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Socio-Economic Analysis of Fishermen and Fisheries Stakeholders of Two Locations in Bangladesh

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ABSTRACT

This study investigates the livelihood status of 100 randomly selected fishermen and stakeholders in Kawran Bazar, Dhaka, and Trishal, Mymensingh, using structured interviews and focus group discussions conducted in 2025. Results show that 48.25 of respondents fall within the 31-50 age bracket. Demographically, 70% are Muslim, while 41% live in nuclear families, with 55% maintaining a joint family. Educational attainment is low 44% HSC passed; 59% SSC, and 11% fishermen can sign. While fishing is the primary source of income, many supplement this income through agriculture (51%), labor (30%), or net-making. Living conditions reflect significant hardship: 80% and 87% reside in katcha houses, with 20% and 13% in semi-paccha houses. Sanitation challenges are evident: 3% use open fields for toilets, 70.5% use katcha latrines, 27% use open holes, and 59% use latrines. Collectively, these findings highlight a precarious socio-economic environment. Improving these conditions is vital not only for the well-being of the fishing community but also for the sustainable management of local fisheries biodiversity. Addressing gaps in education, healthcare, and sanitation through targeted policy interventions is essential to fostering a more resilient and productive aquatic ecosystem in Bangladesh.

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Introduction

Fishermen and fisheries stakeholders are among the most vital socio-economic communities in Bangladesh. The fisheries sector stands as one of the most productive and dynamic contributors to the Bangladeshi economy. About 0.8 million people of the country are directly involved in fisheries (DoF, 2017), but it is a fact that the socio-economic condition of fishermen and fisheries stakeholders is not so good. The socio-economic landscape for fishers in Bangladesh remains challenging, with recent studies continuing to identify them as one of the most vulnerable and disadvantaged communities in the country. While earlier research by highlighted their marginalization, contemporary findings emphasize that they still struggle with high illiteracy rates, lack of access to formal credit, and dependency on informal lenders (Islam *et al.,* 2026). Most of the fishers live below the poverty line, and most work as fishers or laborers. In Bangladesh, the fisheries sector plays an important role in food consumption, nutrition, employment, and export. This sector contributes more than 2.43% of Bangladesh‘s GDP, and it creates job opportunities for 1.4 million people and about 12 million people are directly or indirectly involved in fisheries and other ancillary activities (BER, 2023). In the world, fish provides the best source of protein, as well as essential macro- and micronutrients. The proverb goes "mache bhate bangalee," which means that Bangladeshi’s live on fish and rice, indicating the importance of fish. Rice and fish are the favorite foods of the rural people of Bangladesh because of the abundant availability of fish in the country’s inland open waters in the forms of rivers, canals, beels, haors, baors, and seasonal flood plains. Bangladesh is virtually the only drainage outlet for a vast, complete river basin comprising the Ganges (local name: Padma), the Brahmaputra, and the Meghna Rivers, and their networks of tributaries. The alluvial soil deposited by these rivers each year has created some of the world's most fertile plains. Bangladesh has a tropical monsoon climate characterized by heavy seasonal rainfall, high temperatures, and strong winds. In the fishing industry -whether wild-capture or aquaculture stakeholder- there is any individual, group, or organization that can affect or be affected by the management and health of aquatic resources. Because fish are often a common-pool resource, managing these stakeholders is a delicate balance between economic exploitation. There are three broad physiographic regions in Coventry. Fish production of Bangladesh from different aquatic resources in 2016-17 is presented (Table 1). It is a country dominated by wetlands, with more than 50% of its area covered by them. Its territory, encompassing three wetlands, is freshwater marshes, swamps, rivers, estuary, and the world's largest forest, the Sundarbans.

The most recent official figures from the Department of Fisheries (DoF) and conservation assessments indicate that Bangladesh's inland waters are home to approximately 253 to 265 indigenous finfish species, alongside 12 to 16 exotic species and 63 prawn species (Kunda *et al.,* 2022; DoF, 2022). Recent data from the Department of Fisheries (DoF) confirm that fish remains the primary source of animal protein in Bangladesh, accounting for approximately 60% of the national daily intake (DoF, 2022; Rifat *et al.,* 2023). This reflects a slight increase from the 58% figure cited in earlier reports and underscores the sector's continued dominance in national food security. Per capita fish consumption in Bangladesh has risen significantly, reaching approximately 23 kg annually (DoF, 2022), which surpasses the global average of roughly 20.7 kg (FAO, 2024). Nevertheless, the per capita availability of fish remains below the minimum annual requirement of 18 kg. However, fish production has grown significantly in recent years. The sector's internal structure has also shifted toward a more dominant role for aquaculture. While inland fisheries (capture and culture) still account for most of the output-roughly 85% to 86%, the specific contribution of inland aquaculture (culture) has grown to represent over 57% to 58% of total national production (DoF, 2024; Islam *et al.,* 2023). However, recent practices such as pen culture and creek culture have emerged, altering the dynamics of the capture fishery and socio-economic conditions. Despite these changes, fishermen remain one of the most vulnerable communities in Bangladesh, with many living below the poverty line. Their average annual per capita income is significantly lower than the national average. Fishermen face numerous constraints, including economic,

