J. Agrofor. Environ. 2(1): 1-6, 2008 ISSN 1995-6983

Species composition, fishing gears and socio-economic status of the local fishermen of '*mokash beel*' of Kaliakoir upazila under Gazipur district

R. Sarker, M. H. Ali, M. A. Hossain[1], M. A. Salam and F. Ahmed
Department of Aquaculture, Bangladesh Agricultural University, Mymensingh
[1]Department of Fisheries, Rajshahi University, Rajshahi

Abstract: The present study was conducted to determine the types of fishing gears, fishing effort, fish catch composition, catch per unit of effort (CPUE) and socio-economic status of the fishermen in "*Mokash beel"* located in Kaliakoir upazila under Gazipur district. Three types of fishing gears of different nature were used by the fishermen *viz*. fishing nets, fishing trap and wounding gear. A total of 25 species of fish were identified and highest fishing effort and fishing duration were recorded in *current jal*. The highest catch per unit of effort (CPUE) was recorded in *ber jal* (12.30). Species recorded in the catches of *ber jal* (23), followed by the *Jhaki jal* (22) and *current jal* (13), *dharma jal* (18) and *thela jal* (14). In case of traps and wounding gear, *bair* (16) and *borshi* (10) were found to catch a variety of species of fish. About 66% and 34% fishermen were, respectively Muslims and Hindus, and the average family size was 5.90. Among the fishermen 52% were illiterate, 34% were primary level and only 14% were found to have secondary level of education. Housing condition was *Katcha* and they used *katcha* toilet. The average monthly income of the *ber jal* fishermen was the highest (Tk. 2680) and the lowest (Tk. 1160) was found in *borshi* fishermen.
Keywords: Mokash beel, fish species, fishing gears, fishermen, socio-economic status

Introduction

The open water resources, such as rivers, haors, *beel*s and floodplains hold a remarkable position in our country (Gupta *et al.*, 1991). All those resources have got more or less similar fish species composition. Open water inland fisheries play a vital role in the production of fish in Bangladesh (McGregor, 1995). The open water resources are estimated at 4.047 million hectares, of which 2.833 million hectares are floodplains. The average rate of production from floodplain at 600-700 kg/ha which can be increased manifold (DoF, 2001). *Beels* are very good natural habitat of large and small indigenous fishes of different food habits. Many of the fish and prawn species can multiply in number in *beels*. Many other fish and prawn species move into the inundated areas of *beels* from adjacent rivers and canals to feed and grow during monsoon months (Akteruzzaman *et al.*, 1997). People living in village around the *beels* harvest the fish almost round the year without any prior investment except catching devices. A large portion of rural families are engaged in part time fish capture from the beels (Hughes *et. al.*, 1994). Fishermen are one of the most vulnerable communities in *beel* fisheries. Alam and Bashar (1995) estimated the average per capita annual income of the fishermen families to be Tk. 2,442 which is about 70% lower than the per capita income of the country as a whole. Being an isolated community fishermen are deprived of many amenities of life. Despite the destruction of floodplain ecosystem, a number of floodplains still exist in Bangladesh (Hughes *et al.*, 1994 and Hossain *et al.*, 1999). Among them *Mokash beel* in Gazipur is one of the most important ecosystem with its fisheries activities. This floodplain fishery plays a very important role in cushioning rural property and supplying food to the poor. Hence, it is essential that this resource be managed on sustainable basis. Therefore, this study was undertaken to have clear understanding about catch composition, biodiversity and environment in *Mokash beel* for sustainable livelihoods of the poor.

Materials and Methods

Study area and Methods of Observation: *Mokash beel* in Kaliakoir Upazila of Gazipur district is the selected study area. Data were collected from 50 fishermen randomly covering the selected study area for a period of six months, from 15th June to 15th December, 2006. For data collection, a set of interview schedule designed for this study. The draft questionnaire was tested with 10 fish farmers in the study area. The questionnaire was changed, modified and rearranged according to the experience gathered in pre-testing of questionnaire. For this study a combination of questionnaire interview, Participatory Rural Appraisal (PRA) tools such as Focus Group Discussion (FGD) and crosscheck interviews were conducted with key informants such as Upazila Fisheries Officer, BRAC, Local leaders, officials of MACH project and NGOs workers. To calculate catch per unit effort (CPUE), the number of kilograms of fish caught per unit effort (kg/gear/hr) uses the following formula:

$$\text{CPUE} = \frac{\text{Total fish catch in a particular sample gear (wt. in kg)}}{\text{No. of sampled gear} \times \text{fishing hrs}}$$

Data processing and analysis: All the collected information were accumulated and analyzed by MS-Excel and then presented in textual, tabular and graphical forms.

