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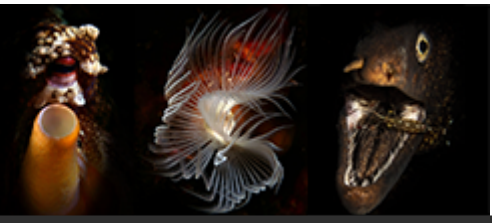

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Assessment of fishing gears, crafts, and socio-economic status of the Hilsa (*Tenualosa ilisha*) fishers' community near the Meghna River, Bangladesh

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ABSTRACT

An evaluation was conducted to assess the current state of fishing gears, crafts, and socio-economic aspects among the Hilsa (*Tenualosa ilisha* Hamilton, 1822) fishers communities residing along the Meghna River region in Gazaria and Munshiganj Sadar Upazila, located in the district of Munshiganj, Bangladesh. About 150 fishers were interviewed using pre-tested questionnaires from selected areas from July 2019 to June 2020, and the data that was obtained was analysed using appropriate statistical tools. The methods employed for Hilsa fishing included the use of drift gill nets (known as Ilish jal, Fash jal, and Poa jal) and seine nets (referred to as Jagat ber jal), while the crafts utilised were Chandi boat and Donga. Most fishers were 31-40 years old (53.33%) in Ismanirchar and (46.67%) in Kalirchar village. Many fishers were Hindus (80%) in Ismanirchar and Muslims (96%) in Kalirchar. Regarding educational level, 69.33% and 70.67% of fishers in Ismanirchar and Kalirchar can only sign, respectively. Semi-earthen toilets were the primary type of sanitary facilities found in the area. Approximately half of the fishers residing in the two villages owned land ranging from 0 to 15 decimals. A significant portion, around 80%, relied on loans from non-governmental organisations (NGOs), while the remaining fishers obtained financial assistance from their neighbours. Hilsa fishing was found to be the main occupation in the study area. The fishers' income increased from September to November and March to May. The primary issues identified included extortion from local criminal groups, insufficient access to credit, absence of proper storage facilities, ongoing conflicts between professional and non-professional fishers, as well as tensions between Muslim and Hindu fishers. To improve their socio-economic situation and ensure sustainable livelihoods, fishers require more institutional support, better organisation, enhanced technical assistance, and increased access to credit.

Keywords: Fishing gears, Fishing crafts, Livelihood, Hilsa fish, Fishers, Meghna River

Introduction

Bangladesh boasts abundant and varied inland waters, with a total inland area of 4.3 million hectares. Approximately 94% of this area is utilised for open-water capture fisheries, while the remaining 6% is designated for closed-water culture fisheries. The Meghna River, a significant water body in the region, is intricately linked with numerous channels, creating a vast expanse of water during the rainy season. Spanning approximately 1200 hectares in Gazaria Upazila, it supports around 1200 fishers relying on its resources for sustenance and protein intake. This fishery sustains about 40% of the local fisher's population, equivalent to 2% of the country's total population, providing crucial livelihood opportunities. The Hilsa fish (*Tenualosa Ilisha* Hamilton, 1822) holds significant importance as the primary aquatic resource and forms the cornerstone of the largest fishery industry in Bangladesh. Production of Hilsa fish was 566,593 tons (DoF, 2023) and a growth rate of 2.68 in the 2022-23 fiscal year (FRSS, 2022). The Hilsa fishery accounted for approximately 1% of the total gross domestic production (GDP) in Bangladesh's fisheries sector (DoF, 2023; Ahsan et al., 2014), contributing 12.22% to the nation's overall fish production (FRSS, 2022). The fisheries industry is paramount in Bangladesh's socio-economic advancement, serving as a primary source of animal protein, employment, food security, foreign revenue, and socio-economic progress (Ali et al., 2009; Siddique et al., 2013). The monofilament gill net is the primary gear utilised in capturing Hilsa fish, typically featuring stretched mesh sizes ranging from 50 to 140 mm. Siddique et al. (2013) noted the use of "chandi jal" in the Meghna River, with mesh sizes between 40 mm and 45 mm, net lengths of 650 m to 700 m, and widths of 10 m to 12 m. These nets are deployed from small motorised boats, the specifics of which vary based on fishing area and capacity. BCAS (1989) documented seven fishing crafts in the Meghna, Padma, and Jamuna rivers. In the Padma River region of Charghat and Bhaga Upazila, Ayenuddin et al. (2017) observed the use of drift gill nets alongside "chandi" boats and "dongas" for Hilsa fishing. Meanwhile, at the Meghna River estuary in Chandpur, Siddique et al. (2013) identified various fishing gears employed, including gill nets, seine nets, fixed purses, cast nets, drag nets, traps, hooks, lines, and wounding gears. Hilsa fishers constitute one of Bangladesh's most vulnerable communities, as Mia et al. (2015) highlighted. Their study revealed that approximately 75% of fishers reside in semi-earthen houses. In comparison, only 2.5% have access to half-built houses within the fishing community spanning a 4-kilometre area along the Meghna River in Ashuganj Upazila, Brahmanbaria district. Fishers faced dire sanitary conditions, with 50% using semi-earthen toilets. Family sizes ranged from 2-11 individuals, with smaller households (2-4 members) and larger ones (7+ members). The highest income of fishers (52.5%) from Bangladeshi taka (BDT) is 1,00,000-2,00,000/year, contrasting with the lowest income of fishers (5%) from BDT 25,000-50,000/year (Mia et al., 2015). Effective planning and development efforts for economically struggling sectors like fish farming require access to current socio-economic data. The absence of sufficient and reliable information on the socio-economic status of the target population hampers the successful execution of developmental programs (Ellis, 2000).

