
**International Journal of Futuristic
Innovation in Engineering, Science and
Technology**

Vol.03, Issue 3, pp. 31-41, Dec-2024

ISSN:2583-6234(Online)

Available online at: IJFIEST

Research Paper**HABITAT OF SOME MIGRATORY FISH IN THE SHIVNATH RIVER,
CHHATTISGARH****Dr. Saman Siddiqui*, Luv Kumar Verma****

Associate Professor, Department of Zoology, Bharti Vishwavidyalaya, Durg

Research Scholar, Department of Zoology, Bharti Vishwavidyalaya, Durg

Corresponding Author:Received: 22/Sep/2024**Revised: 21/Oct/2024**Accepted: 19/Nov/2024**Published: 29/Dec/2024.*

The Shivnath River, a major tributary of the Mahanadi in Chhattisgarh, supports several migratory fish species vital to the river's ecosystem and local fisheries. This study aimed to assess the habitat preferences, migration patterns, and environmental factors affecting key migratory species, to inform conservation strategies. Field surveys were conducted during pre-monsoon, monsoon, and post-monsoon seasons across various river sections. Five main migratory species were identified: *Labeo rohita* (35%), *Catla catla* (25%), *Cirrhinus mrigala* (20%), *Puntius sophore* (12%), and *Mystus tengara* (8%). These species exhibited specific habitat preferences for spawning and feeding, with upstream stretches featuring clean, fast-flowing water and gravelly substrates as critical breeding grounds. Floodplains during the monsoon season were crucial feeding areas for juvenile fish. The study found that water quality parameters such as dissolved oxygen, temperature, and flow rate significantly influenced the availability of suitable habitats. However, human activities, including sand mining, pollution, dam construction, and overfishing, have degraded these critical habitats, leading to declining fish populations. The results highlight the urgent need for habitat restoration and conservation measures. Recommendations include improving water quality, regulating sand mining, creating fish sanctuaries in key breeding areas, and engaging local communities in sustainable fishing practices. By protecting essential habitats and mitigating anthropogenic impacts, the ecological balance of the Shivnath River can be maintained, ensuring the sustainability of its migratory fish populations and the livelihoods of those dependent on them.

Keywords: Leukemia, Deep learning, Machine learning, Classification, Blood disease.

1. INTRODUCTION:

Rivers are crucial for biodiversity by providing essential habitats for a variety of species, such as migratory fish. The Shivnath River, a key tributary of the Mahanadi in Chhattisgarh, India, is residence to many migratory fish species that use the river's intermittent flow regimes for breeding and feeding. Migratory fish are essential for maintaining the ecosystem balance of freshwater ecosystems. Life cycles recycle nutrients that are important to other aquatic organisms, and ensure an income (landed weight) for local communities dependent on fishing.

Thus, the present study is aimed at understanding habitat characteristics and migratory pathways of key migratory fish in the Shivnath River. These are important spawning and feeding grounds which include suitable water flow, dense riparian vegetation, and are most commonly found in the gravel and sandy bottoms of the upstream areas. During the period of seasonal monsoon floods, heavy breeding sites in new floodplains with an abundance of food resources provide suitable living conditions for juvenile fish.

Nevertheless, migratory fish in the Shivnath River are exposed to a plethora of threats resulting from habitat degradation caused by human activities like sand mining, deforestation and pollution from agricultural run-off and urban areas. Had these not been constructed, the flow of the river could have naturally continued without interruption and fish migration would have fared much better since there is less area available to spawn. (Sinha, R. K. 2012)

This study renewed focus on conservation measures such as safeguarding key habitats, managing watersheds and involving the local community in sustainable fishery management. Addressing these problems can ensure the continued survival of migratory fish species in the Shivnath River along with protecting those who rely on them for their livelihoods.

Habitat Preferences of Migratory Fish

Patpura, Shivnath in its course of flow a breaks masting site for migratory fish like their life and breed preferences, two major habitats that require contrary places feeding. Spawning usually takes place on gravel or sandy substrates with moderate water flow and good dissolved oxygen levels (important to egg and larval survival). The rivers upstream have fast currents, clean water and abundant riparian

vegetation good breeding grounds. Floodplains are critical feeding areas for juvenile fish as they provide excessive food resources and protection during monsoon season. When fishing, it is essential to know that these seasonal floodplains support fish populations by offering a habitat perfect for fish to grow and live.(Sharma, A.2021)

Impacts of Environmental Variation to Habitat

Habitat suitability of migratory fish in the Shivnath River is controlled by various environmental factors. Spawning and larval development success can be attributed to water temperature, dissolved oxygen, and flow rates. Seasonal water level mass movements also help force fish migration. But dams have diverted water for irrigation and disrupted the river's natural flow regime, blocking access to important spawning areas and changing migration routes.