Results

Fisher types: A large number of fishermen are engaged in catching of *Mokash beel* through out the year. As per standard practice fishermen are categorized into three groups. They are: 1) Professional fishermen (50%), 2) Seasonal professional fishermen (40%) and 3) Subsistence fishermen (10%). This finding indicates that number of

fishermen increased due to poor economic condition, over growth of population, lack of employment opportunity, lack of awareness and poor education (Bhaumik and Pandit, 1999).

Fishing gears used in *Mokash beel*: From the survey it was found that only seven types of fishing gears were operated by the fishermen. These gears were mostly of traditional and might be classified into three groups, such as, net [*Ber jal* (Seine net), *Current jal*(Gill net), *Thela jal* (Push net), *Jhaki jal* (Cast net) and *Dharma jal* (Lift net)], trap (*Bair/Darki*) and wounding gear [*Borshi* (Hook)]. It was found the gears like *ber jal, current jal, jhaki jal, thela jal, dharma jal, bair* and *borshi* were operated in M*okash beel*. The fishing that are currently used among the fishermen of Bangladesh have been broadly categorized into netting, angling, trapping, spearing, development watering and hand picking by Dewan and Mozid (1994). In the present study a total of 25, 16 and 10 species of fishes were recorded in the catches of nets, traps and wounding gears used by the fishermen in *Mokash beel*, respectively. Rahman *et al.* (1993) recorded a total of 60 species of fish catches in Chanda, BSKB and Halti *beels*. Another study by Rahman (1996) recorded 47 species of fish in the catches of different gears used by the fishermen in BSKB *beel*.

Fishing effort: Among the gears, the highest and the lowest fishing effort were recorded in *current jal* and *dharma jal* which were 29.2 and 0.47 per day, respectively. The average fishing effort of other gears were recorded *jhaki jal* (1.30), *thela jal* (8.0), *ber jal* (0.91), *bair/darki* (26.0) and *borshi* (16.12). The total fishing effort in *Mokash beel* were 82.0. Base line report on fisheries by MACH (2001) reported fishing effort of *Baila beel* in different fishing gears were *ber jal* 0.66, *current jal* 0.32, *thela jal* 6.67, *jhaki jal* 1.75, *dharma jal* 0.47, *borong* 43 and *borshi* 4.92.

Fishing duration: Fishing duration is essential to estimate the fish yields and to keep track of the catch per unit effort (CPUE). It is observed that the fishermen usually increase their operational hours to maintain a satisfactory catch, if the fish availability is less. The average fishing hours of commonly used gears are shown in Table 1. In the present study, the highest and the lowest fishing duration were recorded in *bair/darki* and *thela jal* which were 12.15 hours and 2.30 hours per day, respectively. Fishing duration of other gears recorded were *borshi* 4.30 hours, *dharma jal* at 5.00 hours, *jhaki jal* 4.45 hours, *ber jal* at 3.45 hours and *current jal* at 10.45 hours per day. Base line report of fisheries by MACH (2001) recorded lower fishing duration than the present findings. It implies that fishing duration has increased due to high fishing pressure.

Table 1. The average fishing hours of different gears in *Mokash beel*

Names of gears	Fishing duration (hrs/day)
Jhaki jal	4:45
current jal	10:45
Thela jal	2:30
Dharma jal	5:00
Ber jal	3:45
Bair/Darki	12:45
Borshi	4:30

Catch per unit of effort (CPUE): Catch per unit of effort (CPUE) (kg/gear/day) of different fishing gears such as, nets, traps, and wounding gears of the study area have been shown in Table 2. Among the gears, the highest and lowest CPUE were recorded in *ber jal* and *borshi* which were 12.30 kg/day and 0.38 kg/day, respectively. In all the gears, *ber jal* was found to be the most effective gear. Holder (2002) found CPUE in different gears in his selected areas (*Doba* and *Chara beel),* which were more or less similar in Kaliakoir *Mokash beel.* Basher (1990) found the highest CPUE of 0.15 kg/hour and 0.07 kg/hour in *current jal* and *khona jal* respectively in his selected study areas. Hossain (1998) found the highest CPUE of 2.75 kg/gear/week, 0.94 kg/gear/week and 0.35 kg/gear/week for nets, traps and wounding gears, respectively in the old Brahmaputra river.