However, governmental and non-governmental organisations (NGOs) have yet to make minimal efforts to address and enhance the socio-economic conditions of Hilsa fishers in this region. There needs to be a clearer understanding of the impact of the banning period on the livelihoods of Hilsa fishers. To our knowledge, research has yet to be conducted on the effects of the banning season on the socio-economic conditions of Hilsa fishing communities near the Meghna River. With this in mind, this study aimed to assess the socio-economic and cultural profiles of fishers in the study area, predominantly inhabited by fishers who rely on fishing for their livelihoods. The objectives of this study were to examine the current status of Hilsa fishing gears and crafts in the study area and to evaluate the socio-economic status of Hilsa fishers residing near the Meghna River.

Materials and Methods

Study Area and Time Frame

The study areas were on the riverine fishers of Meghna River under Ismanirchar and Kalirchar village of Gazaria and Sadar Upazila of Munshiganj district (22°49'59.99" N to 90°49'59.99" E), respectively. Data were gathered from the selected survey areas from July 2019 to June 2020.

Sample Size and Sampling Procedure

About 150 fishers (75 from Ismanirchar village and 75 from Kalirchar village) were proportionately selected within 2 kilometres of the Meghna River. Data was collected using a thorough interview schedule consisting of a pre-tested structured questionnaire to accomplish the study's objectives.

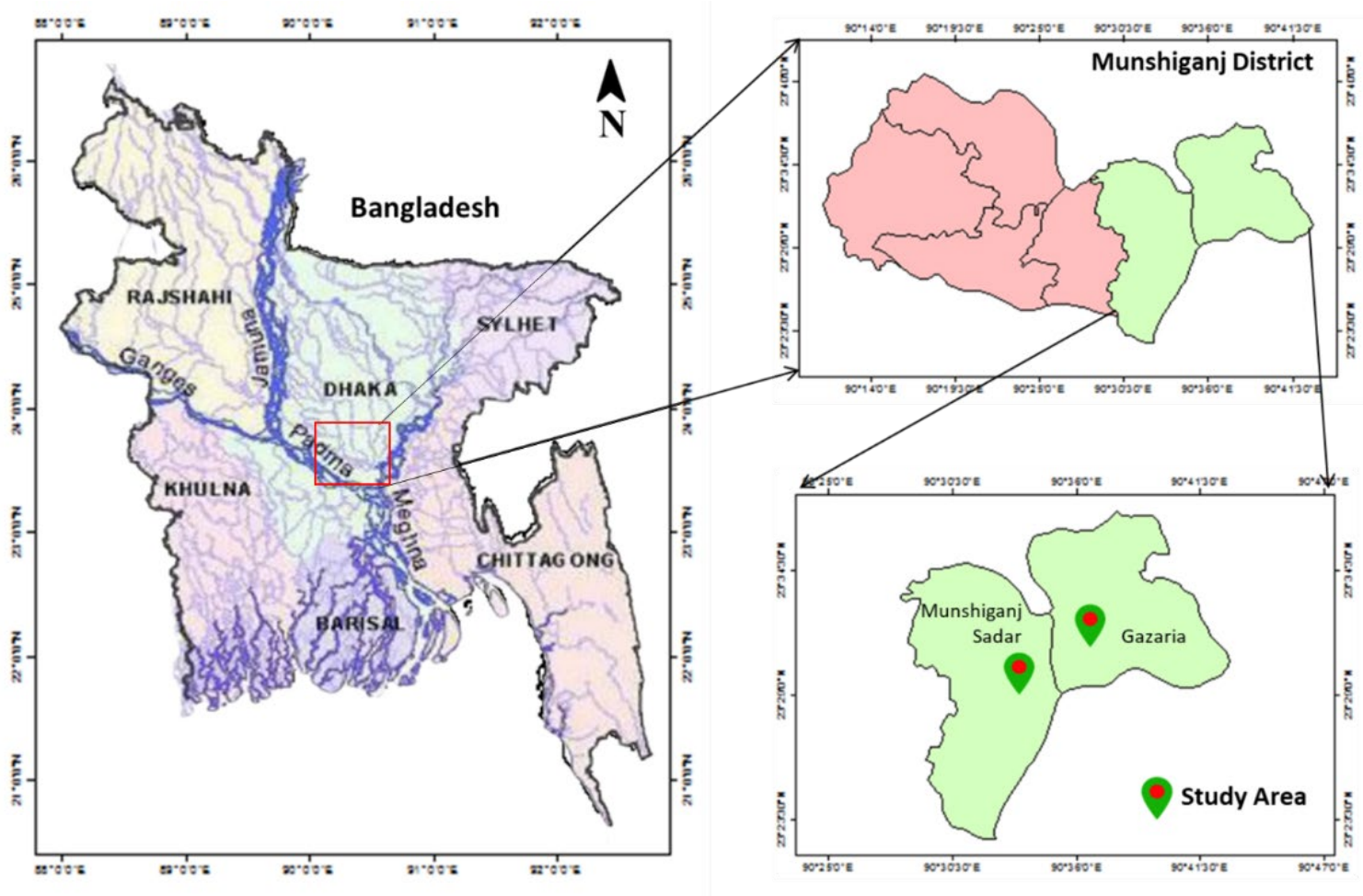

Figure 1: Study areas map under the Munshiganj district of Bangladesh.

Preparation of Questionnaire and Interviews

The questionnaire was carefully structured logically to facilitate fishers responding chronologically. Various parameters were employed to gather comprehensive data on the socio-economic status of fishers, such as categories of Hilsa fishers, fisher's types, age structure, family type, catch per unit effort (CPUE), etc. Catch per unit effort (CPUE) is an indirect measure of the abundance of a target species. Changes in the CPUE are inferred to signify changes to the target species' true abundance. A simple random sampling technique was utilised to select 150 fishers from the study area for questionnaire interviews. Interviews with fishers were conducted on-site at the river during their fishing activities. The collected data underwent validation through interviews with key individuals, including the Upazila Fisheries Officer (UFO), schoolteachers, local leaders, and NGO representatives. These interviews took place at the respondents' respective office locations.