social, and technical barriers. They lack alternative income sources during the off-season and often work as laborers for wealthier fishers who own boats and nets. Their isolated communities lack modern amenities and access to development programs. As of the most recent official estimates, approximately 19.5 million people-nearly 12% of Bangladesh's total population-are now directly or indirectly involved in the fisheries sector (DoF, 2024; Islam *et al.,* 2023). Small-scale fishing communities in Bangladesh remain among the most marginalized and vulnerable groups, continuing to face systemic social exclusion, economic oppression, and extreme stratification (Ahmed *et al.,* 2021). These disadvantaged conditions are exacerbated by the isolated nature of fishing villages, which often lack basic community infrastructure such as electricity, cold storage, and proper road networks (Mozumder *et al.,* 2018). However, the livelihoods of these fishermen remain unsatisfactory. This study seeks to compile and analyze data on fish diversity and socio-economic conditions to inform targeted development initiatives. By understanding the challenges and opportunities, policymakers can design effective interventions to further uplift these vulnerable communities. Shamsuzzaman *et al.* (2017) reported that the fisheries sector is a vital component of the Bangladeshi economy, contributing significantly to foreign exchange earnings, employment generation, poverty reduction, and national protein security. According to DoF (2022), fish consumption accounts for approximately 60% of Bangladesh's national animal protein demand and 19% of total protein intake. FRSS (2017) reported that in 2016-2017, Bangladesh produced a total of 4,134,434 MT of fish, of which 3,927,142 MT was contributed by inland capture fisheries. FRSS (2022) data indicate that fisheries contribute 4.39% to Bangladesh's GDP and 22.76% to the agricultural GDP, while generating 2.46% of export earnings. Of the 1.28 million fishermen solely dependent on this sector, 60% work in inland waters and 40% in marine environments. Unfortunately, the socio-economic status of these communities remains unsatisfactory. These fishers face systemic deprivation and a continuous struggle for survival, exacerbated by limited access to the water bodies essential for their trade. Anonymous (2025) reported that notable rivers in Trishal upazila include the ancient Brahmaputra River, Situia, Khiru, Pagaria, and Banar. There is no water during the dry season. In the rainy season, the river is flooded with water and there are several species of fish found in the country. Trishal is an important upazila in Mymensingh district. This upazila is characterized by 1 major river, 31 beels, innumerable ponds, and extensive seasonal floodplains. Alam *et al.* (2017) found that salinity intrusion from coastal brackish-water aquaculture negatively impacts freshwater fish production. Saika *et al.* (2025) noted that pollutants, including heavy metals, pesticides, petroleum hydrocarbons, and microplastics, have reached concerning levels in aquatic soils and waters. These contaminants not only disrupt the metabolic and physiological functions of fish species but also pose significant risks to food safety and public health through bioaccumulation. DoF (2016) reports that among the various fisheries sub-sectors, inland aquaculture contributes over 55% of the country's total fish production. Asaduzzaman *et al.* (2016) note that the rivers surrounding Dhaka city are severely polluted by toxic wastewater discharged from thousands of industrial units, particularly tanneries and metal factories. Historically, they had free access to open waters; however, in recent decades, they have faced significant challenges. Due to the siltation of water bodies, competition from non-indigenous fishermen, and inadequate policy support, many are leaving their ancestral profession. This rapid shift is resulting in an alarming, unstable economic situation for these communities. Islam (2020) showed that river erosion adversely affects the livelihoods of the fishing community. Tania *et al.* (2021) discussed river pollution and natural disasters; however, the cumulative effects of these factors, along with urban-industrial growth, on the fishing communities of Ashulia Union remain under-researched. For overall planning, development, and implementation in the fisheries sector, it is necessary to have a sound understanding of the livelihood patterns of the relevant people. With this goal in mind, this study examined the socioeconomic conditions of participating fishermen and fisheries stakeholders and offered recommendations to improve the livelihoods of local fishermen.

