

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 NAAS Rating (2026): 5.29
 IJABR 2026; 10(7): 320-324
www.biochemjournal.com
 Received: 21-04-2026
 Accepted: 26-05-2026

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Socio-economic profile and livelihood vulnerability of fishermen associated with the Harike wetland system of Punjab, India

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i7e.9011>

Abstract

This research study provides an insight into the socio-economic profile of the fishermen community associated with Harike wetland, a Ramsar site in Punjab, India. The data was gathered using random sampling and structured interview techniques. The results demonstrate the prevalence of a male-dominated workforce, youth disengagement in labor force, extended family structures, as well as presence of marginalized castes within the population. Education level remains relatively low, which causes low awareness of governmental programs and economic instability because the fishermen tend to use informal means of finance and have no contacts with any welfare or financial institutions. Fishing is the dominant occupation among the fishermen with poor diversification of livelihoods, lack of ownership of artisanal equipment, and low income rates. Protein-rich diets are standard, but nutritional vulnerability persists due to fluctuating catches and low income. The majority of respondents perceive a decline in fish catches, attributing this trend to ecological degradation, overfishing, and inadequate enforcement of regulations. The combination of formal education gap, infrastructural problems, limited access to finance, and resource depletion increases the vulnerability of the community. The findings suggest the need for specific interventions such as provisions of training, infrastructure, access to finance, and participatory resource management, thereby providing a foundation for informed policy and sustainable development.

Keywords: Sustainable, Harike, fisherman, management

Introduction

Inclusion of socio-economic elements in the governance and management of wetland ecosystems is necessary for sustainable conservation and development (Denmati *et al.*, 2012)^[5]. In India, the fisheries sector provides employment for millions; yet 61% of fisher families are classified as living below the poverty line, a stark indicator of vulnerability among these communities (Rahaman *et al* 2021)^[14]. Limited data on the specific challenges, needs, and adaptive capacities of wetland-dependent fishers catalyse this widespread socio-economic marginalization. Lack of such information may be a hindrance to the creation of effective national and regional management plans that require detailed socio-economic data to ensure both ecological sustainability and household resilience (Fisheries Statistics Division 2023, Pinello *et al* 2017)^[7, 13].

The Harike wetland, situated at the confluence of the Sutlej and Beas rivers in Punjab, stands as one of India's largest and most biodiverse protected wetlands. Recognized internationally as a Ramsar site, it supports a diverse array of aquatic life and provides crucial resources to numerous local fishing communities. Despite its ecological and economic significance, systematic socio-economic assessment of Harike's fishermen community remains understudied, with a lack of limiting the development of targeted interventions and sustainable policy frameworks. Wetland fisher communities face numerous obstacles related to occupational dependence, environmental degradation, infrastructural problems, and volatile resource availability. It is evident that social factors, such as community participation, equal access to resources, and participatory management, play a significant role in the resilience of fishermen's livelihoods (Feng *et al.*, 2024; Hossain and Banik *et al.*, 2022)^[6, 9].

At the same time, despite the need for holistic and balanced fisheries management policies in India, social and economic aspects of the problem remain relatively underdeveloped and understudied (Nongmaithem and Ngangbam, 2014) ^[11]. In numerous regional case studies, it was shown that households living in wetlands depend greatly on fishing both for survival and income; however, their earnings are becoming less stable because of environmental changes, reduction of fish stock and market pressure (Pandit *et al.*, 2023; Adhya and Banerjee, 2022) ^[12, 1].

Gender dynamics typically reflect a predominance of males in active fishing, while females participate primarily in post-harvest and marketing roles (Ayisi *et al* 2023, Lekshmi *et al* 2022) ^[2, 10]. Infrastructural shortcomings ranging from inadequate healthcare and sanitation to poor educational attainment further amplify vulnerability and restrict adaptive capacity (Roy *et al* 2022, Bhattacharya *et al* 2024) ^[15, 3]. Environmental degradation, pollution, and the proliferation of invasive species lead to severe resource limitations, pushing households toward occupational diversification or migration (Chakraborty *et al* 2023, Hidayat *et al* 2022) ^[4, 8]. These compounded pressures have also led to modifications in traditional fishing practices, gear use, and seasonal strategies.

Recognizing these gaps, the present study represents a pilot socio-economic evaluation of the fishermen community associated with the Harike wetland. Using structured interviews and random sampling, this investigation profiles household demographics, occupational structure, resource use patterns, income diversification, and responses to environmental and economic challenges. The findings will provide actionable insights for participatory management, targeted welfare interventions, and evidence-based conservation policy, advancing the dual mandate of wetland sustainability and livelihood enhancement.