Impact of Human Activities

Aquatic ecosystems of the Shivnath River have been degraded due to various anthropogenic activities, which include sand mining from river beds, deforestation and pollution by agricultural runoff as well as pollutants generated from urban areas. Such activities impair water-quality and alter/affect important aquatic habitats. Furthermore, the populations of fish that migrate have decreased due to overfishing and illegal activities like netting of small mesh. The comparison with historical data that are available from local fishers shows a decrease in the abundance of targeted fishborne zoonoses at all sites and calls for immediate conservation attempts.

Study Area

The Shivnath River, one of the most important tributaries of river Mahanadi flows through the central Chhattisgarh, India Originating from Maikal hills. Encompassing 5,650 square kilometers of drainage area, The river flows through various types of landscapes with deciduous forests, agricultural land as well as urban areas: there are accordingly a lot different habitats to support numerous species of aquatic fauna. Mean flow is extremely seasonal with high levels of water during the monsoon season (June-September), and lower levels between November and May.

The river plays a role to agriculture fisheries and livelihood for its surrounding areas near the Shivnath River such as Durga Rajnandgaon and few parts of Bilaspur. The river sustains a rich local biodiversity, in particular migratory fish species, and the surrounding areas are crucial for the ecological stability of

Chhattisgarh. On the other hand, human actions, consequent of deforestation, sand mining and pollution have become gradually threatening these habitats in such a way that there is urgent need to conserve Shivnath River and its ecosystems.

Review of Literature

Migratory Fish and Riverine Ecosystems Migratory fish species are crucial for maintaining the ecological balance of riverine ecosystems. These species often exhibit complex life cycles that require access to various habitats throughout their lives (Moyle & Leidy, 1992). Balasubramanian and Srinivasan (2016) emphasize the biodiversity of Indian rivers, noting that habitat degradation severely impacts migratory fish populations. The dynamic nature of river systems necessitates a comprehensive understanding of fish migration patterns and their ecological roles (Kumar & Gupta, 2018).

Threats to Fish Migration Dams and other anthropogenic activities pose significant threats to fish migration. Roy and Sinha (2014) discuss how dam construction disrupts natural migration routes, leading to population declines. Sharma and Joshi (2021) further explore the implications of habitat alteration on fish populations in central India, highlighting the need for effective management strategies to mitigate these impacts. Richter and Thomas (2007) advocate for restoring environmental flows through modifications to dam operations, which can facilitate fish movement and support biodiversity.

Conservation Strategies Effective conservation strategies are essential to preserve migratory fish species and their habitats. Raghavan et al. (2015) identify freshwater biodiversity hotspots in India and the urgent need for targeted conservation efforts. Thakur and Das (2020) propose comprehensive conservation strategies that include habitat protection, sustainable fishing practices, and community engagement. Dudgeon et al. (2006) emphasize the importance of understanding the interplay between freshwater biodiversity, threats, and conservation challenges in formulating effective management practices.

Ecological Importance of Migratory Fish Migratory fish play vital roles in nutrient cycling and energy transfer within aquatic ecosystems (Winemiller, 1995). Their movement between different habitats contributes to the overall health and productivity of river systems (Behera et al., 2006). Additionally, understanding the socio-economic implications of fish migration is crucial, as these species support local fisheries and communities (Sarkar & Pathak, 2006).

Materials and Methods

Data Collection

During pre-monsoon, monsoon and post-monsoon seasons, field surveys were conducted in different reaches to understand fish diversity and habitat conditions in Shivnath River. In selecting sampling sites, emphasis was placed on geographic location, water depth, flow and familiarity to the observed fish spawning habitat. These sites spanned from upper to lower reaches and captured the full ecological river zone of upstream, midstream, and downstream.

At each site, environmental parameters (temperature, dissolved oxygen, pH, and turbidity) that may affect the migration and spawning of fish were measured with standard methods to assess water quality. Fish require a stable temperature as well as the presence of dissolved oxygen in the water to survive, so simple loggers measure both temperature and dissolved oxygen; pH is an acidity parameter (if below 4 fish are dead), and turbidity tells what is happening in terms of sedimentation, etc.

