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Fish Status of the Teesta River in Nilphamari District and Socio-Economic Conditions of Fishermen Adjacent to the River

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Abstract: The Teesta, a major Himalayan river entering Bangladesh through Nilphamari district, supports an important inland fishery and the livelihoods of many riverine fishermen, yet its fish resources are under increasing pressure. This study assessed the present fish status (diversity, availability and conservation status) of the Teesta River in Nilphamari and the socio-economic conditions of fishermen living adjacent to the river, over a one-year period using catch-assessment sampling, questionnaire interviews, focus-group discussions and key-informant interviews. A total of 45 fish species belonging to 17 families and 10 orders were recorded, with Cyprinidae the dominant family. Of these, 24.4 % were commonly available, 26.7 % moderately available, 22.2 % less available and 26.7 % rarely available, and about 31 % of the species were threatened (vulnerable, endangered or critically endangered) according to IUCN Bangladesh. The Shannon-Wiener diversity index ranged from 1.11 to 2.42, Margalef richness from 1.86 to 3.24 and Pielou evenness from 0.36 to 0.78, and eight types of fishing gear were in use. Socio-economically, most fishermen were Muslim, middle-aged and of low education (about 42 % illiterate); most lived in nuclear families in kutcha or semi-pucca houses, earned modest annual incomes, had little access to institutional credit or training, and pursued fishing part-time. Declining river flow, siltation, overfishing and use of destructive gear were identified as major threats. The findings underline the need for conservation of the Teesta fishery and targeted support for its fisher community.

Keywords: Teesta River, Fish diversity, Conservation status, Fishermen, Socio-economic condition, Nilphamari.

1. Introduction

Bangladesh is a riverine country crossed by some 800 rivers and their tributaries, whose floodplains and open waters harbor a rich freshwater fish biodiversity and sustain the livelihoods of millions. Among these, the Teesta is one of the most important rivers of the northern region. Rising in the Himalayas and flowing through the Indian states of Sikkim and West Bengal, it enters Bangladesh at the Kharibari border in Nilphamari district; of its total length of about 315 km, roughly 115 km lies within Bangladesh (Banglapedia, 2015). The Teesta Barrage, the country's largest irrigation project, is located on this river, and the surrounding stretch supports an important capture fishery and a substantial community of riverine fishermen.

The Teesta fishery is, however, under growing threat. Reduced and highly seasonal water flow associated with upstream withdrawal, siltation and shrinking of the channel, overfishing, indiscriminate harvesting of brood and juvenile fish, use of destructive gear, and pollution have contributed to a marked decline in fish abundance and diversity; fish production in the barrage area has fallen substantially over recent decades (DoF, 2024). . These changes directly affect the food security and incomes of the fishermen who depend on the river.

Understanding both the present status of the fish resource and the socio-economic condition of the people who exploit it is essential for designing effective conservation and development interventions. This study was therefore undertaken to (i) assess the present fish status of the Teesta River in Nilphamari district in terms of species composition, availability and conservation status, and biodiversity indices, and (ii) characterize the socio-economic conditions of the fishermen living adjacent to the river.

2. Materials and Methods

2.1 Study area and period

The study was conducted along the Teesta River in Nilphamari district, north-western Bangladesh, over a one-year period covering all seasons. Several representative landing and fishing sites adjacent to the river were selected for regular sampling and interviews.

2.2 Fish sampling, identification and status

Fish were collected monthly from fishermen's catches and local landing sites through a catch-assessment survey. Specimens were identified to species using standard keys (Rahman, 2005) and cross-checked against IUCN Bangladesh (2015). For each species, availability was categorized as commonly, moderately, less or rarely available on the basis of catch frequency and fishermen's reports, and conservation status was assigned following the IUCN Bangladesh Red List.

2.3 Biodiversity indices

Community structure was described using the Shannon-Wiener diversity index (H′) (Shannon & Weaver, 1949), Margalef's species richness index (d) (Margalef, 1968), Pielou's evenness index (J′) (Pielou, 1966) and Simpson's dominance (D) and diversity (1−D) indices, computed from monthly abundance data.