Summarisation and Presentation of the Data

After collecting primary and secondary data from the field, the information was entered into master table sheets. Subsequently, all gathered data were carefully summarised, reviewed, and recorded. Finally, relevant tables and graphs were created using Microsoft Office 2019 to align with the study's objectives.

Results and Discussion

Fishing Gears Used in Catching Hilsa

Table 1 provides descriptions of the fishing gears utilised for catching Hilsa. Fisher's selection of nets for operation varies depending on factors such as current velocity, catch characteristics, and financial resources. Gill and seine nets were the primary types employed in the region, particularly for catching Hilsa (*Tenualosa ilisha*). During the Hilsa season, the majority of fishers were found to use chandi jal (drift gill net).

These nets typically ranged in length from 20 meters to 300 meters and in width from 1 meter to 5 meters, with stretched mesh sizes ranging from 35 to 150 millimetres. Using a gill net for Hilsa fishing commonly has a 50 to 140 mm mesh size (Halder et al., 2011). Sazzad (1993) observed that the gear used for Hilsa fishing were current jal, chandi jal, gulti jal, kona jal, jagotber jal, daba jal. It has been reported that chandi jal was mainly used in the Meghna River for Hilsa fishing with a mesh size of 40 mm to 45 mm and the length of the net was 650 m to 700 m, and the width was 10 m to 12 m (Siddique et al., 2013). Mondal et al. (2013) also found that chandi jal or Ilisha jal was very common in the Meghna River at Ramgati Upazila, Lakshmipur district and the species caught by this net was mainly Hilsa.

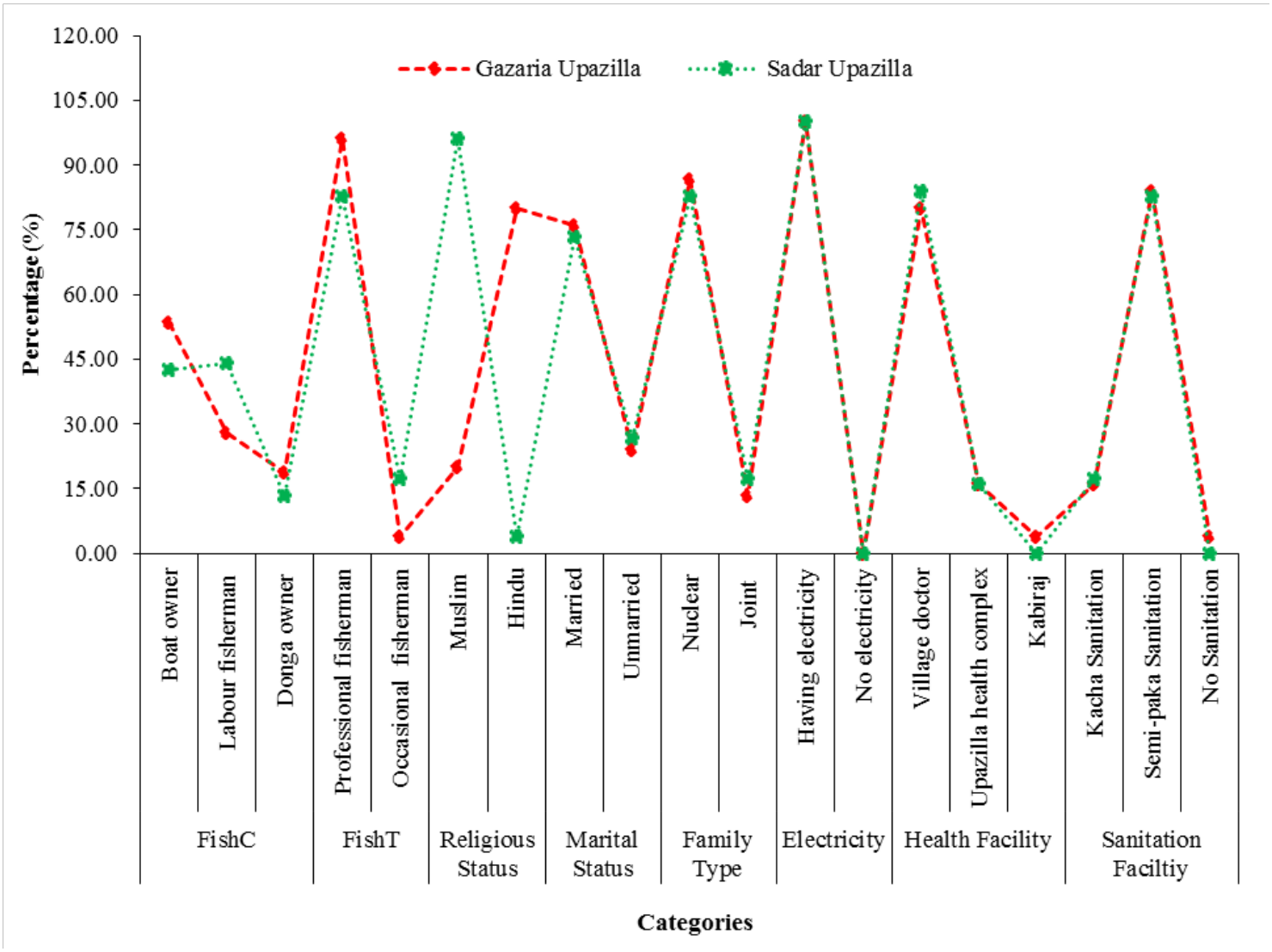

Figure 2. Fisher's categories (FishC), fisher's types (FishT), religious status, marital status, family type, electricity facility, health facility and sanitation facility of Hilsa fisher's communities.