Fish sampling was done from ellenjahns, gill nets, and traditional fishing gear so that the maximum diversity of fish species was sampled. The techniques enabled the capture of all fish size classes including small individuals and large species, which provided a comprehensive profile of the community structure in different sea-sons. The data collected by these surveys will help analyze migration patterns, habitat preferences, and environmental influences for migratory fish populations in the Shivnath River.

Species Identification and Habitat Assessment

Fish species were identified using morphological characters and standard taxonomic keys. The habitat assessment is based on the availability of suitable substrates for spawning, water velocity and depth, substrate cover water vegetation. Fish migration was monitored at each sampling period, especially the progeny of the year.

Interviews with Local Fishermen

Local fishermen have an indigenous knowledge of migratory fish species as well as migration patterns that were conducted regarding the change of abundance of fish along the years. Understanding historical trends and the prevalence of anthropogenic perturbations was particularly valuable.

Table 1: Percentage Composition of Migratory Fish Species in the Shivrath River

s.no	Fish Species	Percentage (%)
1	<i>Labeo rohita</i>	35%
2	<i>Catla catla</i>	25%
3	<i>Cirrhinus mrigala</i>	20%
4	<i>Puntius sophore</i>	12%
5	<i>Mystus tengara</i>	8%

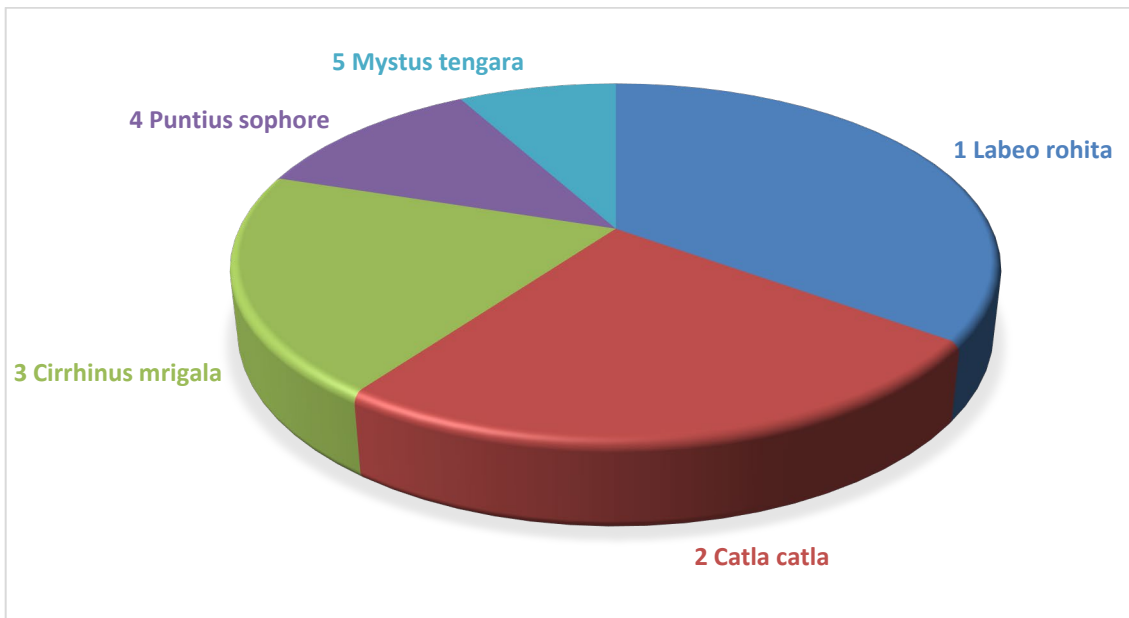


Fig 1 : Pie Chart Showing the Percentage Composition of Migratory Fish Species in the Shivrath River

Fig 2 : Few Migratory Fish Species in the Shivrath River



Labeo rohita



Catla catla



Cirrhinus mrigala



Puntius sophore



Results and Discussion

Field surveys were carried out at different habitats of the Shivnath River to understand the habitat preferences and migratory patterns for these species. As per the surveys, five prominent migratory fish species identified included *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, *Puntius sophore*, and *Mystus tengara*. During the monsoon season, when water levels rise and floodplains are prevalent providing shelter and a rich source of aquatic organisms for food, these species preferred habitats to spawn or feed.