Table 1. Fish type, production and aquatic sources scenarios in Bangladesh

Types of fisheries	Sector of fisheries	Water area (hectare)	Production (metric ton)	% of production
Inland open water (capture)	River and estuary	853863	271639	6.57
	Sundarbans	177700	18086	0.44
	Beel	114161	98117	2.37
	Kaptai lake	68800	9982	0.24
	Floodplain	2712678	765782	18.52
Capture total		3927142	1163606	28.13
Capture total inland closed (culture)	Pond	384700	1833118	44.34
	Seasonal culture body	136273	215547	5.21
	Baor	5488	8002	0.19
	Shrimp/Prawn farm	272717	246406	5.96
	Crab	27010	14421	0.35
	Pen culture	7564	13368	0.32
	Cage culture	1.10 lakh cu. meter	2490	0.06
Culture Total		833752	2333352	56.44
Inland fisheries total		4760894	3496958	84.58
Marine fisheries	Industrial (trawl)		108479	2.62
	Artisanal		528997	12.79
Marine fisheries total			637476	15.42
Country total			4134434	100

Source: FRSS, 2017

Materials and Methods

The study focuses especially on the socio-economic patterns of fishermen and stakeholders in Dhaka and Mymensingh districts. To understand the socio-economic conditions of fishermen, a face-to-face personal interview with a structured questionnaire was conducted. For the survey design of the research work, the following is followed (Figure 1).

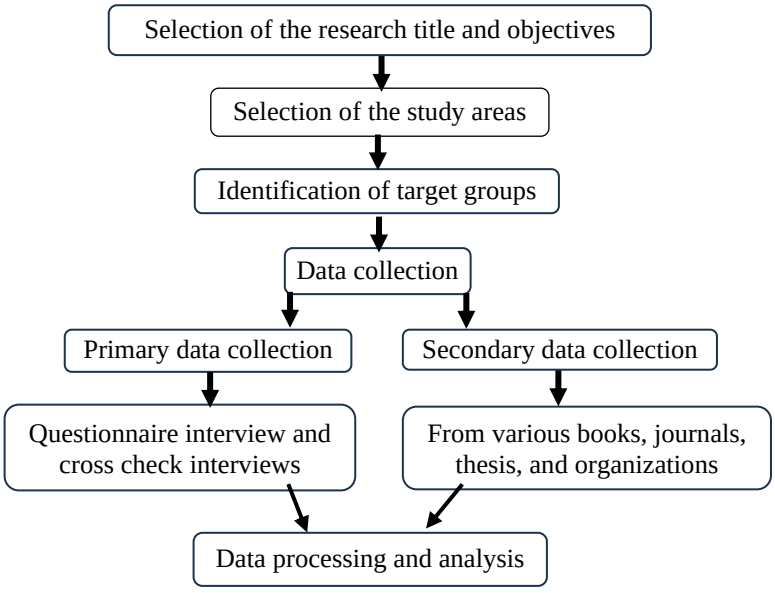


Figure 1. Design of the research work.

The study was conducted on the fishermen and stakeholders of Karwan Bazar, Dhaka and Trishal Upazila, Mymensingh during January to April 2025 and October to December 2025, respectively. 100 fishermen of 2 areas were interviewed during the survey (Figure 2). The area was selected because large scope of fishing and processing would be possible.

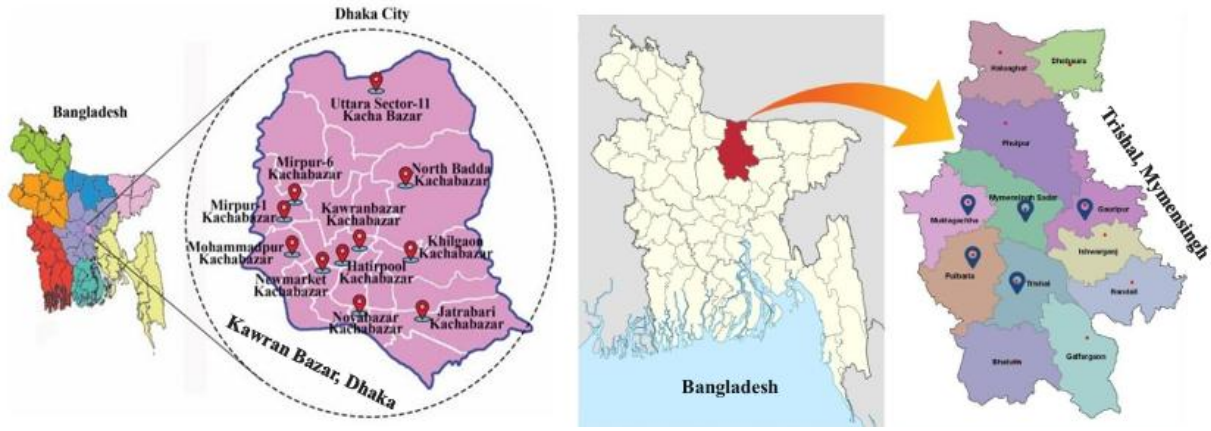


Figure 2. Map of the study areas (Kawran Bazar, Dhaka and Trishal, Mymensingh)

