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Study on fishing gears, species selectivity toward gears and catch composition of BSKB beel, Khulna, Bangladesh

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Abstract
An investigation on the types of fishing gear used and their species selectivity and effects on fishes of BSKB beel in Khulna was conducted from June'95 to January'96. Fishermen were found to follow 6 fishing techniques *viz.*, netting, trapping, angling, spearing, dewatering and hand picking. Among them 23 types of the fishing gear was recorded to be used by the fishermen of which 7,8,4 and 4 are nets, traps, hooks and lines, and hand harpoon respectively. A total of 47 species of fish were identified in the catches of different gears used by the fishermen in BSKB beel. Particulars, mode of operation, fishing season and catch composition of different fishing gears were determined. Seine, cast and lift net, traps (charo, arinda and ghuni), and hooks and lines (dhawn and nol broshi) were recorded as non-selective gear considering the fish species caught. However, gill nets (punti, koi and fash jal), clasp nets (bhuti jal), some traps (khadom, tubo), hooks and lines (chip borshi, chasra) and all spears were used as more or less selective gear. With respect to species and its size fash jal, bhuti jal, trap (khadom, ramani), and koach, juti and jhupi among spears were regarded to be more or less large-species-gear. But punti jal, koi jal, trap (koi dughair, charo, tubo, arinda and ghuni), nol borshi and spear (ful-kuchi) were small-species-gear. Among all gears seine net, cast net, lift net, koi dughair and ramani were recorded deleterious for carps specially for stocked fingerlings. For relatively small sized wild fishes koi jal, punti jal and ghuni traps were identified as detrimental gear.

Key Words : Fishing gear, Floodplain, Species selectivity, Regulations

Introduction

Beels are depressed low lying areas that carry perennial water even during dry season. It constitutes one of the most lucrative sources of fisheries in Bangladesh. Beels generally possess high potential for *in situ* fish production. The average fish production from beels area is about 487 kg/ha/yr and from the flood lands is 127 kg/ha/yr (DOF 1994). During the last decades natural migratory patterns of fishes have been largely interrupted by construction of dikes, regulators etc. The flood control and

irrigation programme with no provision for the passage of fish has alarmingly declined the fish production from floodplain sources (Islam 1996). In order to overcome such crisis, the Department of Fisheries (DOF) have undertaken a massive stocking program with carp fingerlings to augment fish production. To safeguard the early growth stage of stocked fingerlings from the exploitation is one of the key factors to the success of stocking program as well as the wild fisheries.

A fairly large number of types and forms of gear are being operated in the floodplains to exploit wild fishes since time immemorial. The intensity of use of any form of gear in a beels dependent on the intensity of target fish population presumed to be available in that beel. Among them, many of these have been known to catch carp fingerlings before they grow to legal size and many of these are responsible for sharp decline in the population of wild species of the floodplain of the country. However, operation of all types of gear can not be kept suspended to allow the stocked fingerlings and also wild fishes to grow.

Considering the above circumstances, the present study was undertaken with the objectives i) to identify the types and characteristics of fishing gears operated in BSKB beel, ii) to determine their catch composition of gears during different season and iii) to find out probable reasons for sharp declination in the abundance of wild fish species from the beel.

Materials and methods

The study was conducted on the fishes of Barnal, Salimpur, Kola and Bashukhali (BSKB) beel located at Terokhada, Rupsha and Dighalia Thana of Khulna district and Kalia Thana of Narail from June '95 to January '96. The total area of BSKB beel is 26,040 ha, represents a poldered enviornment.

Monthly collection of catch data were done at fish landing centers (galas), bazars, hats and at the fishing spot individually with the help of field staffs. The particulars of fishing gears (mesh size, length, width, materials, etc.) and the catch data were collected from fishermen at the fishing spot through interview and direct observation. Then detail description (mesh size, length, wide, height, materials etc.) of each and every type of fishing gear was recorded from the fishermen during fishing. Mode of operation of the gear (time, place, habitat, lure, accessories etc.) was also recorded. Catch composition by each type of gear was recorded either by examining the total catch or 10 to 20% random of the total catch, incase of large catch. The samples were then sorted out species wise and the total length of individual fish of each species were measured.