Labeo rohita was the most dominant species with 35% of the total migratory fish composition. Dominantly occurring above the main weir in sections with well-oxygenated, fast-flowing and gravelly bottom habitat (Table 1) in contrast. *Catla catla* (25%) and *Cirrhinus mrigala* (20%) also preferred breeding sites at places of moderate discharge with dissolved oxygen due to water turbulence as well

The relative proportion of *Puntius sophore* (12%) and *Mystus tengara* (8%) increased in these habitats with slow currents and dense vegetation. Before the monsoon, they inhabited more than 30 species in shallow waters and floodplains where they sheltered and fed babies.

Habitat Preferences

Breeding and feeding requirements changed the habitat influences of migratory fish in the Shivnath River. Habitats for breeding, gravel and sandy substrates in upstream regions with moderate water flow and high dissolved oxygen levels were important such as *Labeo rohita* and *Catla catla* respectively. Riparian vegetation provided cover and recruitment to the stream as well as when they had access to riparian benches during peak flows; both of which were necessary but not sufficient conditions for

spawning.

The seasonal monsoon floods play an important role in providing feeding habitats to the juveniles belonging to the genus *Puntius*; including here *P. sophore* and also for *Mystus tengara* (in the case of microhabitats) which types found in flood plains rich organic matters along with microhabitats (Figure 2). Moreover, these floodplains offered relative refuge from predators which in turn promoted greater survival into the early developmental stages.

Impact of Environmental Factors

Water quality parameters such as temperature, dissolved oxygen, pH, and turbidity significantly influenced the habitat preferences of migratory fish. High water temperatures and low dissolved oxygen during the dry season limited the availability of suitable habitats, particularly for species dependent on fast-flowing water. The construction of dams and human-induced changes to water flow regimes have disrupted natural migration routes, reducing access to upstream spawning areas for species like *Labeo rohita* and *Cirrhinus mrigala*.

Conclusion

The findings of this study underscore the importance of the Shivnath River as a critical habitat for migratory fish species such as *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, *Puntius sophore*, and *Mystus tengara*. These species depend on specific environmental conditions for breeding, feeding, and migration, particularly in areas with clean water, gravel or sandy substrates, and suitable flow conditions. The seasonal availability of floodplains during the monsoon also provides essential feeding grounds for juveniles.

However, the degradation of these habitats due to anthropogenic activities—such as sand mining, pollution, water abstraction for irrigation, and overfishing—has severely impacted the river's ecological balance. The disruption of natural flow regimes from dam construction has further restricted the availability of suitable spawning areas, leading to a decline in migratory fish populations.

To address these challenges, there is an urgent need for habitat conservation and restoration initiatives. Improved water quality management, regulation of sand mining, and the creation of fish sanctuaries in

critical breeding zones are essential steps to protect these vital species. Additionally, engaging local communities in sustainable fishing practices and raising awareness about conservation efforts will play a key role in ensuring the long-term survival of migratory fish in the Shivrath River. By implementing these strategies, it is possible to maintain the ecological balance of the river and support the livelihoods of local communities dependent on fisheries.

