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Ichthyofaunal Assemblage and Species Diversity of Lakhandei River at Aurai, Muzaffarpur: A Field Study Perspective

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Abstract: The Lakhandei River is a significant tributary of the Bagmati-Ganga River system. Aurai is a small town and Block under district Muzaffarpur, Bihar. The river sustains a rich ichthyofaunal diversity essential for the local food security and ecological stability at Aurai. This study, synthesized from regional aquatic surveys and our Field work, identifies the composition and conservation status of fish species within this riverine stretch. A total of 43 fish species belonging to 15 families under 8 orders have been recorded. The order Cypriniformes remains dominant with 18 species under 12 genera and 2 families, followed by Siluriformes. In terms of percentage, it stands respectively as 41.86%, 31.10% and 13.33%. Its one family Cyprinidae alone contains 15 species. Bagridae, with 4 species, is the second most diverse family. In terms of family diversity, Siluriformes stood first with 5 families. Clupeiformes, Cypriniformes and Perciformes jointly stand at second position, each with two families. Other orders reported from the site are Beloniformes, Channiformes, Mastacembeliformes and Tetraodontiformes; each with one family. The Red List Conservation Status (IUCN 2024-25) of fish diversity in this region shows a prevalence of species categorized as Least Concern (LC), but several key species are under threat. *Clarias magur* (State fish of Bihar) is Endangered (EN), *Notopterus notopterus*, *Hypophthalmichthys molitrix, Labeo pangusia*, *Ompok bimaculatus*, and *Ailia coila* are Near Threatened (NT), while *Wallago attu* and *Cyprinus* carpio is Vulnerable (VU). Three species, *Cyprinus carpio, Ctenopharyngodon idella* and *Hypophthalmichthys molitrix* are introduced (exotic) species, rest were native one. *Cyprinus carpio* is also an Invasive Species. Anthropogenic stressors, including habitat fragmentation and seasonal eutrophication, pose significant threats to native populations.

Keywords: Ichthyofauna, Fish Diversity, Lakhandei, Aurai, Muzaffarpur, Red List

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Introduction: Fish diversity is quite remarkable. It consistently participates more than 50% of all the vertebrate species (Nelson *et al*., 2016; Thakur *et al*., 2021), which itself constitute less than 5% of the described animal species in the world (Zhang, Zhi-Qiang, 2013). FishBase (2025) describes about 36000 fish species. Out of more than 37000 valid fish species (Eschmeyer's Catalog of Fishes (2025), more than 18000 are freshwater forms (Samantha *et al.*, 2025; Tedesco *et al*., 2017; Lundberg *et al.,* 2000). So, freshwater ecosystem supports high fish diversity in

comparison to its smaller spatial extent (Ralf B. Schäfer *et al.*, 2025; Battin *et al*. 2023; Pekel *et al.,* 2016).

Indo-Gangetic plains of India are very fertile and harbours significant number of biotic species. It is globally recognised for its biotic as well as socio-economic diversity. A well-known State under this region is Bihar. Bihar is home to a vast network of rivers, *mauns* (oxbow lakes) and *chaurs* (wetlands). Its major rivers like the Ganga, Gandak, Burhi Gandak, Koshi, Bagmati have been studied extensively to varying extent ((Sarkar *et al.*, 2012; Das *et al.,* 2013; Das *et al.*, 2023; Baitha *et al*., 2024; David, 1963; Kumar,V. *et al.*, 2025; Chandravanshi *et al*., 2025; Chandra *et al*., 2020; Singh *et al.*, 2013; Vaseem & Banerjee, 2016; Malik *et al*., 2022; Kamboj *et al*., 2023; Vass *et al*., 2010). The region also consists of many small rivers as tributaries which are locally of high ecological and economic importance. Despite highly significant in the areas they cover, they are under-studied (Kumar and Kumar, 2023; Kumar *et al.,* 2025; Sharma and Paul, 2025; Kumari & Yadav, 2020; Kumar *et al*., 2020). One of such under-documented rivers is Lakhandei river, a tributary of the Bagmati river which finally meets to the Ganga. The river acts as a socio-biological corridor; it is not a mere hydrobiological entity.

