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Factors Influencing the Knowledge and Attitudes of Fishermen about Fish Diversity and Conservation

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ABSTRACT

Background: Knowledge is a critical input for solving sustainable resource management issues. The study was conducted to determine the factors that influence the knowledge and attitudes of fishers about fish diversity and conservation in the Siang River of Arunachal Pradesh.

Methods: This study used a descriptive research design. The data were collected from randomly selected 90 respondents from two blocks of East Siang District of Arunachal Pradesh with the help of a structured interview schedule and participant observation technique. The knowledge levels of the fishers were measured under three domains: conservation strategies, reservoir ecology and fishing practices.

Result: The findings of the study revealed that the majority (53.33%) of respondents had a medium level of knowledge in three domains. Correlation analysis revealed that fishing experience and annual fishing days were positively and significantly correlated with knowledge level at a 1 per cent level of probability, whereas age and annual income were positively and significantly correlated with knowledge level at a 5 per cent level of probability. Gender, caste, education, family size, family type, average monthly catch and average fishing duration were not associated with the knowledge level of respondents about fish diversity and conservation. The attitude level of respondents was categorized into three categories: positive, neutral and negative. The findings of the study indicated that the majority of respondents (63.33%) had positive attitudes towards fish diversity and conservation, whereas 23.33 per cent had neutral attitudes and 13.34 per cent had negative attitudes toward fish diversity and conservation.

Key words: Attitude, Conservation, Diversity, Fishers, Knowledge.

INTRODUCTION

Fisheries is one of the fastest growing sectors and plays significant roles in generating employment and income and improving the socio-economic conditions of rural fishers and fish farmers in our country. Fish and fish products have presently emerged as the largest group in agricultural exports from India contributing 1.24 per cent to India's Gross Value Added (GVA) and 7.28 per cent (2018-19) to the agricultural GVA of the country (NFDB, 2020). The country has vast fisheries resources in the form of lakes, rivers, reservoirs, ponds, wetlands, *etc*, with 1.05 million tonnes of fish annually (Ayyapan *et al*., 2011). Riverine fisheries are one of the major contributors to inland fish production in India. Many of these rivers are exploited for their fishing resources and diversity, which are a source of livelihood for many rural fishermen. The mighty Siang River is the lifeline of the East Siang District and in Pasighat, it calms down before entering Assam. It is also the major drainage system of the district and most of the fish catch has been reported from the river or its tributaries. However, the river has been facing severe threats in terms of its biodiversity and its resources due to the different unwanted interventions made by the fishing communities residing around the water body and also by the growing tourist population. The fisher communities of a particular river system largely depend on the kind of available aquatic habitat conditions and other river characteristics in which they dwell, grow, move around, complete their life cycle and survive, which are being destroyed and facing severe threat through human interventions, siltation, climatic changes and deteriorating water bodies.

Different studies indicated that the knowledge and attitudes of the fishers towards the conservation of natural resources are critical inputs for the development of effective conservation strategies (Braga *et al*., 2017). Also, an expanding body of research suggests that backing for conservation efforts is frequently undermined when people's interests and livelihoods are at risk (Kideghesho *et al*., 2007). Fishery value chains typically involve numerous

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stakeholder groups (Hamilton-Hart and Stringer, 2016; Shalehin *et al*., 2022). These stakeholder groups may possess extensive knowledge of the overall fish ecology. (Pinto *et al*., 2013; Braga *et al*., 2017). For an efficient conservation policy, understanding the attitudes of all stakeholders toward the target species is crucial and policies should be tailored accordingly (Galib *et al*., 2023). This stresses the importance of the genuine engagement of key stakeholders in implementing conservation strategies affecting livelihoods and prioritizing the needs and interests of local communities. Additionally, education should be prioritized to raise awareness, change attitudes and promote alternative income-generating activities, with a particular focus on involving young people (Kideghesho *et al*., 2007). Attitudinal studies play a significant role in assessing public perception, acceptance and the effectiveness of conservation efforts, informing the creation of new management approaches (Holmes, 2003; McClanahan *et al*., 2005). To mitigate opposition and secure local backing for conservation, benefit-based approaches are increasingly favoured. These methods operate on the principle that tangible benefits derived from conservation serve as crucial motivational incentives for local residents to alter their attitudes, endorse conservation initiatives and align their behaviours with conservation objectives (Gadd, 2005; Holmes, 2003; Kideghesho *et al*., 2007). Understanding people's perceptions and attitudes also relies heavily on knowledge (Tonin and Lucaroni, 2017). Hence, integrating local ecological knowledge with scientific principles is crucial for developing comprehensive and fair management and conservation strategies (Haque *et al*., 2021). Keeping all this in mind, the present study was conducted to examine the factors that are associated with the knowledge level of fishers about fish diversity and conservation in the Siang River of Arunachal Pradesh.