The draft questionnaire was developed with the specific objective of the study in mind and later refined through pilot interviews to prepare the final questionnaire. The primary data has been collected from the villages of Trishal, namely Baliapara, Amirabari, and Harirumpur. It is well known that the fishermen from three villages are employed on a self-employed basis to catch fish. The reasons for choosing those three villages are that a high number of fishermen live in Trishal and Mymensingh. The survey areas were selected on a purposive sampling basis, where the concentration of fishermen choosing their occupation traditionally. So, the fishermen class was high in those three villages. The respondents, however, were selected by using a random sampling method. Baseline information was collected on the socio-economic background of the respondents, including age, marital status, level of education, past and present occupation, religion, working conditions, income, capital requirements in the present occupation, prospects for the present occupation, and attitudes toward the present occupation in the near future. Our second destination was Karwan Bazar fish market, one of the largest and busiest wholesale fish markets in Dhaka, Bangladesh. Located in the heart of the city, it plays a vital role in supplying fresh fish to retailers, hostels, and restaurants. Every day, fish arrive here from rivers, lakes, beels, coastal areas, and fish farms from different parts of the country. Information was also gathered from secondary sources by reviewing available literature on the semi-urban informal sector. Available articles and reports on the daily socio-economic lifestyle of fishermen from secondary sources, which help us collect the real lifestyle of fishermen in the village of Trishal, Mymensingh, as well as Kawran Bazar, Dhaka.

Figure 3. Photographs of fish markets in Dhaka and Mymensingh districts

Data were collected through personal interviews using questionnaire forms. The fishermen were selected by random sampling, with a total of 100. The collected data were also compared with other information received from UFO, DFO, BFDC, NGO's, local leaders, and other owners. The selected parameters were family size, education and culture-related information, socio-economic and demographic characteristics of the fishermen, Fish marketing, yearly income, investment, and profit, identification of the occupation of the fishermen, various assets including agricultural land, livestock, poultry, and fishing, availability and utilization of credit, and health and sanitation. Data on socio-economic conditions, such as occupation types, educational status, age group, sex ratio, family size, and religious status of the fishermen, were collected.

Results

The fish marketing systems in Karwan Bazar (Dhaka) and Trishal (Mymensingh) represent two distinct yet interconnected levels of the supply chain in Bangladesh. While Trishal is a major production and assembly hub, Karwan Bazar serves as a massive wholesale consumption hub. Fish marketing information is presented (Table 2).

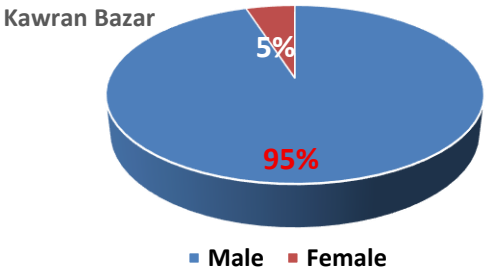
Table 2. Fish marketing systems of Trishal and Kawran Bazar

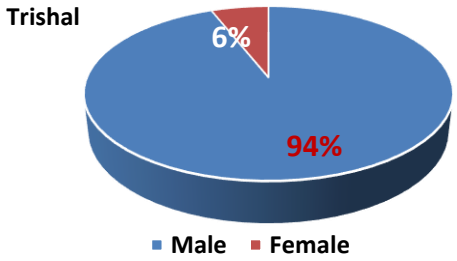
Feature	Trishal (Mymensingh)	Karwan Bazar (Dhaka)
1. Market	Primary/Assembly Market	Secondary Wholesale Market
2. Min Role	Collection and distribution	Redistribution to Retailers
3. Dominant Species	Farmed fish (Pangas, Telapia)	All types (Riverine, Farmed, Marine)
4. Participates	Farmers, Farias, Beparis	Aratdars, Wholesalers, Retailers
5. Logistics	Focus on harvesting and local transport	Focus on night-time truck arrival and unloading
6. Pricing	Based on production cost and middlemen margin	Compitative auction -based pricing

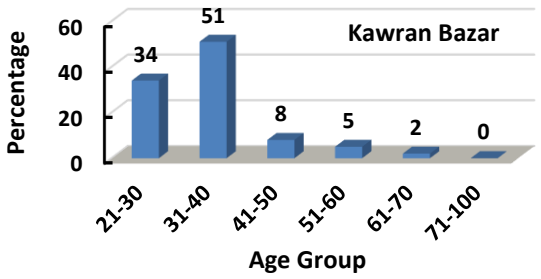
Socio-economic characteristics

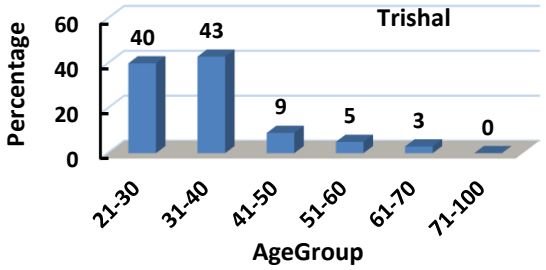
The relevant data were collected on the socio-economic characteristics, including sex, age group, religion, marital status, family type, condition of house, educational status of the fishermen, number of members in their family, household assets, use of electricity, occupation, sanitation, agricultural land, ownership of the domestic animals, source of drinking water, medical treatment and loan etc.