The Lakhandei is a Churia river (Adhikari, 2013) that originates in the Sivalik Hills of Nepal (CERP, 2023; Ripendra Awal & Shakya,). However, a Project (2020) traced its origin in the Mahabharata range of Central Nepal. In India, it flows through Sitamarhi and Muzaffarpur districts (Adhikari 2013), where it serves as a critical habitat for diverse piscine fauna. In Muzaffarpur district, a small semitown named Aurai is situated on its bank. In the Aurai block, the river's flood-prone nature creates a dynamic ecosystem, yet local biodiversity is increasingly under pressure from overfishing, pesticide runoff, and aquatic pollution.

Material and Methods: Aurai is a small town and administrative Block under subdivision East, district Muzaffarpur, Bihar (https://muzaffarpur.nic.in) with a total population, as per 2011 census, of 290,545 (https://www.censusindia.co.in/). It is situated at an average altitude of 55 meters (180 ft) above sea level and at Coordinates 26°19′06″N 85°33′55″E approximately. Lakhandei river flows through it. For fish collection and sampling, three sites were selected after consultation with the local fishermen. The stations of study have been:

1. Near northern junction of Jale-Aurai rd and Runnisaidpur-Keotsa rd (26.32N, 85.56E)
2. Near Aurai bazaar just below Naya Gaon Road (26.32N, 85.56E)
3. Near Maharani Sthan, Purvi Bhabhangawan (26.31N, 85.56E)

Fig: The three stations of present study at Aurai

Based on standardized research protocols for North Bihar rivers and the knowledge of local fishermen, fishes were collected periodically in 2024 and 2025 using traditional gears (cast nets, drag nets, and bamboo traps) at the three sites (Sampling). Gill and cast nets used were of various mesh sizes. Drag nets fit across the breadth of the river during normal nonflooded period. Various bamboo traps like *ghana, duari and chachari* were helpful. Hooks were used mainly for catfishes and snakeheads.

For fixation of collected specimens, 10% formaldehyde solution was used. The specimens were brought to the laboratory for morphometric and meristic measurements. Species were identified using standard taxonomic keys (e.g., Day (1878), Srivastava (1994), Talwar and Jhingran (1999), Jayaram (1994, 1999, 2010)) and verified after Nelson (2016) and via global databases like FishBase and Eschmeyer's Catalog of Fishes. Classification of fishes mentioned is primarily after Srivastava (1994) which itself follows Berg (1940). The changes in the species zoological names as per FishBase are included under parentheses. Conservation status is as per IUCN Red List Status (Ref. 130435: Version 2025-1).

Observation

At Aurai, 43 fish species have been collected from the Lakhandei River. They belong to 31 genera under 15 families and 8 orders. Cypriniformes was the most abundant order in terms of species diversity. Similar trend is found in other rivers of the Gangetic plain. The order has 18 species under 12 genera and 2 families. In terms of percentage, it stands respectively as 41.86%, 31.10% and 13.33%. Its one family Cyprinidae alone contains 15 species. The second largest order is Siluriformes with 11 species under 9 genera and 5 families. In terms of family diversity, it surpasses all other orders at the site. Similar results have been reported from Baya River, a tributary of the Ganga (Kumar and Kumar, 2023, Kumar *et al*. 2025). In terms of percentage, its species, genus and family share stands respectively as 25.58%, 29.03%, and 33.33%. Bagridae, with 4 species, is the second most diverse family. Clupeiformes, Cypriniformes and Perciformes jointly stand at second position, each with two families. Other orders reported from the site are Beloniformes, Channiformes, Mastacembeliformes and Tetraodontiformes; each with one family.

The Conservation Status (IUCN 2024-25) of fish diversity in this region shows a prevalence of species categorized as Least Concern (LC), but several key species are under threat. *Clarias magur* (State fish of Bihar) is Endangered (EN), *Notopterus notopterus*, *Hypophthalmichthys molitrix, Labeo pangusia*, *Ompok bimaculatus*, and *Ailia coila* are Near Threatened (NT) while *Wallago attu* and *Cyprinus* carpio is Vulnerable (VU). Three species, *Cyprinus carpio, Ctenopharyngodon idella* and *Hypophthalmichthys molitrix* are introduced (exotic) species, rest were native one. *Cyprinus carpio* is also an Invasive Species. The details can be observed in the Tables.