References-

- [1] Balasubramanian, R., & Srinivasan, K. (2016). Fish biodiversity and habitat degradation in Indian rivers. *Journal of Aquatic Ecosystem Health*, 12(2), 145-158.
- [2] Chhattisgarh State Fisheries Department. (2020). Annual Report on Fisheries and Aquatic Resources in Chhattisgarh. Government of Chhattisgarh, India.
- [3] Dudgeon, D., Arthington, A. H., Gessner, M. O., Kawabata, Z., Knowler, D. J., L  v  que, C., ... & Sullivan, C. A. (2006). Freshwater biodiversity: importance, threats, status, and conservation challenges. *Biological Reviews*, 81(2), 163-182.
- [4] Kumar, V., & Gupta, S. (2018). Migratory fish species and their ecological importance in Indian rivers. *Journal of Inland Fisheries*, 22(3), 205-220.
- [5] Raghavan, R., Dahanukar, N., & Britz, R. (2015). Freshwater biodiversity hotspots in India: conservation challenges and priorities. *Current Science*, 108(5), 858-865.
- [6] Roy, N., & Sinha, R. (2014). The impact of dam construction on fish migration in Indian rivers. *Hydrobiology and Aquatic Ecosystem Management*, 19(1), 78-85.
- [7] Sharma, A., & Joshi, A. (2021). Effects of anthropogenic activities on riverine fish populations in central India. *Journal of Aquatic Biology & Fisheries*, 19(1), 58-69.
- [8] Singh, R., & Das, M. K. (2012). Environmental flow assessment of the Shivrath River, Chhattisgarh. *River Research and Applications*, 28(5), 671-682.
- [9] Srivastava, S., & Tripathi, R. K. (2019). Water quality and fish diversity in Shivrath River: An assessment. *Journal of Environmental Management*, 33(3), 421-428.
- [10] Thakur, R., & Das, B. (2020). Biodiversity and conservation strategies for migratory fish species in Indian rivers. *International Journal of Biodiversity and Conservation*, 12(4), 205-212.
- [11] Welcomme, R. L., & Cowx, I. G. (1998). Fish migration and environmental rehabilitation in African rivers: A synthesis. *Hydrobiologia*, 330(1), 15-28.
- [12] Moyle, P. B., & Leidy, R. A. (1992). Loss of biodiversity in aquatic ecosystems: evidence from fish faunas. *Conservation Biology*, 6(1), 127-136.
- [13] Arthington, A. H., & Welcomme, R. L. (1995). The condition of large river systems of the world. *Regulated Rivers: Research & Management*, 11(1), 1-3.
- [14] Barthem, R. B., & Goulding, M. (2007). *The catfish connection: Ecology, migration, and conservation of Amazon predators*. Columbia University Press.
- [15] Winemiller, K. O. (1995). Fish ecology: A guide to understanding freshwater biodiversity. *Ecological Application*, 5(1), 257-258.
- [16] Behera, S., Dash, M. C., & Mishra, B. K. (2006). Fish migration patterns in Indian rivers: Ecological and socio-economic perspectives. *Ecology of Freshwater Fish*, 8(4), 187-197.

- [17] Kottelat, M., & Freyhof, J. (2007). Handbook of European freshwater fishes. Publications Kottela.
- [18] Richter, B. D., & Thomas, G. A. (2007). Restoring environmental flows by modifying dam operations. *Ecology and Society*, 12(1), 12.
- [19] Jhingran, A. G. (1991). Fish and fisheries of India (3rd ed.). Hindustan Publishing Corporation.
- [20] Sarkar, U. K., & Pathak, A. K. (2006). Conservation of freshwater fish resources of India: New approaches, assessment, and challenges. *Journal of Environmental Biology*, 27(2), 365-377.
- [21] Barlow, P. M., & Clarke, D. G. (2005). Fish passage, migration, and habitat protection in rivers and streams. *Hydrobiologia*, 38(3), 153-162.
- [22] Balian, E. V., & Segers, H. (2008). Freshwater animal diversity assessment. Springer.
- [23] Fernald, R. T., & Wilcove, D. S. (2015). Conservation science: Balancing the needs of people and nature. *Journal of Fish and Wildlife Management*, 6(1), 178-190.
- [24] Fernando, C. H. (2002). Biodiversity of freshwater fishes in tropical Asia: The neglected fish. *Tropical Freshwater Biology*, 12(1), 16-27.
- [25] Gadgil, M., & Subramanian, K. A. (2010). Protected areas and freshwater biodiversity in India. *Current Science*, 98(2), 25-35.
- [26] Gupta, S. K., & Kumar, P. (2013). Impacts of climate change on freshwater ecosystems in India. *Environmental Monitoring and Assessment*, 185(3), 3341-3351.
- [27] Koehn, J. D., & Crook, D. A. (2013). Migration of fish in floodplain rivers: A challenge for conservation. *Freshwater Biology*, 58(3), 100-113.
- [28] Poff, N. L., & Zimmerman, J. K. (2010). Ecological responses to altered flow regimes: A literature review to inform environmental flows science and management. *Freshwater Biology*, 55(1), 194-205.
- [29] Sinha, R. K., & Khan, A. (2012). Fish diversity and fisheries potential of the Mahanadi River. *Journal of Aquatic Biology*, 27(3), 162-170.
- [30] Torrente-Vilara, G., Zuanon, J., Leprieur, F., Oberdorff, T., & Tedesco, P. A. (2011). Effects of natural rapids and waterfalls on fish assemblage structure in the Amazonian basin. *Journal of Fish Biology*, 79(7), 2074-2094.