MATERIALS AND METHODS

This study was conducted in the East Siang District of Arunachal Pradesh. The district has an area of 4005 sq. km and lies approximately between the longitudes 94°42′E to 95°35′E and latitudes 27°43′N to 29°20′N. It is blessed with good aquatic resources. Two blocks, Pasighat and Mebo, were purposefully selected for the present study as the river Siang flows through the blocks and a good number of fishers reside in these two blocks. Different villages nearby the Siang River were selected for the present studies based on random sampling. Four villages were selected from each block by a simple random sampling technique without replacement. Thus, a total of eight villages were selected and respondents were selected based on 20 per cent of the total population sample size by a simple random sampling technique without replacement. Thus, a total of 90 respondents constituted the sample size. Age, gender, caste, education, family type, family size, annual income, fishing experiences, annual fishing days, average monthly catch and average fishing durations were taken as the independent variables and the knowledge level of fishermen was taken as the dependent variable. Data were collected by a structured interview schedule. The interview schedule was constructed, including all the selected independent variables and dependent variables. The knowledge level was measured by a knowledge test mainly around three domains of interest: conservation strategies, reservoir ecology and fishing practices. Based on the knowledge score, a knowledge index was developed for each domain using the following formula:

Knowledge index =

$$\frac{\text{Mean score obtained in particular}}{\text{Domain maximum obtainable score in that domain}} \times 100$$

Then, the overall knowledge index is calculated as follows:

Overall knowledge index =

$$\frac{\text{Knowledge score obtained by combining all domain}}{\text{Maximum obtainable score by combining all domain}} \times 100$$

Thus, after computing knowledge index scores, the respondents were categorized into three categories taking mean and standard deviation as a measure of the check. An attitude scale based on the three-point continuum technique was developed with both positive and negative statements. Fourteen statements were given to the respondents on a three-continuum scale ranging from 'agree', 'undecided' and 'disagree' with corresponding scores of 3, 2 and 1, respectively. The scoring for the positive statements is reversed for the negative statements. Seven negative and positive statements were framed for determining attitude level.

Scoring pattern of the attitudes of the respondents

Statement	Response		
	Agree	Undecided	Disagree
Positive	3	2	1
Negative	1	2	3

The weighted mean method for each statement of the attitude data was also taken after those ranks were added to it.

A weighted mean or average is one where each value has a specific weight or frequency.

$$\bar{x} = \frac{\sum_{i=1}^{n}(x_i \times w_i)}{\sum_{i=1}^{n} w_i}$$

Where,

$\Sigma W_i X_i / W_i$ = Weighted mean.

Σ = Total sum.

X_i = Average score value of i^{th} respondent.

W_i = Weight of category of the i^{th} respondent.

Thus, after computing attitude scales, the respondents were categorized into three categories: low, medium and high, taking the mean and standard deviation as a measure of the check.

RESULTS AND DISCUSSION

Knowledge level

The results of the study (Table 1) revealed that the knowledge level of the fishers was moderately high in three domains: conservation (77.96%), riverine ecology (70%) and fishing practices (73.33%). These may be due to respondents having vast experience with and exposure to fishing activities in rivers. The respondents were also familiar with different conservation methods that are needed, reasons for regulating the mesh size of fishing gear and reasons for the fishing prohibition of fish in certain seasons of the year. They also understood how fishing with electricity, inverters and poison severely harms nature and the environment. The old age group of the respondents believed that some of the indigenous endemic fishes of Arunachal Pradesh have considerably decreased in quantity because of the loss of biodiversity.