Materials and Methods

Study Area and Sampling

This study was conducted amongst the fishing communities around the Harike wetland system, a Ramsar site of Punjab, India. Fifty-two fishing households were randomly selected from the landing center and adjacent settlements, ensuring representation of different age groups, family types, and backgrounds.

Data Collection

Primary data were gathered via structured interviews using a detailed questionnaire which addressed demographics, education, family structure, occupational activities, income and food security, resource access, social organization, and perceptions of conservation and catch trends. Both closed and open-ended questions were included to enable quantitative and qualitative analysis.

Interviews were conducted in the local language, following verbal consent and assurances of confidentiality. Photographs were also collected with permission.

Data Analysis

The analysis of data was performed using Microsoft Excel, with qualitative responses and open-ended comments being thematically grouped to reveal patterns and context for quantitative results.

Results and Discussion

Demographic and household structure

The fishing community at the Harike wetland is predominantly comprised of males hailing from Bihar (32.69%), Uttar Pradesh (21.15%), Punjab (15.38%), and West Bengal (30.77%). The age distribution is more inclined towards middle-aged and older respondents, with the highest proportion in the 46-55 year group (16.67%), and only 10.42% above 55 years. Fishing activities decrease significantly among the respondents below 30 years of age, who often seek alternative occupations.

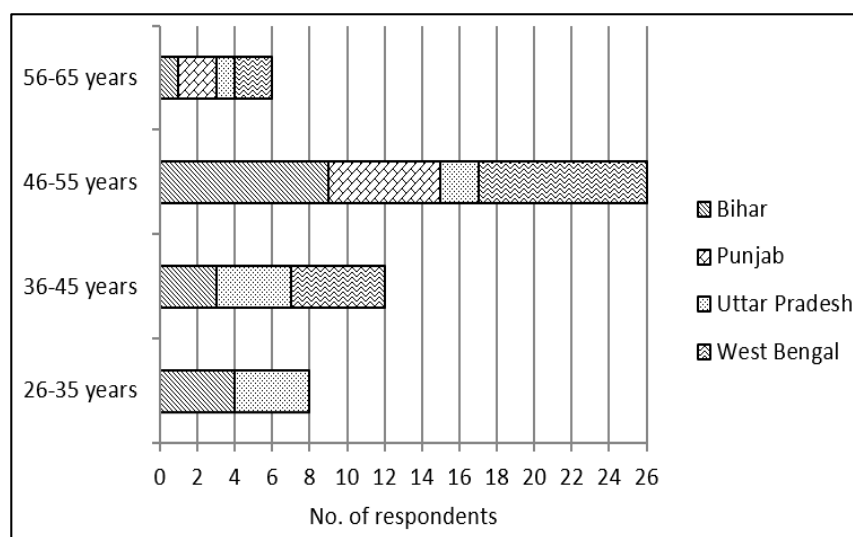


Fig 1: Age-wise distribution of respondents by state of origin. The stacked horizontal bars show the number of respondents from Bihar, Punjab, Uttar Pradesh, and West Bengal within each age group.

The household structure shows that the extended family system is the dominant category (51.92%). Majority of the respondents are married (86.53%) and typically the families rely on a single economically active fisherman. Though there is high rate of ownership of houses, the quality of

houses is poor. Out of total households, 65.38% live in kutcha houses while 34.61% live in pucca houses. Extended families are more prevalent in kutcha housing (Table 1), reflecting social and economic marginalization in the community.

Table 1: Respondents living in kutchha and pucca housing categorized by marital status (Married, Unmarried) and family structure (Extended, Nuclear).

Marital status and Family structure	Housing type		Respondents (nos.)
	Kutchha	Pucca	
Married	28	17	45
Extended	12	12	24
Nuclear	16	5	21
Unmarried	6	1	7
Extended	2	1	3
Nuclear	4		4
Respondents (nos.)	34	18	52

Educational profile

Educational attainment among the respondents is reasonably low, a situation that can be attributed to factors such as joining the workforce at an early age, requirement to provide support to the family, and lack of education facilities. Half of the respondents have no formal education, while 41.7% reported being below the matriculation level, and only 8.3% attained matriculation. These might be due to economic hardships as well as for being exposed to frequent migration. Such educational deprivation may also limit awareness of alternative income opportunities, government schemes, and sustainable resource management practices, which is quite apparent.

The linkage between low education, economic and infrastructural deficit is quite prominent amongst the

respondents.