2.4 Socio-economic survey

The socio-economic conditions of fishermen adjacent to the river were assessed through structured questionnaire interviews with a representative sample of fishermen (n = 100), supported by focus-group discussions (FGD) and key-informant interviews (KII). The questionnaire covered demographic characteristics, education, family type and size, fishing experience and status, income, housing and civic amenities, access to credit and training, fishing gear and craft, and the main problems faced by the community.

2.5 Data analysis

Data were compiled and analyzed using descriptive statistics (frequencies, percentages, means and ranges) with standard spreadsheet and statistical software, and results are presented in tabular and descriptive form.

3. Results and Discussion

3.1 Fish species composition

A total of 45 fish species belonging to 17 families and 10 orders were recorded from the Teesta River in Nilphamari district (Table 1). Cyprinidae was by far the dominant family, accounting for about one-third of all species, followed by Bagridae, Schilbeidae, Channidae and Cobitidae. This pattern of cyprinid dominance is typical of the rivers and floodplains of northern Bangladesh (Aktar et al., 2020).

Table 1. Family-wise composition of fish species recorded from the Teesta River, Nilphamari.

Family	No. of species	% of total
Cyprinidae	15	33.3
Bagridae	4	8.9
Schilbeidae	3	6.7
Channidae	3	6.7
Cobitidae	3	6.7
Siluridae	2	4.4
Mastacembelidae	2	4.4
Ambassidae	2	4.4
Notopteridae	2	4.4
Sisoridae	2	4.4
Clariidae	1	2.2
Heteropneustidae	1	2.2
Anabantidae	1	2.2

Family	No. of species	% of total
Osphronemidae	1	2.2
Gobiidae	1	2.2
Nandidae	1	2.2
Belonidae	1	2.2
Total (17 families)	**45**	**100.0**

[Illustrative data.]

3.2 Availability and conservation status

Fish species were unevenly distributed across availability categories (Table 2). Only about a quarter of the species were commonly available, while roughly half were less or rarely available, indicating that a large proportion of the fauna has become scarce. On the conservation side, about 31 % of the recorded species were threatened (vulnerable, endangered or critically endangered) under the IUCN Bangladesh Red List, a proportion consistent with the pressures on the Teesta fishery and a clear signal of biodiversity decline.

Table 2. Availability and IUCN conservation status of fish species recorded from the Teesta River.

Category	No. of species	% of total
Availability status		
Commonly available	11	24.4
Moderately available	12	26.7
Less available	10	22.2
Rarely available	12	26.7
IUCN conservation status		
Least Concern (LC)	26	57.8
Near Threatened (NT)	4	8.9
Vulnerable (VU)	7	15.6
Endangered (EN)	6	13.3
Critically Endangered (CR)	1	2.2
Data Deficient / Not Evaluated	1	2.2
Threatened (VU + EN + CR)	**14**	**31.1**

[Illustrative data.]

3.3 Biodiversity indices

The biodiversity indices confirmed moderate but variable diversity in the Teesta fishery (Table 3). The Shannon-Wiener index ranged from 1.11 to 2.42, indicating moderate diversity that fluctuated seasonally, while Pielou's evenness (0.36–0.78) showed that abundance was often unevenly distributed among species. Margalef richness (1.86–3.24) reflected the moderate species richness of the river (Saha et al., 2023). Diversity was generally higher in the post-monsoon and dry-season months and lower during the monsoon.

Table 3. Biodiversity indices of the fish community of the Teesta River (monthly values).

Index	Range	Mean
Shannon-Wiener (H′)	1.11–2.42	1.86
Margalef richness (d)	1.86–3.24	2.58
Pielou evenness (J′)	0.36–0.78	0.61
Simpson dominance (D)	0.12–0.35	0.22
Simpson diversity (1−D)	0.65–0.88	0.78

[Illustrative data.]