Fishing Crafts Used in Catching Hilsa

Depending on the fishing craft, different gear sizes are used to catch fish for Hilsa fishing. The craft used in Bangladesh may have begun in ancient times when people started catching fish from rivers and other open water bodies. In the study area, small motorised boats such as Chandi nauka are predominantly utilised for Hilsa fishing (Table 1). Fishers also employed "Donga" to catch Hilsa fish. There was a total of 72 Chandi nauka and 24 Donga boats in the study area. Chandi nauka boats typically measure between 5 to 8 meters in length, 1.5 to 2 meters in width, and have a depth of 0.5 to 1 meter. These boats feature a flat bottom and pointed stern, requiring 2 to 6 persons for operation. In contrast, Donga boats have a length ranging from 3 to 4 meters, a width of 0.5 to 1 meter, and a depth between 0.4 to 0.7 meters. A slightly rounded bottom characterises them, is blunt and stern, and can be operated by only 1 to 3 persons. Bangladesh's fishermen commonly utilise various crafts with differing lengths, breadths, depths, shapes, and sizes.

Table 1: Description of fishing gear and crafts used in Hilsa fishing.

Fishing Gear

Type of gear	Name of gear	Habitat	Construction cost and life span	Number of crew	Length width and mesh size	CPUE (kg/gear/day)	Materials	Operation period	Major species caught
Drift gill net	Current jal or Net jal or Ilish jal or "angly" jal	River or Estuary	5000 to 30000/- & 3-4 yrs	2-6	100 -250 m; 2-3 m; 6-8 cm.	5-30	Synthetic mono-filament fibre, rope, sinkers and floats	All the year-round	Hilsa, Poa
Drift gill net	Fash jal	River or Estuary	2000 to 10000/- & 1-3 yrs	1-2	20 -200 m; 1-1.5 m; 4-15 cm.	10-15	Synthetic mono-filament fibre, rope, earthen sinkers and floats	All the year-round	Hilsa, Poa
Drift gill net	Poa jal	River or Estuary	2000 to 20000/- & 4-5 yrs	2-4	40 -100 m; 3-5 m; 3.5-4 cm.	5-10	Synthetic or cotton polyamide monofilament fibre, rope, sinkers and floats	All the year-round	Hilsa, Poa, Bata
Seine net	Jagot ber jal	River or Estuary	20000 to 50000/- & 5-7 yrs	4-8	100 -300 m; 5-7 m; 0.3-2.5 cm.	10-40	Nylon twine or double cotton twines or tier cord, rope, sinkers and floats	All the year round	Hilsa, Jatka, Pangus

Fishing Crafts

Name of the crafts	Size				Construction materials	Bottom	Stern or bow	Person per craft	Mechanised or manual	Durability (year)
	Length (m)	Width (m)	Depth (m)	Carrying capacity (kg)						
Chandi nauka	5-8	1.5-2	0.5-1	500-1000	Wood, Iron sheet, Motor	Flat	Pointed	2-6	Mechanised/ Motorized	3-8
Donga	3-4	0.5-1	0.4-0.7	200-500	Wood, Bamboo, Tin	Slightly rounded	Blunt	1-3	Manual	1-3

Rural carpenters typically construct crafts or boats based on their plans, using planks as the primary material. Traditionally, boat-making involves the use of wood and bamboo. In traditional construction, no approved design is followed; therefore, classification of the crafts is very difficult. In a study conducted by Sazzad (1993), it was discovered that the primary crafts utilised in the Meghna River consisted of small motorised boats as well as non-motorized boats, including chandi boats and dingi boats. Additionally, BCAS (1989) documented the operation of seven distinct types of fishing crafts in the Meghna, Padma, and Jamuna rivers. DoF (2019) stated that different types of 32 fishing boats were involved in Hilsa fishing from Bhola Sadar to Hatia Island. CIDA (1993) documented the use of various fishing crafts by fishers in the northeast region of Bangladesh, particularly in the greater Sylhet and Mymensingh districts. These included chandi boats, dinghi boats, khosa boats, bachari boats, and dongas.

Table 2: Age group, educational status, family size, earners-dependency ratio, fish carrying system and gender of Hilsa fishers' communities.

Categories		Study Area			
		Gazaria Upazila (Village Ismanirchar)		Sadar Upazila (Village Kalirchar)	
		Number	Percentage	Number	Percentage
Age (in 2022) group of fishers					
less than 20		8	10.67	12	16.00
21-30		15	20.00	18	24.00
31-40		40	53.33	35	46.67
41-60		10	13.33	10	13.33
Above 60		2	2.67	0	0
Total		75	100	75	100
Educational status of the Hilsa fishers in the study area					
Illiterate		8	10.67	5	6.67
Only can sign		52	69.33	53	70.67
Class 1-5		10	13.33	15	20.00
Class 6-10		3	4.00	1	1.33
Above SSC		2	2.67	1	1.33
Above HSC		0	0	0	0
Total		75	100	75	100
Family size of Hilsa fishers in the study area					
1-3		8	10.67	10	13.33
4-6		62	82.67	60	80.00
7-9		3	4.00	5	6.67
10 or above		2	2.66	0	0.00
Total		75	100	75	100
The percent distribution of earners and dependency ratio					
Total earners		115	31.08	109	31.59
Total dependents		285	77.02	236	68.41
Total		370	100	345	100
Earners: dependents		1:2.48		1: 2.17	
Status of school-going children of fishers.					
Non-school going		18	18.75	15	17.65
School going	Only boys	30	31.25	28	32.94
	Only girls	22	22.92	22	25.88
	Both boys girls	26	27.08	20	23.53
Total		96	100	85	100
Gender					
Male		75	100	75	100
Female		0	0	0	0
Total		75	100	75	100