Table 2. Comparison of catch per unit of effort (CPUE) of fishes by different gears in Mokash beel.

Name of gears	Catch per unit of effort (CPUE) (kg/gear/day)
Jhaki jal	1.75
current jal	2.50
Thela jal	1.75
Dharma jal	1.36
Ber jal	12.30
Bair/Darki	0.88
Borshi	0.38

Species composition: Species composition (% of catch by number) of different types of gears, traps and wounding gears of the *Mokash beel* are shown in table 3, 4. In the present study, a total of 25 species of fishes were recorded in the catches of different fishing gears used by the fishermen. In the catches of *ber jal,* a total of 23 species of fishes were recorded during the study period. Holder (2002) recorded 20 species of fishes in *Doba beel* and 18 species of fishes in *Chara beel* in Mymensingh, where *A. mola* was found to be the highest dominant species of fish in both the *beel*. BCAS (1994) recorded 19 species of fish other than shrimp and small size fishes in *chanda beel,* where as Hossain (1998) recorded 19 species of fishes in the old Brahmaputra river in the catches of the gear. In the catches of *current jal,* a total of 13 species of fishes were recorded during the study period. Paul *et al.* (1993) recorded 7 species in the catches of gill net (*Fash jal*) in *Chanda beel* and 9 species of fish in the catches of *fash jal* in *Halti beel*. Hossain (1998) recorded 14 species of fishes in the catches of *current*

jal in the old Brahmaputra river and Holder (2002) recorded 9 small indigenous species (SIS) in *Doba beel* and 5 small indigenous species (SIS) in *Chara beel* respectively. The results of the present study are more or less in agreement with the above reports. In the catches of *thela jal*, a total 14 species of fishes were recorded during the study period. Among the 14 species, *icha* was found to be the highest in number which contribute about 28.03%. Hossain (1998) recorded 6 species in the old Brahmaputra river by the catches of this net. Holder (2002) recorded 13 species and 16 species of fishes in *Doba beel* and *Chara beel* by the catches of this net. The catch composition in case of *Thela jal* in the present study differ much from Hossain (1998) and Holder (2002) which seemed to be due to difference in locality and habitat. A total 22 species of fishes were recorded in Kaliakoir *Mokash beel* with *Jhaki jal*. Holder (2002) recorded 17 species of fishes both in *Doba beel* and *Chara beel*. In the catches of *Dharma ja*l, a total of 18 species of fishes were recorded during the study period. Paul *et al.* (1993) recorded 28 species of fish in the catches of lift net in *Halti beel* and Holder (2002) recorded 11 species of fishes. Sixteen species of fishes were recorded with *Bair* during the study period. Hossain (1998) recorded 3 species of fishes caught by *bair* in the old Brahmaputra river. Holder (2002) recorded 11 species in *Doba beel* and 12 species of fishes in *Chara beel*, respectively. A significantly higher number of species as captured by *Bair* in the present study is an indication of the richness and productivity of *Mokash beel* as compared to other *beel* (Hossain 1998, Holder 2002).

Table 3. Average species composition (% of catch by number) of the fishes as captured by different types of nets in *Mokash beel*

Species Name	Name of nets									
	Ber jal		Current jal		Thela jal		Jhaki jal		Dharma jal	
	No.of fish	% of total	No. of fish	% of total	No. of fish	% of total	No. of fish	% of total	No. of fish	% of total
X cancila	5	1.50	6	5.50	-	-	2	1.18	2	1.98
C.puntatus	10	3.01	4	3.66	4	3.73	5	2.95	2	1.98
P.sophore	22	6.62	42	38.53	7	6.54	14	8.28	25	24.75
P.ticto	18	5.42	-	-	12	11.21	10	5.91	11	10.89
m.pancalus	10	3.01	5	4.58	20	18.67	12	7.10	3	2.97
M.aculeatus	2	0.60	4	3.66	-	-	1	0.59	-	-
M.lamrrei	48	14.45	-	-	30	28.03	12	7.10	-	-
C.nama	18	5.42	-	-	3	2.80	18	10.65	12	11.88
C.ranga	22	6.62	-	-	3	2.80	15	8.87	10	9.90
L.rohita	1	0.30	2	1.83	-	-	5	2.95	-	-
L.calbasu	1	0.30	1	0.90	-	-	4	2.36	-	-
C.mrigala	2	0.60	-	-	-	-	2	1.18	-	-
C.catla	2	0.60	-	-	-	-	4	2.36	2	1.98
C.carpio	12	4.20	2	1.83	2	1.86	8	4.72	-	-
A.mola	80	24.09	-	-	4	3.73	2	1.18	-	-
L. guntea	13	3.91	-	-	4	3.73	-	-	2	1.98
M.vittatus	12	3.61	16	14.67	-	-	5	2.95	4	3.69
H.fossilis	2	0.60	6	5.50	-	-	-	-	1	0.99
N.nandus	14	4.21	10	9.17	2	1.86	4	2.36	2	1.98
G.giuris	-	-	4	3.66	4	3.73	3	1.77	4	3.69
A.testudineus	8	2.40	7	6.42	7	6.54	3	1.77	2	1.98
C.fasciatus	4	1.20	-	-	-	-	18	10.65	10	9.90
W.attu	-	-	-	-	-	-	-	-	2	1.98
O.pabda	8	2.40	-	-	-	-	4	2.36	2	1.98
B.dario	18	5.42	-	-	5	4.67	18	10.65	5	4.95
Total	332	100	109	100	107	100	169	100	101	100