Results and discussion

The fishermen were found to follow six fishing techniques *viz.*, netting, trapping, angling, spearing, dewatering and hand picking. However, within these fishing techniques 23 types of fishing gear was recorded to be used by the fishermen. Among them 7 were nets, 8 traps, 4 hooks and lines and 4 hand harpoons. The particulars of different types of net, trap, hook and line

and hand harpoon are given in Tables 1(a), 1(b) and 1(c). BCAS (1989) recorded 13 types of fishing gears in 4 beels of Netrokona and Sunamganj districts. The fishing techniques that were followed by the fishermen in BSKB beel were similar to those reported by Ahmed (1954).

Table 1(a). Particulars of different types of net used for fishing in BSKB beel

Type of net	Name of gear	Description (m)		Mesh size (cm)	Materials used	Nature of Gear	Fishing period
		Length	Depth				
Gill net	Punti jal	10-12	0.6-1	2.5-3.18	Nylon twine or double cotton twines or tier cord	More or less selective	June -January
	Koi jal	10-12	0.6-1	3.18-3.8	Nylon twine or double cotton twines or tier cord	More or less selective	June -January
	Fash jal	10-12	0.6-1	8.0-9.0	Nylon twine or double cotton twines or tier cord	Selective	August-January
Seine net	Ber jal	50-67	1.5-2	0.5-2.5	Nylon twine or double cotton twines or tier cord	Non-selective	September - January
Lift net	Vashal jal	12-15	10-12	0.5(centre)-1.5 (front)	Nylon/cotton twine, bamboo frame	Non-selective	June - Aug. & Oct.- Dec
Cast net	Khepla jal	8-10 diameter		1.0-1.5	Cotton/Nylon	Non-selective	Jul.-Sep. & Dec. -Jan.
Clasp net	Bhuri/ Bhuti jal	1.5-2.0 diameter (Mouth) and 0.5-0.6 diameter (opening)		2.5-4.5	Nylon/cotton twine & bamboo pole	More or less selective	October - November

Table 1(b). Particulars of different types of trap used for fishing in BSKB beel

Different type of trap	Description (cm)			Mesh size (cm)	Material used	Fishing period
	Length	Height	Breadth			
Koi Dughair	45-90	15-30 diameter (mouth portion)		1.0-2.0	Split of bamboo and cane	June – January
Khadam (u-Shaped)		100-150	50-60 (front)	1.5-2.5	Split of bamboo and cane	September – January
Ramani	100-150	60-80	30-40	1.5-2.5	Split of bamboo and cane	September – January
Arinda	45	25	25	0.8	Split of bamboo and cane	Jully – January
Charo	40	25	15	1.0-1.5	Split of bamboo and cane	June – January
Ghuni	25-60	25-40	9-20	0.2-0.5	Thin bamboo stick and cane	June – January
Tubo	20-25	25-30	15	0.2-0.2	Thin bamboo stick and cane	June – January

Table 1(c). Particulars of different types of hook and line and spear/ harpoon used for fishing in BSKB beel

Hook and line				Hand harpoon		
Name of hook And line	Number of hook per line of lift	Bait used/ not used	Fishing period	Name of spear/ harpoon	Materials used	Fishing period
Dhawn borshi	Several hundred	Bait used	August-December	Koach	Split-bamboo pieces, pointed end covered with iron cap	September-January

Nol/Dhap borshi	Several hundred	Bait used	June-Janurary	Juti	Split-bamboo pieces with barbed iron point, which attached to the shaft by cords	September-January
Chip borshi	1 hook	Bait used	All season	Jhupi	Iron rods with/ without barb	September-January
Chasra	Bamboo made pin probe (both end pointed)	Bait used	July-November	Fulkuchi	Sharp-pointed steel wires (umbrella stick/ rickshaw spoke) without barb	September-January

The fishing period of different gears varied with the types of gear. In this study area of BSKB beel, the fishing was found starting from early monsoon with some hooks and lines and small meshed gill net, but more extensively with fine mesh traps (ghuni, arinda, charo, tubo and koi-dughair) which continued till the end of fishing season. Fishing pressure was found to increase gradually after stocking of fingerlings in the beel that is, from late August with the use of different types of gears *viz.*, fash jal (larger meshed gill net), ber jal (seine net), kephla/jhaki jal (cast net), veshal/ khora jal (lift net), bhuti jal (clasp net), large meshed traps (ramani and khadom) and wounding gears (koach, juti, juppi and ful-Kuchi). Fine-mesh traps were used mainly at shallow depth area by non-professionals to catch small size fishes mainly for family consumption and occasionally by regular fishermen for their livelihood. Besides these fishing gears, fishermen were also found to catch fish by dewatering the water body and by hand picking during the last monsoon period.