Concerning overall knowledge level (Table 2), it was found that the majority of the respondents possessed a medium level of knowledge (53.33%), followed by a low level of knowledge (25.55%) and the remaining per cent (21.11%) possessed a high level of knowledge. A similar type of finding was reported by (Arivukkarasu, 2005; Kumar, 2008; Adesoji and Kerere, 2013; Rajan, 2013; Rathore, 2016). The study also examined the association between knowledge level and various variables like age, gender, caste, education, family type, size, annual income, fishing experience, average monthly catch, annual fishing days and fishing duration. It was observed from Table 3 that fishing experience and annual fishing days were positively and significantly correlated with the fishers at a 1 per cent level of probability and age and annual income was positively and significantly correlated at a 5 per cent level of probability, similar findings also reported by Kideghesho *et al*. (2007) and Adesoji and Kerere (2013). It was observed that knowledge level had a positive and significant correlation with experience, as depicted in Table 3, which shows that years spent by the fishers in fishing activities with gained experience increase the knowledge level of the fishers. It was also observed that there is a positive correlation and significant relationship between annual income and knowledge, showing that an increase in knowledge level positively increases the income of fishermen.

Attitude level

The attitude of the respondents was measured by using three continuums with both of the seven positive and negative statements given and then the attitude level of the respondents was categorized into three categories: positive, negative and neutral (Table 4), in which the majority of the respondents had a positive attitude towards fish diversity and conservation (63.33%), followed by neutral attitudes (23.33%) and then the remaining ones had negative attitudes (13.34%) towards fish diversity and conservation. The result is consonance with the findings of Goswami (2016), Ahmed *et al.* (2018).

The weighted mean method for each statement of the attitude data was also taken. Table 5 shows the estimation of each statement's weighted mean and after that, ranks were added to it. From the given table, it can be seen that the fishers had a strong attitude towards using electric or dynamite fishing in the rivers (4.07, I), as the fishers are also conscious of the destruction it causes to biodiversity and also aware that there is still use of some of these

Table 1: Knowledge index of the respondents in different domains (N=90).

Knowledge category	Maximum obtainable score	Obtained score	Knowledge index (%)
Conservation strategies	540	421	77.96
Riverine ecology	540	378	70
Fishing practices	540	396	73.33
Overall score	1620	1195	73.76

Table 2: Distribution of respondents according to knowledge level (N=90).

Category	Frequency (Nos.)	Percentage (%)
Low (<12)	23	25.56
Medium (13-15)	48	53.33
High (≥15)	19	21.11
Total	90	100
Mean 13.51	SD 1.68	Range 0-18

Table 3: Correlation of knowledge with different given variables.

Name of the variable	Pearson correlation
Age	0.038*
Gender	-0.37 (NS)
Caste	-0.101 (NS)
Education	-0.49 (NS)
Family type	0.028 (NS)
Family size	-0.178 (NS)
Annual Income	0.0146*
Fishing experiences	0.097**
Annual fishing days	0.085**
Average monthly catch	-0.10 (NS)
Average fishing durations	0.191 (NS)

NS= Non-significant *Correlation significant at 0.05% level of significance (2-tailed) **Correlation significant at 0.01 level of significance (2-tailed).

Table 4: Distribution of the respondents according to their attitudes (N=90).

Category	Frequency (Nos.)	Percentage (%)
Positive	57	63.33
Neutral	21	23.33
Negative	12	13.34
Total	90	100

Table 5: Weighted mean and ranks for the statement of the attitudes.