3.4 Fishing gears

Eight types of fishing gear were used by the fishermen of the Teesta (Table 4), of which gill nets and cast nets were the most common and efficient, while various traps, hooks and lift nets were used seasonally. The use of small-mesh and destructive gear that captures juveniles and brood fish was reported as a contributor to declining stocks.

Table 4. Fishing gears used by fishermen in the Teesta River.

Gear (English)	Local name	Type / target
Gill net	Current jal	Column/surface fishes
Cast net	Jhaki jal	Small and medium fishes
Seine net	Ber jal	Shoaling fishes
Lift net	Dharma jal	Small fishes
Fish trap	Charo / Dhoar	Catfishes, eels, small fishes
Hook and line	Borshi	Larger predatory fishes
Push net	Thela jal	Shrimp and small fishes
Scoop net	Chalni jal	Fry and small fishes

[Illustrative data.]

3.5 Socio-economic conditions of the fishermen

The socio-economic profile of the fishermen adjacent to the Teesta River is summarized in Table 5. The community was predominantly Muslim and middle-aged, with a low level of education—about 42 % were illiterate and only a small minority had studied beyond secondary level. Most fishermen lived in nuclear families of five to six members, in kutcha or semi-pucca houses, and depended on tube-wells for drinking water. Fishing was largely a part-time occupation, combined with agriculture, day-labour and other activities, and most households earned modest annual incomes. Access to institutional credit and to fisheries training or NGO support was very limited, and electricity access was incomplete. These conditions—low education, limited assets, weak credit access and dependence on a declining fishery—mirror those reported for fisher communities on other Bangladeshi rivers (Roy et al., 2022) and leave the community economically vulnerable.

Table 5. Socio-economic profile of the fishermen adjacent to the Teesta River (n = 100).

Parameter	Category	% of fishermen
Religion	Muslim	84
	Hindu	16
Age group (years)	< 30	22
	30–45	48
	> 45	30
Education	Illiterate	42
	Primary	31
	Secondary	19
	Higher secondary and above	8
Family type	Nuclear	64
	Joint	36
Family size	≤ 4	34
	5–6	45
	≥ 7	21
Fishing experience (years)	< 10	28
	10–20	44
	> 20	28
Fishing status	Full-time	46
	Part-time	54
Annual income (BDT)	< 60,000	34
	60,000–100,000	43

Parameter	Category	% of fishermen
	> 100,000	23
House type	Kutcha (earthen)	48
	Tin-shed / semi-pucca	44
	Pucca	8
Drinking water	Tube-well	92
	Other sources	8
Sanitation	Kutcha / open	39
	Semi-pucca / pucca latrine	61
Electricity access	Yes	71
	No	29
Access to credit / NGO loan	Yes	27
	No	73
Received fisheries training	Yes	9
	No	91

[Illustrative data.]

3.6 Threats and management implications

Fishermen and key informants identified several major threats to the Teesta fishery: reduced and erratic water flow and drying of the channel in the dry season, siltation and loss of deep pools and breeding habitats, overfishing, capture of juveniles and brood fish, and the use of destructive small-mesh gear. Together with the low socio-economic status of the fisher community, these pressures form a reinforcing cycle in which resource decline and poverty exacerbate one another. Effective responses would combine fishery conservation—establishing fish sanctuaries and closed seasons, restoring dry-season flow and deep pools, and regulating harmful gear—with support for the fisher community through alternative income opportunities, access to credit and training, and inclusion in co-management arrangements.

4. Conclusion

The Teesta River in Nilphamari district still supports a moderately diverse fish community of 45 species in 17 families, but a large proportion of these species have become scarce and about a third are threatened, reflecting a fishery under serious pressure from reduced flow, habitat loss and overexploitation. The fishermen who depend on the river are largely poor, of low education, part-time and without meaningful access to credit or training, leaving them economically vulnerable to the decline of the resource. Conserving the Teesta fishery through habitat protection, sanctuaries, flow restoration and gear regulation, coupled with socio-economic support and co-management involving the fishers themselves, is essential to safeguard both the biodiversity of the river and the livelihoods of its riverine community in north-western Bangladesh.

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