Socio-Economic Status of the Fishers

Fisher's category

Different groups of people engaged in Hilsa fishing in the study area are given in Figure 2. The categories of fishers were done mainly as a boat owner (who has their own boat for Hilsa fishing), labour fishers (the fishers who have no boats and work in boat owner fishers' boats) and donga owners (who have their donga for catching Hilsa fish). In the study area, boat owner fishers were (53.33% in Ismanirchar and 42.67% in Kalirchar), labour fishers (28.00% in Ismanirchar and 44.00% in Kalirchar) and donga owners (18.67% in Ismanirchar and 13.33% in Kalirchar). Ayenuddin et al. (2017) classified Hilsa fishers into three categories: boat owners, labour fishers, and donga owners. They identified two types of Hilsa fishers: professional, accounting for 57% in Raowtha and 61.63% in Vanukor, respectively, and occasional, comprising 43% in Raowtha and 38.37% in Vanukor, respectively.

Fishers' type

In the study area, various fishers were identified, including professional fishers, who rely on fishing as their primary source of income throughout the year, and occasional fishers, who engage in fishing for part of the year (October to November) to earn income. These categories are depicted in Figure 2. Subsistence fishers, who catch fish solely for personal consumption, were not present in the area since the fishers primarily catch fish for commercial purposes. It was found that professional fishers comprised 96% of the population in the village of Ismanirchar of Gazaria Upazila, and occasional fishers comprised 4%. In contrast, professional and occasional fishers were 82.67% and 17.33% in the village of Kalirchar of Sadar Upazila. In their study, Faruque and Ahsan (2014) identified that 56.52% to 75.00% of fishers were classified as professional, 20.83% to 43.48% as occasional, and 0.00% to 7.69% as subsistence Hilsa fishers in the Padma River. Conversely, Mondal et al. (2013) reported that 82% of fishers were classified as professional, while 18% were categorised as seasonal in the Meghna River within Ramgati Upazila, under Lakshmipur district.

Religious status

The survey area's fishers belonged to two religions, Muslims and Hindus. About 80% Hindu and 20% Muslim fishers were found in the village of Ismanirchar of Gazaria Upazila (Figure 2). On the other hand, around 96% Muslim and only 4% Hindu fishers were found in the village of Kalirchar of Sadar Upazila. According to Faruque and Ahsan (2014), Muslim fishers predominantly engaged in Hilsa fishing in the Padma River, except in Horisonkorpur, where most were Hindus. Hossain et al. (2015) discovered that in the Punorvaba River under Sadar Upazila, Dinajpur, most fishers were Muslim, constituting 90% of the population. Similarly, Hassan and Mahmud (2002) observed that in the coastal fishing community at Kuakata, Patuakhali, 93.94% of fishers were Muslim. However, Islam et al. (2013) found that most fishers in the Jessore district were Hindu.

Marital status

About 76% of fishers in this study were married from Ismanirchar (Figure 2). Similarly, 73.33% of fishers were married, and 26.67% were unmarried in Kalirchar. Faruque and Ahsan (2014) found that 90-95% of the fishers were married and 5-10% unmarried in Padma River. Ahamed (1996) also reported that married fishers (94%) were dominant in Tangail.

Family size and type

The family size of fishers was categorised into two groups (Table 2). According to Kostori (2012), most families, comprising 4-6 members, accounted for 64% of the sample respondents. Similarly, Ali et al. (2009) found that 45% of fish farmers belonged to families with 4 to 5 members in the Mymensingh district. Abdullah-Bin-Farid et al. (2013) observed that a significant portion (48%) of fishers in the Baluhar Baor area of Jhenaidah, Bangladesh, had small families with fewer than 5 members, consistent with the present study's findings. Mahmud et al. (2015) noted a prevalence of medium-sized families (5-7 members) comprising 60% of fishers in the Paira River. These findings align closely with Kabir et al. (2012) and Hossain et al. (2009).

This study identified two types of family structures: nuclear families, consisting of married couples and their children, and joint families, which comprise a group of individuals connected by blood and legal ties (Figure 2). Around 86.67% nuclear and 13.33% joint families in Ismanirchar village and 82.67% nuclear and 17.33% joint families in Kalirchar village were found. According to Minar et al. (2012), most fishers, accounting for 86%, resided in joint family setups, while 16% lived in nuclear families along the Kirtonkhola River. In the Mymensingh district, Ali et al. (2009) reported that approximately 42.5% of fishers lived in nuclear families, with the remaining 57.5% residing in joint family arrangements. Hossain et al. (2015) found that 37% of fishers lived in joint families, while 63% lived in nuclear families along the Punorvaba River. Additionally, Bappa et al. (2014) noted that over 56% of fishers resided in nuclear families, while 44% lived in joint family settings.

Table 3. Recreational media, land holding capacity, living house conditions, source of drinking water and fish carrying system of Hilsa fisher's communities.