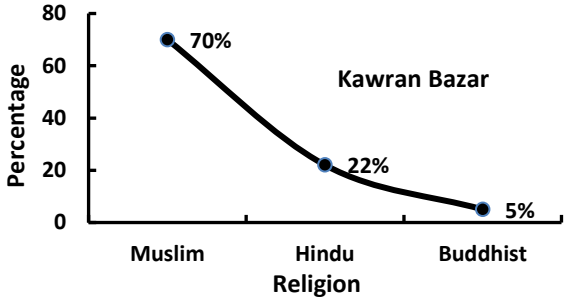
Sex: The survey was conducted among 50 fishermen at Kawran Bazar: 95% were male and 5% were female; at another location, 94% were male and 4% were female (Figure 4). Generally, women were involved in household work, and they could not afford to go out for fishing on a large scale due to trafficking and other social problems. Where males were free from those barriers and engaged themselves in the lake fishing.

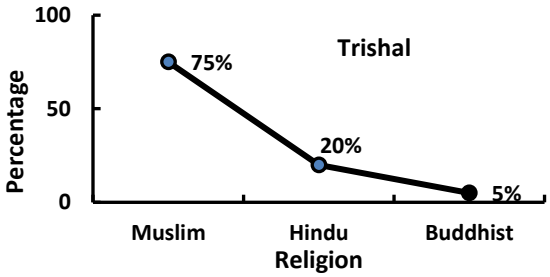


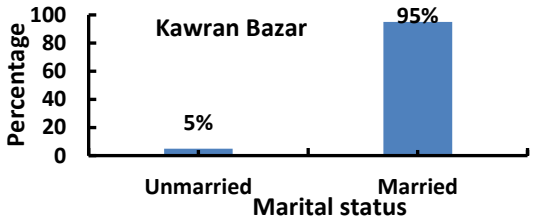


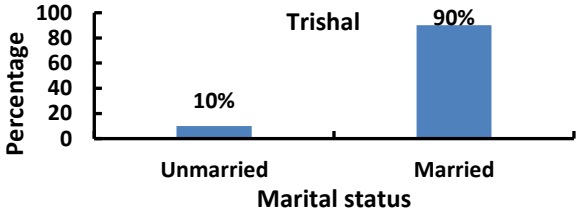


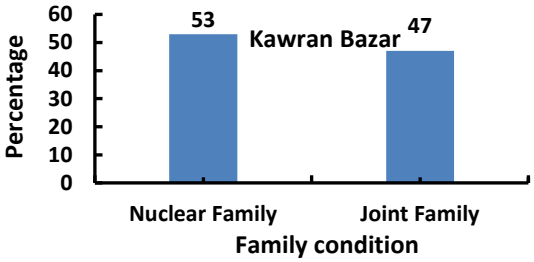


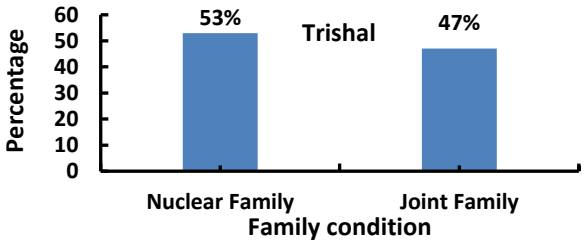


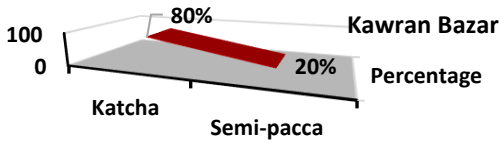




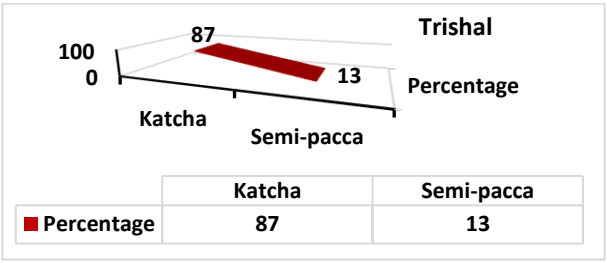




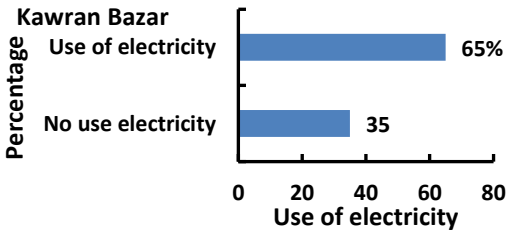