Statements	Attitudes	
	Weighted mean	Ranks
Species diversification should be there even if there is a preference for few species in the area	5	III
Sampling should be done from time to time by fisher folk to check the health of fish diversity	3.23	X
Training, demonstrations and exhibitions on fisheries should be held more often by the department	3.9	II
More steps need to be taken up for the maintenance of fish diversity and its conservation in the rivers.	3.63	IV
Fishing methods like electric fishing and dynamite fishing severely harm the ecosystem and biodiversity of the river	4.07	I
The government's role in helping aquatic development and fishery maintenance cannot be overlooked	3.51	VI
Limitations of freshwater resources exploitation of the rivers should be practiced for environmental conservation.	3.17	XI
Money and time spent on fishing activities is a sheer waste (-)	3.47	VII
Poor coordination between the fisher community and government (-)	3.59	V
Fishing activities are not a profitable occupation, it is just a hobby (-)	3.26	VIII
It is hard for the fishers to think about conservation issues as they are busy catching fish for an individual family (-)	2.73	XII
The decrease in fish diversity is because of an increase in tourist activities. (-)	2.58	XIV
A decrease in fish diversity is the obvious consequence of population growth and is not of serious concern (-)	3.18	X
Fish diversity is mainly 3.8 destroyed by global warming and overall climate change for which fisher folk cannot be blamed (-)	2.74	XIII

methods even though it severely harms the biodiversity of the riverine ecology. The fishers also had a strong positive attitude toward the government's decision to conduct more training, demonstrations and exhibitions (3.9, II). They also agreed that there should be more species diversification in the riverine resources, even if it is not preferred, as the abundance of the species corresponds to the healthy state of the water body (3.85, III). It was a concern that the fishermen were unwilling and did not take it as their responsibility to save the fish species diversity on their own (3.23, X). The fishers also showed, to a certain degree, that it is hard for them to think about conservation issues as they are busy catching fish for individual families (2.73, XII), as Goswami (2012) found that family type and family size appeared as the most dominant variables in influencing the attitude of the respondents. They are aware that global warming is one of the many reasons for the decrease in biodiversity and conservation of the riverine ecology and fishers alone are not to blame. They also believed and had positive attitudes that the decrease in riverine diversity was due to tourists' activities (2.58 XIV).

CONCLUSION

In conclusion, the findings of this investigation shed light on the factors influencing the knowledge and attitudes of fishers regarding fish diversity and conservation in the studied area. The majority of respondents demonstrated a medium level of knowledge, with a notable proportion possessing a high level. The knowledge indices for various aspects, such as conservation strategies, riverine ecology and fishing practices affecting fish diversity, revealed comparatively elevated outcome. Correlation analysis highlighted significant associations between knowledge levels and socio-physiological variables. Fishing experience and annual fishing days exhibited a strong positive correlation at a 1 per cent significance level, while age and annual income showed a positive correlation at a 5 per cent significance level. Gender, caste, family type and size, however, were not found to be associated with knowledge levels. In terms of attitudes, a significant portion of the respondents displayed positive attitudes toward fish diversity and conservation, while a smaller proportion held neutral or negative attitudes. The weighted mean method further emphasized the strength of certain attitudes, such as the strong belief that harmful fishing practices like electric or dynamite fishing should be prohibited. Additionally, there was a consensus among respondents on the need for more training, demonstrations and exhibitions by the Department of Fisheries. However, concerns were raised regarding poor coordination between the government and fishermen, indicating a potential area for improvement in conservation efforts. Overall, the study underscores the importance of addressing socio-physiological factors, enhancing training and awareness programs and improving coordination between stakeholders to foster a more positive and informed approach among fishers towards fish diversity and conservation in riverine ecologies. These insights could guide policymakers and conservationists in developing targeted interventions for sustainable fisheries management and biodiversity preservation.

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Ethical statement

The paper reflects the author's own research and analysis in a truthful manner. This work has not been published previously elsewhere.

Author's contribution

Conceptualization and designing of the research work (L.J., S.S.D., A.H.M.); Execution of field/lab experiments and data collection (L.J.); Analysis of data and interpretation (L.J., A.H.M., S.S..); Preparation of manuscript (A.H.M., M.R.S., S.S.).

Conflict of interest

The authors declared that they have no conflict of interest.

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