Categories		Study Area			
		Gazaria Upazila (Village Ismanirchar)		Sadar Upazila (Village Kalirchar)	
		Number	Percentage	Number	Percentage
Uses of recreational media by the Hilsa fishers					
Radio		0	0.00	3	4.00
Cassette player		12	16.00	8	16.67
Television		55	73.33	57	76.00
Mobile		62	82.67	66	88.00
Both Television & Mobile		48	64.00	52	69.33
None of them		15	20.00	12	16.00
Total		75	100	75	100.00
Distribution of total land holding by the Hilsa fishers					
Landless to 15 decimals		38	50.67	35	46.67
16 to 33 decimals		22	29.33	28	37.33
Above 33 decimals		15	20.00	12	16.00
Total		75	100	75	100
Condition of living house					
Kacha	Present	16	21.33	21	28.00
	Absent	0	0.00	0	0.00
Tin shed	Present	50	66.67	44	58.67
	Absent	0	0.00	0	0.00
Semi-pacca	Present	7	9.33	7	9.33
	Absent	0	0.00	0	0.00
Pacca	Present	2	2.67	3	4.00
	Absent	0	0.00	0	0.00
Total		75	100	75	100
Drinking water source					
Tube-wells		75	100.00	75	100.00
(a) Own		45	60.00	45	60.00
(b) Neighbor's		30	40.00	30	40.00
River water		0	0.00	0	0.00
Others		0	0.00	0	0.00
Total		75	100	75	100
Hilsa carrying system					
By foot		8	10.67	7	9.33
By van		3	4.00	2	2.67
By fishing craft		64	85.33	66	88.00
Total		75	100	75	100
Plastic tray		63	84.00	62	82.67
Cork sheet box		12	16.00	13	17.33
Wash fish		0	0.00	0	0.00
Use ice		0	0.00	0	0.00
Chemical use		0	0.00	0	0.00
Total		75	100	75	100

Table 4. Catch per unit effort (CPUE), fishing effort, occupation, training programs, organisations, funding sources, and various aids of Hilsa fishers' communities.

Categories		Study Area			
		Gazaria Upazila (Village Ismanirchar)		Sadar Upazila (Village Kalirchar)	
		Number	Percentage	Number	Percentage
Catch Per Unit Effort (CPUE) and Fishing effort					
CPUE (kg/gear/day)	Fishing effort (hour/day)				
1-5	1-2	12	16.00	7	9.33
6-10	2-3	58	77.33	60	80.00
11-20	3-4	5	6.67	8	10.67
Total		75	100	75	100
The fishers engaged in Hilsa fishing are occupied.					
Solely fishing		51	68.00	48	64.00
Fishing combined with agriculture		13	17.33	18	24.00
Fishing alongside day labour		8	10.67	5	6.67
Other related activities		3	4.00	4	5.33
Total		75	100	75	100
Training on fishing and fish quality taken by fishers					
Awareness of Jatka, Ma Ilish, Current net		75	100	75	100
Awareness of Special Combing Operation		75	100	75	100
Workshop on Fish Conservation Act 1950		75	100	75	100
Good Aquaculture Practice (GAP)		12	16.00	0	82.67
Others		0	0.00	0	0.00
Total		75	100	75	100
Name of organisation					
NGOs	Association for Social Advancement (ASSA)	25	33.33	24	32.00
	"Ekti Bari Ekti Khamer"	5	6.67	3	4.00
	Bangladesh Rural Advancement Committee (BRAC)	8	10.67	12	16.00
	Blue Bangla	22	29.33	20	26.67
Not required		15	20.00	16	21.33
Total		75	100	75	100
Source of funding					
None		7	9.33	6	8.00
Neighbour		5	6.67	5	6.67
Relatives		3	4.00	5	6.67
NGO		60	80.00	60	80.00
Total		75	100	75	100
Aids from GO and NGO for Hilsa fishers					
GO	VGF (Rice) during ban season	60	80.00	57	76.00
	AIG (Rickshaw, Van, Selai Machine)	24	32.00	18	24.00
	Others relief	42	56.00	33	44.00
NGO		0	0.00	0	0.00
Total		75	100	75	100

Table 5: General information about Hilsa size, price and consumer demand.

Size (kg)	Price (BDT)	Maximum caught size (kg)	Considering price maximum consumer demand size (kg)	Study area (in total)	
				Number	Percentage
0.4-0.5	300-400	0.4-0.6	0.6-0.8	150	100
0.6-0.8	500-700				
0.9-1.0	800-1000				
Above 1.0	1000-1500				
			Total	150	100

Electricity facility

In both Ismanirchar and Kalirchar villages, all fishers enjoyed full access to electricity (Figure 2). However, Hossain et al. (2015) discovered that approximately 36% of fishers residing near the Punorvaba River in Sadar Upazila, Dinajpur, lacked access to electricity. Similarly, Mia et al. (2015) noted that approximately 87.5% of respondents in the fisher community along the Meghna River in Ashuganj Upazila, Brahmanbaria District, had access to electricity, while 12.5% did not. Mahmud et al. (2015) found that a maximum of 82% of households had electricity connections, while 18% did not, among fishers residing along the Pira River.

Health facility

Regarding health facilities, approximately 80% of fishers in Ismanirchar village received healthcare services from village doctors, 16% from Upazila Health Complexes, and the remaining 4% sought assistance from quacks (Figure 2). In contrast, around 84% of fishers in Kalirchar village received healthcare services from village doctors, with the remaining 16% utilising services from Upazila Health Complexes. Faruque and Ahsan (2014) reported that approximately 68.14%, 24.05%, and 7.81% of fishers received healthcare from village doctors, Upazila Health Complexes, and quacks, respectively. Kabir et al. (2012) noted that 60% of fishers received healthcare from village doctors, 30% from Upazila Health Complexes, and 10% from private Bachelor of Medicine, Bachelor of Surgery (MBBS) doctors. Bappa et al. (2014) revealed that 64% of respondents sought treatment from quacks, while only 16% visited MBBS doctors for treatment. It is important to note that no facilities were provided by MBBS or trained registered doctors in the study area (Khan et al., 2013).