A total of 47 species of fish were identified in the catches of different gears used by the fishermen in BSKB beel. The catch composition of different nets, traps, hooks and lines and spears/ harpoons are presented in Tables 2, 3 and 4, respectively. Among the different types of nets operated highest number of species was recorded in the catches of seine net (35), followed by the catches of lift net (32) and cast net (30). Relatively less number of species were recorded in the catches of the gears- koi jal (17), punti jal (14), clasp net (7) and fash jal (7). Among the traps, charo (28), arinda (26) and ghuni (18) were found to catch a variety of species of fish. But only 5 species of fish were recorded in the catches of tubo, whereas, in the catches of ramani and koi dughair 11 species of fish were recorded. Dhawn borshi (16) and nol borshi (17) caught more species of fish than the rest of the hooks and lines. Lowest number of species were recorded in the catches of chasra of which *Anabas* sp. alone contributed about 95.8% of the catch (Table 4). However, the hand harpoons were recorded to be more or less selective towards a few no. of fish species.

Among these gears, punti jal was found to catch mainly *Puntius* sp. (49.61%), and koi jal mainly *Anabas* sp. (45.62%) along with other resident species to a lesser extent. Fash jal is used by the fishermen to catch mainly the stocked carp (99.72%) (Table2). Choudhury (1989) also stated in his study that punti jal and koi jal are used for *Puntius* sp. and *Anabas* sp. respectively, whereas fash jal was used mainly to catch large and medium size carp and catfishes. Similar to fash jal, clasp net (bhuti jal) is another gear which was identified to catch mainly stocked carp (88.33%) (Table 2). BCAS (1991) recorded 19 species of fish other than shrimp and small sizes fishes in the

catches of seine net and that of cast net were caught 20 species in Chanda beel. But in the present study recorded catches for seine net and cast net were 35 and 30 species, respectively. The name of different species listed in the catches are shown in Table 2 which were similar to the study of BCAS (1991). Similar to cast net, lift net was also found to be effective in catching different species of fish (Table 2).

Table 2: The catch composition of seine net, lift net, cast net, clasp net and gillnets (punti , koi and fash jal) operated at BSKB beel.

Species	Catch composition (% by number)						
	Seine net	Lift net	Cast net	Clasp net	Punti jal	Koi jal	Fash jal
	%	%	%	%	%	%	%
Catla catla	3.12	4.92	2.0	14.16	0.42	0.21	27.67
Cyprinus carpio	5.49	0.70	1.89	4.17		0.37	31.89
Labeo calbasu	0.20	0.23	0.06			0.16	0.38
Cirrhina mrigala	3.82	8.28	5.93	19.17	0.85	6.94	4.32
Labeo rohita	6.85	15.4 4	9.11	50.83	0.64	7.79	34.52
Puntitus gonionotus	0.57	0.26	0.20		1.84	0.64	0.94
Glossogobius giuris	1.8	1.13	4.68	5.83	8.86	2.83	
Mastacembelus armatus	3.52	3.33	2.07		6.24	0.64	
Pseudeutropius atherinoides	0.10	0.41	0.18				
Nandu nandus						0.10	
Mystus tengra	2.86	2.32					
Ambassis nama	9.94	2.40	3.51				
Oxygaster phulo	3.32	2.64	2.28				
Channa gachua	1.06		0.45				
Colisha channa	6.88	4.43	4.56				
Esomus danricus	1.56	2.37	5.75				
Notopterus notopterus	0.13	0.09	0.18				
Channa marulius	0.20	0.35	0.09				
Lepidocephalus guntia	1.2	0.61	1.38				
Xenentodon cancila	3.36	9.36	1.89		0.21		
Aplocheilus panchax	1.96	0.67	0.78				
Colisha faciata	3.56	1.71	2.88		5.39	4.75	
Anabas testudineus	1.06		1.98		8.01	45.62	
Clarias batrachus	0.53	0.06	0.36			0.43	
Ompok pabda	0.17	0.09	0.18				
Puntius sp.	15.3 9	23.9 3	25.9 9		49.61	2.51	
Heteropneustes fossilis	2.29	0.78	1.35		10.70	19.69	
Channa striata	1.1	1.65	0.69	1.67	0.71	0.59	0.28
Channa punctatus	2.96	0.98	2.13		2.41	6.30	
Mystus vittatus	6.55	7.27	12.0 2		4.11	0.43	
*Others	2.86	0.87	1.23	4.17			
Macrobrachium sp.	5.59	2.72	4.20				