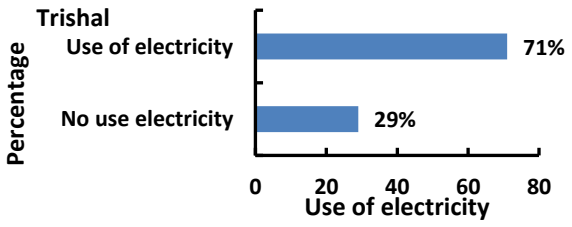


	Katcha	Semi-pacca
Percentage	80	20



	Katcha	Semi-pacca
Percentage	87	13





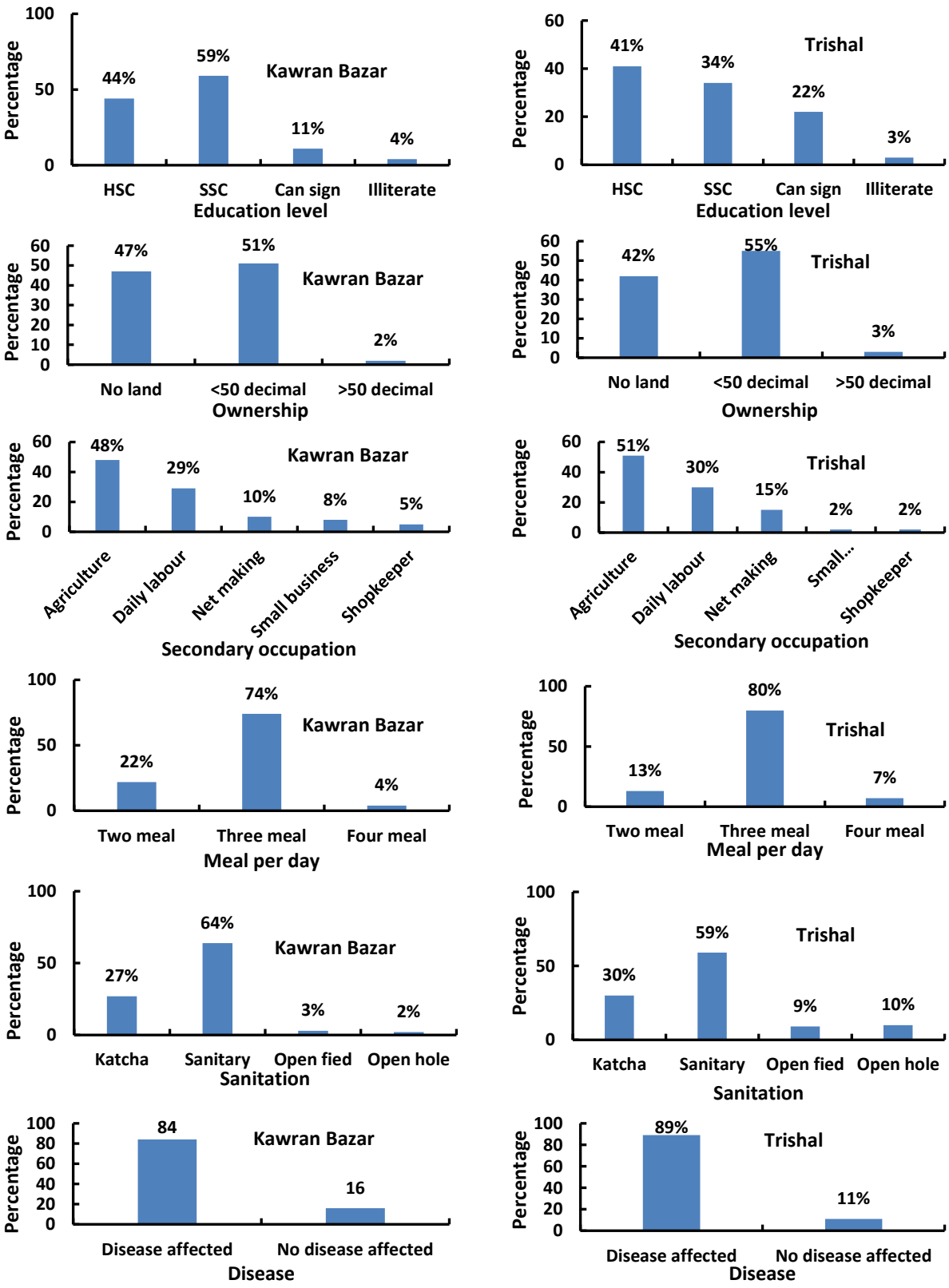


Figure 4. Socio-economic status of fishermen of Karwan Bazar and Trishal

Age group: Figure 4 shows that, 34%, 51%, 8%, 5%, 2% and 0% of fishermen belonged to the age groups in 21-30, 31-40, 41-50, 51-60, and 61-70 years, respectively, in Karwan Bazar, Dhaka. Results showed that the highest number of fishermen were between the 31-40 age group, indicating the middle-aged group, which was the dominant in fishing due to their physical strength. We can also see the same scenario in Trishal, Mymensingh. Fig 4 shows that 40%, 43%, 9%, 5%, 3%, and 2% of fishermen belong to the age groups mentioned in the graph in Trishal, Mymensingh.