Sanitation facility

The hygiene standards among the fishers in the study area were notably low, as depicted in Figure 2. Faruque and Ahsan (2014) reported that approximately 88% of toilets were of "kacha" construction, with 10% being semi-pacca in the Charghat Upazila of Rajshahi, while 2% lacked any sanitary facilities, mirroring the current findings. Similarly, Kabir et al. (2012) noted that around 70% of fishers had access to sanitary facilities.

Age group

In assessing the potential productive human resources, understanding the age distribution of fishers is crucial. Various age groups of fishers were identified in the study area (Table 2). Kostori (2012) reported that individuals aged 20-30 comprised the primary workforce in the Chalan Beel community of Tarash Upazila, Sirajganj district, Bangladesh. Our findings were generally consistent with those of Faruque and Ahsan (2014) and Hossain et al. (2009). Minar et al. (2012) discovered that most fishers fell within the age brackets of 31 to 40 years (56%) in the Kirtonkhola River, Barisal. Similarly, Pravakar et al. (2013) observed that most fishers belonged to the age groups of 41-60 years (44%) and 20-30 years (20%) in Shahrasti Upazila, Chandpur district.

Educational status

This study categorised fishers into six groups based on their educational attainment (Table 2). Most fishers demonstrated the ability to sign their names, possibly indicating efforts by NGOs to promote educational development within the fishing community. Faruque and Ahsan (2014) discovered that 67.54% of Hilsa fishers in Charghat Upazila could only sign their names, while 16.62%, 14.05%, and 1.57% were classified as illiterate, primary-educated, and secondary-educated, respectively. Similarly, Minar et al. (2012) reported that 80% of riverine fishers in Barisal town were illiterate, with 12% able to sign their names and only 8% having completed primary education. Pravakar et al. (2013) found that in Shahrasti Upazila, Chandpur district, approximately 10% had no formal education, 16% had completed primary education, 48% had completed secondary education, 16% had attained higher secondary education, and 10% had obtained a bachelor's degree.

Table 6. Income of the Hilsa fishers in the study area.

Season	Highest catch	Categories of fishers	Income/day (in BDT)
During Hilsa fishing season (Sep-Nov and March-May)	Sep-Nov	Boat owner fishers	1500-2000
		Labor fishers	500-600
		Donga owner fishers	1000-1200
Other seasons of the year (Dec-Feb and July-Aug)	July-Aug	Boat owner fishers	500-1000
		Labor fishers	300-500
		Donga owner fishers	500-800

Percent distribution of earners and dependency ratio

Observations revealed that only males were earning money in the study area, while females typically assisted in net-making activities. However, in certain households, children under 18 were also found to contribute to the family's income (Table 2). About 31.08% were earners, and 77.02% were dependents in Ismanirchar village. In contrast, around 31.59% were earners, and 68.41% were dependents in Kalirchar village.

Status of school-going children of fishers

In the study area, it was observed that around 18.75% and 17.65% of the children of fishers were non-school-going in Ismanirchar and Kalirchar villages, respectively (Table 2). The remaining (63.60%) were school-going children, both boys and girls. Kostori (2012) noted that in the Chalan Beel area under Tarash Upazila of Sirajganj district in Bangladesh, 53% were boys, and 47% were school-going children.

Gender

No female fishers were found in this study area. All the fishers of the area (100%) were male. Society discourages hard work like Hilsa fishing and the involvement of females in fishing activities. These fishing activities of females were always rare, which corresponded with the findings of Faruque and Ahsan (2014) and Halder et al. (2011).

Recreational media

Most fishers used television and mobile phones as recreational media (64% in Ismanirchar village and 69.33% in Kalirchar village) (Table 3). According to Mahmud et al. (2015), approximately 34% of fishers utilised their radios, while 46% relied on television sets for recreational purposes and to stay informed about national news. Additionally, 20% of fishers spent leisure time conversing at tea stalls. Kostori (2012) discovered that around 36% of individuals in the Chalan Beel area of Sirajganj district used radio or television for recreation, while 64% did not possess any recreational devices.

Landholding

The individual with a large area of land leads the community, and his social status is comparatively higher than others (Table 3). Rahman et al. (2014) reported that the majority (52%) of the fishers living near Jamuna River under Shirajgonj District had land properties ranging from 1 to 20 decimal.

Living house condition

Four housing categories (Kacha, Tin shed, Semi-paka, and Paka) were identified (Table 3). Alam et al. (2009) reported that approximately 82.22% of household structures were categorised as kacha, with semi-paka and paka structures accounting for 11.11% and 6.66%, respectively, among Basantapur Beel fishers. Ahmed (2002) found that 62% of housing structures among fish farmers in the Mymensingh region were kacha. Similarly, Mia et al. (2015) observed that the majority (75-80%) of respondents had kacha houses, while 17.5% had tin sheds, and 2.5-7.5% had semi-paka or paka structures within the fisher's community of the Meghna River in Ashuganj Upazila, Brahmanbaria district, Bangladesh.

Drinking water facility

Most households of Hilsa fishers relied on tube-well water for drinking purposes, either utilising their tube-well or a neighbouring household (Table 3). This practice was widespread among fishers across various regions of Bangladesh, with similar findings reported by Alam et al. (2009), Kabir et al. (2012), Abdullah-Bin-Farid et al. (2013), and Hossain et al. (2015). In their study, Faruque and Ahsan (2014) also observed that 100% of Hilsa fisher households residing along the Padma River in Charghat Upazila utilised tube-well water. Additionally, Rahman et al. (2014) documented that approximately 83% of fishers in the Sirajganj District, situated along the Jamuna River, accessed water from their tube wells, while the remaining 17% relied on tube wells belonging to neighbours.