*'Others' *Danio devario, N.chitala, Gadusia chapra, M. puncalus, Ctenopharyngodon idella, M. bleeker, Amblypharyngodon mola, Badis badis, Hypophthalmichthys molitrix, Macrognathus aculeatum, T. cutcutia and Botia dario.*

Table 3. The catch composition of traps (koi dughair, khadom, charo, tubo, ramani, arinda and ghuni) operated at BSKB beel

Species	Catch composition (% by number)						
	Koi dughair	Khadom	Charo	Tubo	Ramani	Arinda	Ghuni
	%	%	%	%	%	%	%
Catla catla	1.13	29.5 7	0.18		8.13	1.66	
Cyprinus carpio		2.49				0.17	
Labeo calbasu			0.04			0.17	
Cirrhina mrigala	6.60	21.3 8	1.6		24.74	5.48	
Labeo rohita	12.0 8	40.4 1	2.04		37.8	7.48	

Puntitus gonionotus		0.59	0.40		0.74	
Myystus aor			0.04			
Glossogobius giuris	0.22	0.73	4.0	7.97	5.31	0.73
Mastacembelus armatus			5.78		11.05	3.78
Pseudeutropius atherinoides			0.13		0.25	
Wallago attu		0.15				
Mystus tengra			1.73		1.41	1.42
Ambassis nama						5.67
Oxygaster phulo				1.02		1.63
Channa gachua			0.31	0.85	0.25	0.04
Colisha channa			0.62	11.41	1.58	23.68
Esomus danricus				0.17		12.35
Notopterus notopterus					1.41	
Channa maruliius	0.13	0.15		0.34		
Macrognathus aculeatum			1.06			0.15
Lepidocephalus guntia			2.89		1.82	3.45
Aplocheilus panchax						5.48
Colisha faciata	2.04		13.3 7	1.02	9.63	0.18
Anabas testudineus	39.7 5	0.29	7.77	2.71	6.98	2.76
Clarias batrachus	0.13	0.73	1.91	0.17	0.41	
Amblypharyngodon mola			0.31			
Ompok pabda			0.09		0.25	
Puntius sp.			19.5 4	65.36	13.05	28.08
Heteropneustes fossilis	1.39		5.95	1.69	5.90	
Channa striata	2.78	2.63		2.37		0.47
Channa punctatus	33.7 5	0.88	5.82	0.34	10.51	10.30	0.80
Mystus vittatus			23.5 4		1.53	9.22	0.76
**Others*			0.30			4.07	6.97
Macrobrachium sp.			0.58	21.70		

*'Others' *B. badis, M. puncalus,T. cutcutia, Hypophthalmichthys molitrix, Awaous grammepomus*

Table 4. The catch composition of hook and line and spear/harpoon (wounding gear) operated at BSKB beel

Species	Catch Composition (% by number)				
	Dhawn Borshi	Nol Borshi	Chip Borshi	Chasra	Hand harpoon
	%	%	%	%	%
Catla catla	0.20		3.19		15.0
Cyprinus carpio	3.25		1.2		19.55
Cirrhina mrigala	1.67	0.23	9.96		12.27
Labeo rohita	3.25	0.63	47.01		24.09
Puntius gonionotus	0.49				
Glossogobius giuris	5.31	6.43			
Mastacembalus armatus	4.23	1.82			4.55
Pseudeutropius atherinoides		0.03			
Wallago attu					0.46
C. gachua	2.17	0.27			
Notopterus chitala					0.45
Notopterus notopterus		0.50			0.91
C. marulius	0.79	0.36			6.36
X. cancila	5.22	2.09			
A,.testudineus	0.89	8.58	20.72	95.8	
C. batrachus	1.18	0.40			
Ompok pabda	0.10	0.03			
Puntius sp.		0.10	9.16		
H. fossilis	8.37	8.29	1.99		
C. striata	15.94	14.98	1.59	0.76	14.09
C. punctatus	43.50	51.48	2.39	3.44	2.27
M. vittatus	3.44	3.44	2.79		

With respect to species selectivity ber jal, khepla jal and vashal jal (net), charo, arinda and ghuni (trap), dhawn and nol borshi (hook and line) were recorded non-selective gear both for species and size. Punti jal, koi jal, fash jal and bhuti jal (net), khadom and tubo (trap), chip borshi and chasra (hook and line) and all hand harpoons were recorded more or less selective gears. But fash jal, bhuti jal (net), khadom, ramani (trap) and koach, juti and jhupi (spears) were regarded as large species gear. On the contrary, punti jal, koi jal (nets), koi dughair, charo, tubo, arinda and ghuni (trap), nol borshi (hook

and line) and ful-kuchi among spears were found to be small species gear. However, bamboo made hook-chasra was recorded as a gear of restricted species (koi, lata and shol) among all the gears studied.