Table 4. Average species composition (% of catch by number) of the fishes of different types of traps and wounding gear used in *Mokash beel*

Species name	Bair/ darki		Borshi	
	No.of fish	% of Total	No. of fish	% of total
Colisa chuna	8	7.92	-	-
Colisa fasciatus	1	0.99	-	-
Esomus danricus	13	12.87	-	-
Lepidocephalus guntea	3	2.97	-	-
Puntius sophore	3	2.97	17	26.99
Puntius ticto	9	8.91	13	20.63
Channa punctatus	2	1.98	7	11.11
Channa straiatus	-	-	3	4.77
channa gachua	3	2.97	5	7.93
Heteropneustes fossilis	-	-	1	1.58
Mystus vittatus	3	2.97	3	4.77
Macrognathus aculatus	2	1.98	-	-
Mastacembelus puncalus	1	0.99	5	7.93
Glossogobius giuris	7	6.93	7	11.11
Anabas testudineus	-	-	2	3.17
Chanda nama	9	8.91	-	-
chanda ranga	7	6.93	-	-
Amblypharyngodon mola	11	10.89	-	-
Macrobrachium lamerri	19	18.81	-	-
Total	101	100	63	100

A total of 10 species of fishes were recorded during the study period in catches of *borshi*. Hossain (1998) recorded 7 species of fishes in the old Brahmaputra river in the catches of *borshi*. Holder (2002) recorded 7 species in *Doba beel* and 8 species in *Chara beel* in the catches of *borshi*. Catch composition of the *beel* as observed in the present study using different types of fishing gear were much more diverse and rich in term m of numerical abundance and quality (kg). This is an indication of the higher biological productivity of the *Mokash beel* might be due to better bottom soil, fertile catchments basin, preferable depth and overall suitability of water.

Socio-economic conditions of fishermen

Religion: In the study area, 66% of fishermen were Muslims and the remainder 34% were Hindus with no Buddhists or Christians. Similar result also observed by Shahjahan (2000) at the Jamuna river which was 66.67% Muslims and 33.37% Hindus community.

Age structure: In the study area, most fishermen were quite young. It was found that 28 % of fishermen were up to 30 years; 36%up to 31-40, 22% up to 42-50 and 14% more than 50 years, whereas Bhaumik and Saha (1994) reported age structure of fishermen at sundarban between 20 to 70 years.

Family size: Within the fishermen community according to gear types in *Mokash beel*, the largest family sizes (8.0 persons) belong to the *ber jal* fishermen and the smallest family size (4.4 people) was observed in *bair* fishermen. The next dominant family size was recorded in *dharma jal* (6.5 persons), *jhaki ja*l 5.6 (persons), *current jal* 5.5(persons), *thela jal* (5.4 persons) and *borshi* (5.9 persons). Average family size of the fishermen was found to be 5.90. On the other hand, average family size was 4.00 in South Adnan (Roy and Dorairaj, 1989).

Income of fishermen: The highest average total monthly income from fishing and other sources was recorded in *ber jal* fishermen (Tk. 2680) which was closely followed by the income of *current jal* fishermen (Tk. 2000). The lowest of the income was found in the borshi fishermen and they earned only (Tk. 1160). The present findings closely followed by Shahjahan (2000).