Table 1: Ichthyofaunal diversity of the River Lakhandei at Aurai, Muzaffarpur, Bihar. Classification is primarily after Srivastava (1994) which itself follows Berg (1940). New names, as per FishBase, are mentioned in brackets.

S No	Order	Family	Zoological name	Occurrence (for India)	Local (vernacular) name	IUCN Status

1.	Clupeiformes	Notopteridae	*Notopterus notopterus* (Pallas)	Native	Moya	NT
2.		Clupeidae	*Gudusia chapra* (Ham.)	Native	Suhia	LC
3.			*G. godanahiai (*Srivastava)	Native	Godanahia Suhia	
4.			*Gonialosa manmina* (Ham.)	Native	Majhali suhia	
5.	Cypriniformes	Cyprinidae	*Cyprinus carpio* (Linn.)	Introduced (exotic)	Common carp	VU
6.			*Ctenopharyngodon idella* (Valenciennes) (= *C. idellus*)	Introduced (exotic)	Grass carp	LC
7.			*Hypophthalmichthys molitrix* (Val.)	Introduced (exotic)	Silver carp	NT
8.			*Cirrhinus mrigala* (Ham)	Native	Naini	LC
9.			*C. reba* (Ham.)	Native	Rewah	LC
10.			*Rasbora daniconius* (Ham.)	Native	Derwa	LC
11.			*Catla catla* (Ham.) (=*Labeo catla*)	Native	Bhakur/katla	LC
12.			*Labeo pangusia* (Ham.)	Native	Rewa	NT
13.			*Labeo rohita* (Ham.)	Native	Rohu	LC
14.			*L. calbasu* (Ham.)	Native	Basarhi	LC
15.			*Oxygaster bacaila* (Ham)	Native	Chalhawa	LC
16.			*Puntius sarana* (Ham.) (=*Systomus sarana*)	Native	Daraheee	LC
17.			*Puntius chola* (Ham.)	Native	Sidhari	LC
18.			*Puntius conchonius* (Ham) (=*Pethia conchonius)*	Native	Pothi	LC
19.			*Puntius ticto* (Ham) (=*Pethia ticto*)	Native	Pothi	LC
20.		Cobitidae (>Botiini)	*Botia lohachata* (Chaudhuri)	Native	Bagha	LC
21.		(>Cobitini)	*Lepidocephalichthys guntea* (Ham)	Native	Nakati	LC
22.			*Nemacheilus botia* (Ham.) (=*Acanthocobitis botia*)	Native	Natawa	LC
23.	Siluriformes	Siluridae	*Ompok bimaculatus*	Native	Jalkapoor	NT

24.			*Wallago attu* (Bl. & Schn.)	Native	Boari	VU
25.		Bagridae	*Mystus tengara* (Ham)	Native	Tengari	LC
26.			*Mystus vittatus* (Bloch)	Native	Palawa	LC
27.			*Mystus bleekeri*(Day)	Native	Tengara	LC
28.			*Rita rita* (Ham.)	Native	Ritha	LC
29.		Schilbeidae	*Eutropiichthys murius* (Ham.)	Native	Bachawa	LC
30.			*Ailia coila* (Ham.)	Native	Pataasi	NT
31.			*Clupisoma garua*	Native	Baikari	LC
32.		Heteropneustidae	*Heteropneustes fossilis* (Bloch)	Native	Singhi	LC
33.		Clariidae	*Clarias magur* (Ham.)	Native	Magur, Wagur	EN
34.	Beloniformes	Belonidae	*Xenentodon cancila* (Ham)	Native	Kauwa	LC
35.	Channiformes	Channidae	*Channa punctatus* (Bl) (= *C. punctata*)	Native	Garai	LC
36.			*Channa gachua* (Ham.)	Native	Chenga	LC
37.			*Channa striatus* (Bl.) (= *C. striata*)	Native	Sauri	LC
38.	Perciformes	Nandidae	*Nandus nandus* (Ham)	Native	Dhebari, dhalo	LC
39.		Gobiidae	*Glossogobius giuris* (Ham)	Native	Bulla	LC
40.	Mastacembeliformes	Mastacembelidae	*Mastacembelus armatus* (Lacepede)	Native	Baam	LC
41.			*M. pancalus* (=*Macrognathus pancalus*)	Native	Pataya,	LC
42.			*Macrognathus aculeatus* (Bloch)	Native	Malaga, Gaichi	LC
43.	Tetraodontiformes	Tetraodontidae	*Tetrodon cutcutia* (Ham) (=*Leiodon cutcutia)*	Native	Galphulani	LC
	08 orders	14 families	30 genera, 42 species			

Table 2: Family, genus and species status under different orders for the fishes of the River Lakhandei at Aurai, Muzaffarpur.

