20	20
	2	20	15	15	15	-	-	15	15	15	20	20	20
Other clupeids & engraulids	1	-	-	-	-	-	-	-	-	9	10	10	10
(Anchovy)	2	10	9	9	9	-	-	9	9	9	-	-	-
Mixed finfish	1	-	-	-	-	-	-	-	-	8	10	10	10
	2	8	8	8	8	-	-	8	8	8	-	-	-
Trash fish													
(Tricanthidae	1	-	-	-	-	-	-	-	-	2	2	2	2
Tetraodontidae)	2	2	2	2	2	-	-	2	2	2	-	-	-
Crab and cuttlefish	1	-	-	-	-	-	-	-	-	2	2	2	2
	2	2	2	2	2	-	-	2	2	2	-	-	-

* 1. Coast Station 2. Estuary Station