Livelihoods, work pattern, and economic status

Fishing remains the core occupation within the community, with only marginal movement into ancillary activities such as daily wage labour (6%), agriculture (4%), and shop-keeping (4%). Despite this possibility for buffering through diversified occupations, the adoption of other sources of income is surprisingly low, with about 71% of the households having no involvement in secondary occupations at all. The restricted nature of the livelihood and its associated vulnerability arise as a result of structural obstacles to diversification.

Most of the respondents work between 5 and 12 hours per day, with a minority exceeding 12-hour shifts, particularly during peak fishing seasons. Nearly all report experience of more than a decade, and many exceed 25 or even 30 years in fishing which is a testament to generational continuity, but also an indicator of occupational rigidity (Table 2).

Table 2: Accessibility type and daily working hours of respondents

Accessibility	Daily working hours			Respondents (nos.)
	5-8 hrs	9-12 hrs	>12 hrs	
Leased	10	14	15	39
Open-access	9	2	2	13
Respondents (nos.)	19	16	17	52



Fig. 2. Fishing gears belonging to the respondents of the study area

Fishing is conducted mostly in leased (75%), than that in open-access waters. Fishermen employ a range of gears, including gill nets (*current jal*), cast nets (*ghumav jal*), and hooks and lines (*kundi*) (Fig. 2), yet ownership of fishing

crafts is rare, most rely on shared or rented means. Around 46% of the fishermen use gill nets with a mesh size of around 0.4-1 cm, and a very few opt for hook and line fishing (Fig. 3).

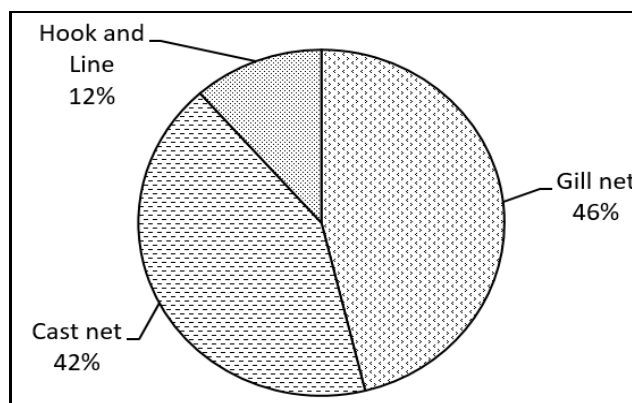


Fig 3: Distribution of gears namely, gill net (*current jal*), cast net (*ghumav jal*), and hooks and lines (*kundi*) recorded during the study period.

45.83% have economically-active family members, and the lowest daily income fall within Rs. 167 to Rs. 333, with the highest exceeding beyond Rs. 667. Around 42.31% have

household expenditures concentrated between ₹161 and ₹190 per day, showing economic vulnerability, with only a mere 0.09% spending beyond Rs. 220 per day (Fig. 4).

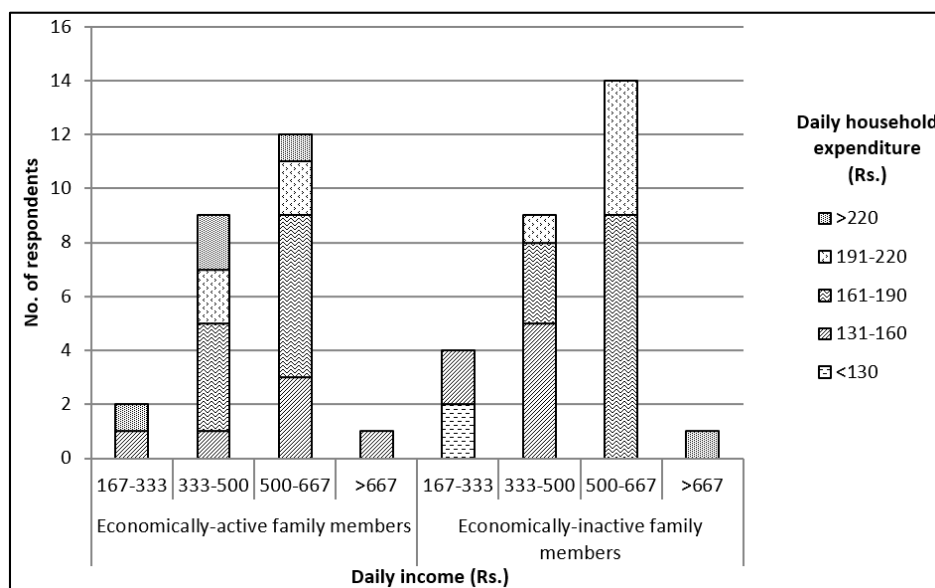


Fig 4: Daily income, household expenditure (in Rs.) of fishermen (in nos.)