Educational status: In all gear type 52% of fishermen were illiterate, 34% had primary level of education and only 14% S.S.C level of education (Fig. 1). With respect to gear type in *Mokash beel*, the highest percentage 75% of illiterate fishermen were obtained among *dharma jal* users and the lowest 11.11% was recorded in *ber jal* users. Shahjahan *et al.* (2003) observed the educational level 66.33% of riverine fishermen were illiterate, 31.67% were up to primary level and 5.00% only secondary level, whereas Mahbubur (2001) found 68% of haor fishermen were illiterate, 28% up to primary level and 4% had only secondary level.

Housing condition: In the study area houses of fishermen are of three main types, 1) *katcha* houses are made of bamboo and tree leaves with mud flooring, 2) semi-*pucca* made of wood/tin and 3) pucca made of brick. The study reveals that 62% of housing structures were *katcha* while 34% were semi-*pucca* and only 4% were pucca (Fig. 2), more or less result were also observed by Siddique (1996).

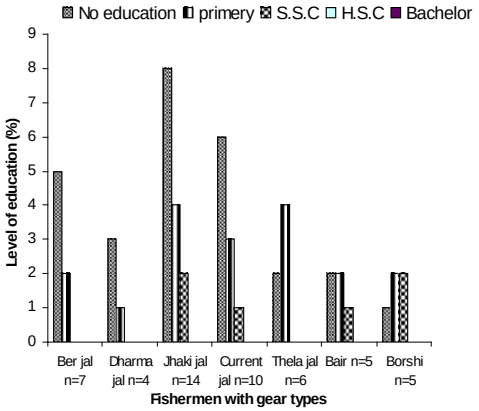

Fig. 1. Educational level of fishermen of the study area

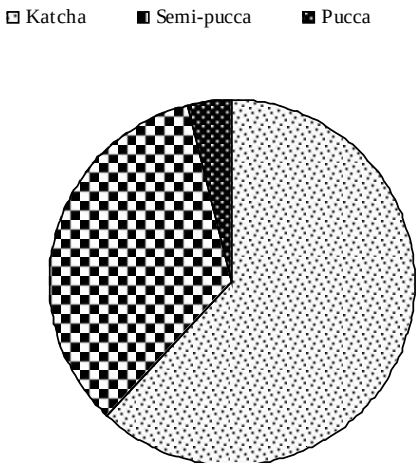

Fig. 2. Housing condition of the fishermen in the study area

Socio-economic constraints of the fishermen

Fishermen have faced various types of problems. The main problems was identified as extortion by the local extortionist, other problems were inadequate credit facility, presence of aquatic vegetation, lack of skill fishermen, lack of appropriate gears and disturbances by dacoits, thieves etc. Most of the fishermen are very poor and they have to resort to credit for buying nets and other fishing equipments. Another socio-economic constraint is the onset of flood that has to be faced by the fishermen almost every year (Choudhury, 1990).

Marketing of fish: In Kaliakoir particularly *Mokash beel*, fish marketing is almost exclusively an undertaken by the private sector where livelihood of a large number of people is associated with fish distribution and marketing systems. The market chain from fishermen to consumers passes through number of intermediaries, local traders, agents/suppliers, and retailers. The price of fish depends on market structure, species, quality, size and weight.

Improvement of livelihood: Most of the fishermen have improved their livelihood conditions through fishing. These include food consumption, increased social status, purchasing power, choice and ability and improvement of their livelihood approach. The most significant change was in food consumption. However, poor infrastructure facilities such as road, transport, electricity, bank, market etc. are the main problems for household of fishermen. Ahmed (2002) also found that 71% prawn farmers improved their socio-economic condition through prawn production.

References

Ahmed, N. 2002. Socio-economic aspects of freshwater prawn culture development in Mymensingh, Bangladesh. A report prepared for ICLARM.

Akteruzzaman, M., Khan, A. M. and Arif, K.H. 1997. Observation on the production of some small indigenous fish species (SIS) in Bangladesh. Proceeding of national workshop on small indigenous fish culture in Bangladesh. Integrated food assisted Development project SP-2 (IFADEP SP-2), Dhaka, Bangladesh. 107-116.

Alam, M. F. and Bashar, M. A. 1995. Structure of cost and profitability of small scale riverine fishing in Bangladesh. Bangladesh Agricultural University, Mymensingh, *Res. Prog.*, 9: 235-241.

Bashar, K.K. 1990. Problems and Potentialities of beel fisheries in Assam. *Fish-Chymes, 9(10):39-43.*

BCAS (Bangladesh Centre for Advanced Studies), 1994. Floodplain Production Monitoring Initial Study Report. BCAS, Dhaka, Bangladesh. 99.