The transportation system of Hilsa

It was observed that Hilsa was transported by van and fishing craft using a plastic tray and cork sheet box. No one was found who washed fish or used ice and other chemicals throughout the study area (Table 3). According to Hossain (2018), Hilsa fish were typically packaged in plastic boxes, which were subsequently stored in large Styrofoam containers filled with ice before being sold to buyers, retailers, and local markets in Bangladesh. However, no literature was available regarding the pricing of Hilsa or the purchasing power of consumers in the Munshiganj district.

Catch per unit effort

About 16%, 77.33% and 6.67% fishers stated that catch per unit effort (CPUE) for 1-2, 2-3 and 3-4 fishing effort (hour/day) was 1-5, 6-10 and 11-20 kg/gear/day in Ismanirchar village, respectively (Table 4). On the other hand, 9.33%, 80.33% and 10.67% fishers stated that CPUE for 1-2, 2-3 and 3-4 fishing effort was 1-5, 6-10 and 11-20 kg/gear/day in Kalirchar village, respectively. Hossain et al. (2014) documented that most Hilsa-catching fishers were dominant and, on average, caught 35-40 kg of Hilsa fish daily. Siddique (2013) stated that the CPUE of ilish jal and fash jal were 120-150 kg and 30-50 kg, respectively.

Occupation

The occupation of the fishers was classified into distinct categories, including solely fishing, fishing combined with agriculture, fishing alongside day labour, and other related activities (Table 4). Previous research conducted by Faruque and Ahsan (2014) revealed that most fishers (ranging from 52.17% to 75.00%) were exclusively engaged in fishing activities in the Padma River. The findings of this study align closely with the conclusions drawn by Kabir et al. (2012) and Bappa et al. (2014).

Training on fishing and fish quality

About 100% of fishers were aware of brood Ilish (Gravid Hilsa), Jatka (Juvenile Hilsa), current net (drift gill net), special combing operation, and the Fish Conservation Act 1950 in both Ismanirchar and Kalirchar villages. Besides, around 16% of fishers received Good Aquaculture Practice (GAP) training in Ismanirchar village, whereas no one received GAP training in Kalirchar village (Table 4). Shuhaimi (2013) described that not much attention has been given to fishers in terms of fishing training.

Associated organisations

Most fishers (Ismanirchar and Kalirchar village) were engaged with different associated organisations such as ASSA, BRAC, and Blue Bangla, except a few (Table 4). Kostori (2012) showed that about 66% of the respondents were involved with a committee/association, and 34% were not involved with any association of the fishers in the Chalan Beel, Sirajganj district.

Source of funding

The maximum number of fishers depended on different NGOs to borrow money, followed by their relatives and neighbours in the study area (Table 4). The amount of loan for fishers varies from fisher to fisher, depending on processing costs, catch systems, boat and net size, and management. In contrast, very few fishers were not borrowed money from any sources. In their study, Mia et al. (2015) observed that 65.25% of fishers in the Meghna River area of Ashuganj Upazila, Brahmanbaria district, Bangladesh, received loans, while the remaining fishers did not have access to loans within the fisher community.

GO and NGO aids

Various GO and NGO aids provided relief facilities to the study area's fishers during different banning periods (Table 4). During the banning months, the Upazila Fisheries Officer (UFO) provided food assistance to 519 fisher families at Gazaria Upazila and 517 fisher families at Munshiganj Sadar Upazila at the rate of 40 kg/family/month (DoF, 2019).

Size and price of Hilsa

Hilsa size, 0.4-0.5 kg, 0.6-0.8 kg, 0.9-1.0 kg and above 1.0 kg Hilsa were the price of 300-400 BDT, 500-700 BDT, 800-1000 BDT and 1000-1500 BDT, respectively. During data collection, all fishers in the studied areas stated that a maximum of 0.4-0.6 kg sizes Hilsa was caught and 0.6-0.8 kg sizes Hilsa demanded by the maximum consumer (Table 5). Fishers of Munsiganj Sadar and Gazaria Upazila mentioned that Hilsa fishing, size and price depended on different seasons in the river Meghna (Sazzad, 1993). Farzana (2014) stated that the Hilsa species price remained more or less the same from July to August.

Income of fishers

Daily income and the highest fishing season for boat owner fishers, labour fishers and donga owner fishers were 1500-2000 BDT, 500-600 BDT and 1000-1200 BDT, respectively, during September to November, and were 500-1000 BDT, 300-500 BDT and 500-800 BDT, respectively during July to

August (Table 6). The income profile serves as a crucial economic gauge for measuring national development. Daily income stands out as a key indicator in comprehending the socio-economic status of fishers. Their income levels vary over time and are influenced by peak and lean seasons, although the demand for Hilsa remains relatively consistent year-round nationwide. During reduced catch rates, fishers often find themselves in the low-income bracket, necessitating borrowing to meet their daily needs. Consequently, they may experience poverty, ill health, and various diseases.

Conclusion

The socio-economic status of riverine fishers' communities was assessed based on family type, family size, and housing conditions. Fishers encountered various challenges, including limited education for their children, inadequate healthcare services, insufficient food supplies, and difficulties in saving during fishing bans. Nearly all fishers identified a lack of capital and viable alternatives during these bans as their primary concerns. Given fishers' crucial role in harvesting Hilsa fish under demanding conditions, the government must take proactive measures to improve their socio-economic well-being and nutritional status. Efforts should be made to raise awareness among fishers through governmental and non-governmental organisations (NGOs). A constructive approach is essential to establish a sustainable Hilsa fishery and integrate it into the broader framework of sustainable livelihoods at both community and national levels. Collaborative efforts between the government and various NGOs are necessary to implement effective management policies and provide additional support during fishing bans.

Compliance with Ethical Standards

Conflict of interest: The author(s) declare no actual, potential, or perceived conflict of interest for this article.

Ethics committee approval: This study does not require ethics committee permission or any special permission.

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Disclosure: -

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