The intensity of use of some gears in BSKB beel increased due to stocking. Thus, the intensity of use of cast net, koi dughair, ramani and seine net increased remarkably. Cast net was operated mainly in the canal, where fingerlings were stocked. Therefore, carps were found to fish by cast net. Koi dughair and ramani is operated in canals situated near the paddy fields or weedy fields at shallow depth. Fishes when attempted to move from canal to beel, got trapped into different traps. Besides, the mode of operation of seine net is such that destroyed the normal habitat of resident species, possibly of stocked carp as well. A large quantity of fingerlings have been caught by this gear. On the reverse, the intensity of use of clasp net, fash jal and harpoon increased due to its increasing catch of larger carp. Clasp net is operated at a spot through which beel water runs from one part to another. The use of net was found to start when water was receding from beel through canal. The intensity of use, operation period (when water receding: October-November) and the location (setting place) of clasp net indicated that it is operate to catch stocked carp as well as existing carps. Because, during this period fishes attempt to move from beel to canal. Fash jal, because of its larger mesh, was successful in catching medium size to larger size carp. Spears/harpoon is used by professional or non-professional fishermen. Intensive use of these types of gear was observed when slurry/stuffy weather remains during which fishes move near the surface water. Then fishermen can easily understand the movement of fish and attempts successfully. It is locally called "Niri" fishing. But the intensity of use of these gears increase considerably during the period between September and January. Sometimes, these types of wounding gears are operated at night using light as attractant with the bow of the boat which is locally called "Alo fishing". Thus, large size fish are caught by these gears but full-kuchi was found to be used to catch small species.

Again, the catches of primary fishing gear like fine mesh traps (ghuni, arinda, charo, tubo and koi-dughair), some hooks and lines and small meshed gill net, almost were the floodplain resident species i.e., *Puntius* sp., *Colisha fasciata* sp., *Heteropneustes* sp., *Anabas* sp., *Mystus vittatus, Channa punctatus* and *Glossogobius* sp, which begins breeding at the onset of inundation and grows during the monsoon flood season were dominant species while *Mastacembelus armatus, Channa striata, Clarias* sp., *Xenentodon* sp., were common and *Ompok pabda, Ambassis nama, Notopterus notopterus, Lepidocephalus guntia, Wallago* sp., *Colisha channa* and *Esomus danricus* were the minor. Among these primary fishing gears, except chasra (bamboo made hook), rest of all hooks and line were found to hook carnivorous fishes like snake head etc. but small mesh of gill net and fine mesh ghuni trap were found to use extensively during early monsoon to catch small size floodplain resident species which grow at the onset of inundation.

Though small mesh gill nets are considered to be detrimental gears for carp fingerlings, these net such as punti jal and koi jal were not found to be detrimental to carp fingerlings in the present study. Because these gears were

found to entangle mostly wild resident species with negligible quantity of carp fingerlings. Similarly, ghuni trap were also recorded harmful gear for wild fisheries. Thus, seine net, cast net, koi dughair and ramani were found to be detrimental gear for major carps. The total length of carp fishes recorded in the catches of fash jal were around the limit of legal size, these can be regarded detrimental gear for carps as it seemed to catch fishes below the legal size at the beginning of fishing season. Considering their detrimental effect on fish stocks it is suggested to restrict the use of these gears for certain period from June to October for effective management of beel fisheries.

Conclusions

To get optimum yield without affecting the future fishery, a guideline of operating fishing gear and to pass judicial decision banning the use of harmful gear needs to be strictly followed. However, for proper and effective management, it is suggested to ban or restrict the use of all types nets and traps from June to September-October depending upon the onset of the monsoon. This will help to grow of stocked carp and increase fish production through safe recruitment. Besides, kua (ditches dug by land owners inside the floodplain) fishing and kata/komor (brush parks placed in flowing canals running through the floodplain or rivers) fishing should also be greatly discouraged along with the restriction of the above gears as these fishing methods were recorded highly detrimental to the stocked fish as well as to wild fishes. Furthermore, extension program is necessary for the fishermen which will enhance the fish production.

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