Bhaumik, U and Pandit, P. K. 1991. Socio-economic status of fishermen in some beels of west-Bengal. *Environ. Ecol.*, 9(3): 600-603.

Bhaumik, U and Saha, S. K. 1994. Prespective on socio-economic status of the fishermen engaged in fishing in the estuaries of Sundarbans. *Environ-Ecol*. 12(1): 181-185.

Choudhury, M. U. 1990. An economic study of hilsa marketing in some selected areas of Brahmanbaria district. Unpublished M. Sc. Thesis, Bangladesh Agricultural University, Mymensingh. 41.

Dewan, S. and Mazid, M.A. 1994. Productivity; exploition and fishing. Productivity exploitation and fishing technology of inland open water fisheries, Bangladesh. A report prepared for the project on assistance to Fisheries Research Institute. (BGD/89/OV). FRI/FAO/UNDP. 1-35.

DoF (Department of Fisheries), 2001. Matshya Pakkhya Saranika 2001. Department of Fisheries and Livestock. Government of the People Republic of Bangladesh, Ramna, Dhaka, 62-75.

Gupta, R. A., Mandal, S. K. and Paul, S. 1991. Methodology for collection and estimation of island fishery statistics in India. Central Indian Capture Fisheries Research Institute, Barrakpore, 743101, west Bengal, India, Bull. No. 58. 8-64.

Holder, D.K.2002. Studies on the availability of small indigenous species (SIS) of fishes and socio-economic condition of fishers in two rice fields. An M.S. thesis submitted to the department of

Fisheries Management. Bangladesh Agricultural University.Mymensingh.

Hossain, M. 1998. A preliminary survey on the fisheries and socio-economic conditions of fishermen of the Brahmaputra River. An M.S. thesis submitted to the Department of Aquaculture, BAU, and Mymensingh.95.

Hossain, M. M., Kabir, M. S., Thompson, P. M. Islam, M. N. and Kadir, M. M. 1999. Overview of the community based fisheries management project, 9-8. In: H. A. J. Middendrop, P. M. Thompson and R. S. Pomeroy (eds.). Sustainable Inland Fisheries Management in Bangladesh. ICLARM, Conf. Proc. 58-280.

Hughes, R., Adnan, S. and Dalal-Clayton, B. 1994. Floodplains or floodplains? International Institute for Environmental and Development and Research and Advisory Services, London.

MACH (Management of Aquatic ecosystems through Community Husbandry), 2001. Baseline Report (Sherpur) on Fisheries, vegetation, wild life and protein consumption. MACH- CNRS, 3/14 Iqbal Road , Block A, Mohammadpur, Dhaka-1207, 5-42.

Mc-Gregor, J. A. 1995. The assessment of policy and management options in inland capture fisheries: Summary guidelines. Centre for development studies, University of Bath, Bath.

Paul.S.K., Rahman, S. Razzaque, A. and Chakraborty, B. 1993. Gear selectivity of the flood plains. In: *progress report*.Fisheries Research Institute, TFP, Santahar, Bogra, Bangladesh.8-15.

Rahman, S. 1996. Studies on the selectivity and effects of fishing gears on the fishes of BSKB beel. An M.S. thesis submitted to the Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh. 113 .

Rahman, S., Chakraborty, B. Razzak, A. Paul, S.K. and Chu-fa, T. 1993. The fishing gear selectivity study. *Report Preliminary Progress*. In: Fisheries Research Institute, TFP, Santahar, Bogra, Bangladesh.1-27.

Roy, S. D. and Dorairaj, K. 1998. Socio-economic aspects of fishermen of Andaman with respect to sustainable-development, Gangawar, B., Chandra and K., rho-ed. Port-Blair-India. Andaman-Science, Association. 147-156.

Shahjahan, M. 2000. Study on the fisheries on socio-economic condition of fishermen of the Jamuna river. An M. S. thesis, submitted to the department of Fisheries Management, Bangladesh Agricultural University, Mymensingh.

Shahjahan, M., Islam, M. S. Bapary, M. A. J. and Miah, M. I. 2003. Socio-economic conditions of fishermen of the Jamuna river, *Bangladesh J. Fish.* 26(1-2): 47-52.

Siddique, R. 1996. A study of socio-economic problems of the fishermen in Tamilnadu and Orissa. *Fish-chimes*. 16(18): 35-36.