Diet and food security

The fishermen's households predominantly practice a non-vegetarian diet (64.58%), often daily or several times a week. Food is sourced from markets (44.23%) and self-reared/grown stocks (15.38%), or from both (40.38%) (Fig. 5). While protein access is comparatively higher, nutritional insecurity remains a risk amidst fluctuating catches and low incomes.

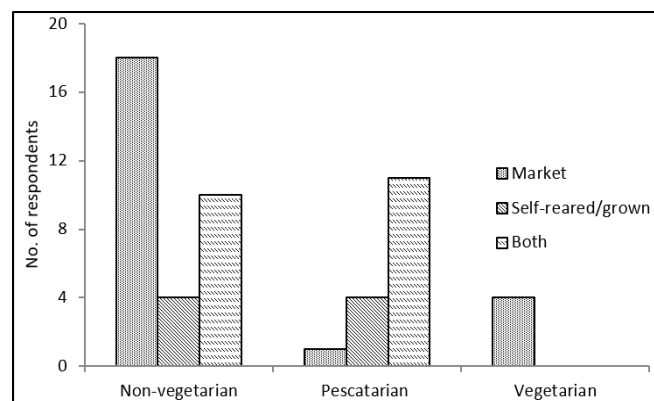


Fig 5: Distribution of respondents' dietary preferences (non-vegetarian, pescatarian, vegetarian) by primary source of food (market, self-reared/grown, or both).

Credit and welfare

Credit is mainly informal, sourced from relatives (23.07%) or money-lenders (67.30%), with negligible engagement in formal banking systems or government schemes (0.09%). Neither training nor compensation measures are undertaken, reinforcing cycles of poverty and debts.

Perspective on catch trends

The perspective on catch trends is a significant point of concern, as the vast majority report a decrease in catches over the past five years, with causes attributed to various obstacles, including aquatic weeds (23.08%), overfishing (26.92%), and pollution (25%). A very few of the fishermen

(2%) reported increases due to improved craft or gear efficiency. The fate of bycatch includes self-consumption, released back to the river, or disposal (Fig. 6).

Fishing regulations awareness and conservation practices are sporadic; while some are aware and adapt accordingly, many declare themselves unaware or indifferent (65.38%). Participation in explicit regulatory actions or conservation efforts is limited.

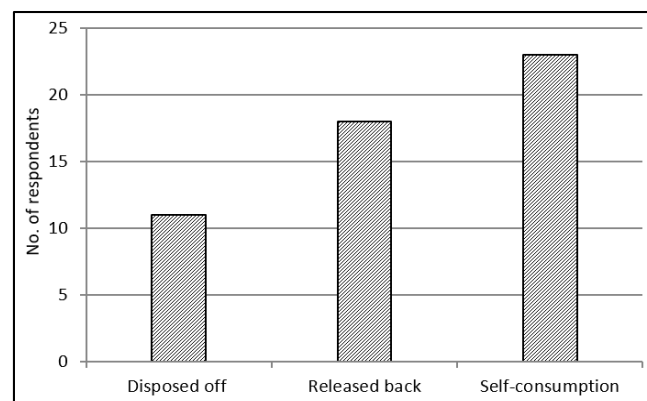


Fig 6: Fate of the bycatch as reported by the respondents, with major portion directed towards self-consumption.

Livelihood vulnerability and policy implications

The convergence of low levels of education, poor quality of housing, limited opportunities for finances, and minimal involvement in government initiatives serves to create an environment of extreme livelihood vulnerability amongst the fishing community at the Harike wetland system. Declining fish catches coupled with environmental degradation further amplify risks, potentially destabilizing food security and household incomes.

Conclusions

The fishermen community of the Harike wetland faces significant socio-economic challenges characterized by demographic aging, low education, marginal housing,

limited financial resources, and dependence on a declining aquatic ecosystem. The predominance of extended family structures and marginalized groups, combined with limited livelihood diversification, heightens vulnerability to environmental and market fluctuations. Persistent gaps in education and access to formal welfare or credit schemes limit the ability to adapt or capitalize on new opportunities. Declining catch trends infer the need for strengthened regulation, habitat rehabilitation, and the implementation of inclusive management strategies. Targeted policy interventions, including educational support, improved infrastructure, enhanced financial inclusion, and participatory management, are crucial for improving resilience, promoting livelihood security, and ensuring the responsible management of Harike wetland and its fishing communities.

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