Religion: Religion status results of Kawran Bazar and Trishal are presented (Figure 4). Religion can play a very important role in people's socio-cultural and environmental lives and can act as a notable constraint on social change. In Karwan Bazar, Muslim fishermen were 70%, Hindu fishermen were 22% (65%), and Buddhist fishermen were 5% and 2% respectively; in Trishal, Muslim fishermen were 70%, Hindu fishermen were 22% (65%), and Buddhist fishermen were 5% and 2% respectively.

Marital status: Marital status results of Kawran Bazar and Trishal are presented in Figure 4. The study was made to see the marital status of the fishermen. The study revealed that most of the fishermen (95%) were married, while the unmarried fishermen represented 5% of the population in Karwan bazar. On the other hand, 90% were married, and 10% were found unmarried in Trishal, Mymensingh. Divorced and oppressed people were not found in this survey.

Family type: In rural Bangladesh, families are classified into two types: 1) Nuclear family- married couples with children and 2) Joint family- group of people related by blood and/or by law. Nuclear families consist of the members of two generations (parents and children) and joint families with members of three or more generations. Family type information of Kawran Bazar and Trishal results are presented (Figure 4).

In the study area, it was found that Karwan bazar 55% of the people lived with joint families and only 41% lived with nuclear families. The nuclear family was very popular because of greater freedom of movement and economic opportunities, better dress, better education, and greater authority for women. The following family condition was found during study. About 53% of the people lived in nuclear family and 47% lived in joint family in trishal, Mymensingh.

Number of family members: Information on the fisherman's family size was collected. The survey result revealed that 59% were joint families. The average number of single-family households was 4.17 per household. The average size of joint family was 6.22 per household (Figure 4).

Housing condition: Housing condition of the areas studied results are presented (Figure 4). Housing conditions are one indicator of economic status. Attempts were made to find out the condition of house of fishermen. In the study area, houses of the community were of two main types: 1) Katcha- houses were made of bamboo and talli or tin with mud flooring, 2) Semi pucca- made of wood or/and tin. The study revealed that 80% of housing structures were Katcha, 20% were semi pucca, and pucca were found in Dhaka. And 87% of housing structures were katcha, 13% were semi pacca, and were found in Trishal.

Use of electricity: Electricity use results from Kawran Bazar and Trishal are presented (Figure 4). About 65% of the fishermen had access to electricity, while 35% didn't; 29% weren't using it, and 71% were using it in Trishal.

Education level of fishermen: The educational level of fishermen is presented (Figure 4). The level of education in the study area was good. In the study area, 44% were H.S.C. pass and 59% were S.S.C. pass. About 11% of the fishermen could sign, and 4% were illiterate, in this survey of our first service area. There was found 41% H.S.C pass, 34% S.S.C passed, 22% can sign and 3 % illiterate in Trishal, Mymensingh.

Agricultural landownership: Agricultural landownership results Kawran Bazar and Trishal are presented (Figure 4). During the survey, it was found how much agricultural land the fishermen owned. Agricultural land is one of the most productive assets for people living in villages. It was found that the highest number of fishermen (51%) had less than 50 decimal lands, while 2% had no land and 47% had more than 50 decimal lands. 55% had less than 50 decimal land, 35% had more than 50 decimal land, and 42% had no land in Trishal Upazila.

Secondary occupation: Secondary occupation status of Kawran Bazar and Trishal fishermen is presented (Figure 4). The study found that 10 people were involved in net making, 5 in shopkeeping, 48 in agriculture, 8 in small business, and 29 in daily labor in Dhaka. 51 people are involved in agriculture, 30 in daily labor, 15 in net-making, 2 in small businesses, and 2 as shopkeepers in Trishal.

Number of meals per day: The number of meals per day of fishermen of Kawran Bazar and Trishal is presented (Figure 4). The present study found that 74% of people used to eat three meals daily. It was also apparent that 22% took two meals per day and 4% took four meals per day. Most people used to eat three meals daily. It is also apparent that 13% ate two meals and 7% of people had four meals in Trishal upazila.

Sanitation practice of the fishermen: Sanitation facilities received by fishermen of Kawran Bazar and Trishal are presented (Figure 4). It was observed that the fishermen's sanitary conditions were good. Types of toilets: 27% katcha toilet, made of bamboo fencing with leaves and inadequate drainage; 68% sanitary latrines; open field; 3% open hole; 2%. In Trishal, most of the people, about 59% are used sanitary latrines, the rest of the 30% used katcha toilets, 9% open fields, and 10% open holes. Rests were used: katcha, sanitary, open-field, and open-hole latrines. Sanitation facilities are shown below.

Suffering from diseases in the last year: The disease burden status of fishermen in Kawran Bazar and Trishal is presented (Figure 4). About 84% of the fishermen did not suffer from various diseases, including Pneumatic fever, Dysentery, Jaundice, Malnutrition, Gastric, Diarrhea, and fever, in the unhygienic environment where they live. It was also found that 16% of the fishermen did not suffer from any disease last year, which was approximately one-fourth of the total fishermen. In Trishal, 89% suffered last year, and 11% did not.

Income conditions: The fishermen's income was not very good. The only source of income for fishermen is selling fish in the market and other places. There are very limited options for non-fishery-related activities, such as day labor in agricultural fields, wall painting, and small-scale trade (shopkeepers). It was found that the highest income of the fishermen from selling fish was Tk. 180/day and the lowest income Tk. 120/day. The average was found Tk. 150/day. Moreover, many people get involved in fishing each year as a seasonal or part-time occupation**.** The villagers' economic condition was not good. Most villagers could eat three times a day. The villagers mainly invested their money in vegetable production, trade (as shopkeepers), farming (poultry and cattle), jute cultivation, and a few in dairies. As they didn't have sufficient capital, they had to borrow for investment. The sources of borrowing are NGO's, Grameen Bank, moneylenders, and sometimes from Krishi Bank or businessmen.

Discussion

The study was conducted to assess the present socio-economic conditions of fishermen in the selected region. Demographically, most fishermen are in the 31-40 age group. The majority are Muslim, while Hindus and Buddhists are from smaller portions. While the 2013 data highlighted a Hindu majority (74.5%) in traditional fishing lineages, 2025–2026 data show an increasing diversification of the community due to the occupational displacement of traditional fishers and the entry of non-traditional Muslim fishers into the sector (Islam *et al.,* 2026). Most fishermen are married, and only a few are unmarried. In the study areas (including riverine corridors such as those in Tangail), 96.67% of fishers were married (Islam *et al.,* 2026). In rural Bangladesh, families are mainly of two types: nuclear and joint families. In Karwan Bazar, joint families predominated, whereas in Trishal nuclear families slightly outnumbered them. Generally, joint families were larger. Housing was overwhelmingly katcha, with only a few semi pacca structures. Additionally, most fishermen had electricity, leaving only a minority without power. However, recent evidence from Bangladesh (2022–2026) corroborates these trends, showing that rural infrastructure and electrification remain critical drivers for shifting households from traditional agriculture to more lucrative nonfarm sectors (Alam and Kaneko, 2019; Malek *et al.,* 2022). The study shows that Karwan bazar fishermen typically own small plots

51%. While landlessness is much higher in Trishal, 42%. The education level of fishermen in the examined area is greater than in the previous study conducted in Bhola, Bangladesh. Shawon *et al.* (2025) found that 26% of fishermen in Bhola, Bangladesh, were 26.0%. Islam *et al.* (2026) conducted a study of Karatoa River fishermen, revealing that 74% had no formal education, 16% had reached only the primary level, and 10% had secondary education, most of whom were landless or had <10 decimal of land. Agriculture and daily labor are the main secondary jobs in both areas, though Karwan bazar has more diverse roles like net making. Rahman (2020) states that over 30 indigenous communities in Bangladesh rely on fishing as their main source of income.

Overall, 74% of the population eats three meals daily. In Trishal, 59% use sanitary latrines, while others use unhygienic options. As a result, 89% of fishermen suffered from diseases last year. Islam *et al.* (2025) noted that coastal fishermen primarily used pond water because of a lack of tube wells, which differs from the present findings. Tania *et al.* (2021) observed that unplanned urbanization in Dhaka city has led to a reduction in water areas and the deterioration of the Turag River ecosystem. Fishermen have low income, earning about Tk 150 daily on average, so many fish only seasonally or part-time. Most fishermen were male (94-95%), while very few were female (4-5%). Women mainly did household work, and men were involved in fishing. Fishermen in the study area face significant socio-economic hardship, including limited alternative livelihoods, poor infrastructure, and restricted access to resources. Their villages are often isolated, with minimal development interventions. Given their vulnerability, targeted policies and community-based. Shawon *et al.* (2025) reported that 70.0% migrated due to natural disasters/erosion.

Conclusions

To mitigate aquatic degradation and improve the livelihoods of fishing communities along the Turag and Brahmaputra rivers, a multi-faceted approach is essential. Key interventions must include strict enforcement of pollution controls, regulation of mesh sizes and fixed engines to ensure migratory passage, and the establishment of permanent fish sanctuaries through government-led re-excavation of dead rivers. Furthermore, addressing the deep-seated socio-economic vulnerability requires prioritizing educational infrastructure and financial support to break the cycle of seasonal poverty. Although this study was constrained by political unrest and limited time, the findings clearly depict a community burdened by economic disparity yet hopeful for generational mobility. Ultimately, achieving a sustainable blue economy in Bangladesh depends on inclusive policies that provide alternative income sources and robust biodiversity conservation, ensuring that the primary producers who form the industry's backbone can secure a resilient and dignified future.

Competing Interest

The author declares that she has no competing interests.

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