S. N	Order	No. of family	% of family	No. of Genus	% of genus	No. of species	% of species
1.	Clupeiformes	2	13.33	3	9.68	4	9.30
2.	Cypriniformes	2	13.33	12	31.10	18	41.86
3.	Siluriformes	5	33.33	9	29.03	11	25.58
4.	Beloniformes	1	6.67	1	3.23	1	2.33

5.	Channiformes	1	6.67	1	3.23	3	6.98
6.	Perciformes	2	13.33	2	6.45	2	4.65
7.	Mastacembeliformes	1	6.67	2	6.45	3	6.98
8.	Tetraodontiformes	1	6.67	1	3.23	1	2.33
Total	08	15		31		43	

Discussion

The Lakhandei River remains a biological lifeline and vital biodiversity hotspot in the Aurai block. Among its fishes, family Cyprinidae under order Cypriniformes dominates the current biomass. With 15 species, the family is also the most diverse fish community in terms of species content. The second most diverse family, Bagridae, is from Siluriformes. Together, these two orders constitute more than two-third (41.86 + 25.58 = 67.44) of the fish species diversity. Also, they contain some of the key species like *Wallago* and *Labeo rohita*. Important Small Indigenous Species (SIS) includes *Rasbora danioconius*, *Puntius chola*, *P. conchonius*, *Ailia coila,* loaches etc. *Labeo rohita* (Rohu), *Catla catla* (Catla), and *Cirrhinus mrigala* (Mrigal) are native major carps while *Cyprinus carpio*, *Ctenopharyngodon idella* and *Hypophthalmichthys molitrix* are introduced or exotic major carps. Minor carps and barbs of the region are *Puntius sophore*, *Puntius ticto*, and *Labeo bata*. These are the most abundant species in the shallow margins of the river. Catfishes in the Lakhandei are highly adapted to the silty, high-turbidity environment of the Muzaffarpur plains. *Wallago attu* (The freshwater shark) is the top predator in this stretch. Being air-breathers, *Heteropneustes fossilis* (Singhi) and *Clarias magur* (Magur) are critical for the local economy as they can survive in the low-oxygen mud during the dry summer months. The bagrids *Mystus tengara* and *Rita rita* and snakeheads *Channa punctata*, *C. striata* and C. gachua can also withstand harsh conditions. The river has been reported to contain 29 fish species under 15 families at Sitamarhi (Singh, P., 1986) and 31 species at Lakhandei-Bagmati sangam near Chamunda sthan, Muzaffarpur (Kumari, 2009).

Present work, for classification, follows Berg, L.S. (1940) after Srivastava (1994). But modern systems of fish classification like Nelson (2016) or Eschmeyer's Catalog of Fishes are becoming more popular. The orders Channiformes and Mastacembeliformes are largely obsolete in 2025 academic standards. Channiformes is considered as a sub-group, Family Channidae, within the order Anabantiformes. Mastacembeliformes is included under order Synbranchiformes.

Most of the species listed here belong to Least Concern (LC) category of IUCN Red List (2025). But some key species are threatened. *IUCN 2025 states "Clarias magur* is highly threatened by exploitation, threats to breeding grounds due to wetland conversion and pesticides in paddy fields, and from introduction of the Thai magur. Population declines of more than 50% in the last few years and predicted decline at the same or slightly higher rate throughout the species range makes it qualify for the Endangered category" (Vishwanath, 2010). Thai magur or African Catfish (*Clarias gariepinus*) is an Invasive Alien Species (IAS) banned in India (Gul et al., 2020; Mahapatra and Mohanty, 2023). *Wallago attu* remains Vulnerable because of an estimated 30% population decline over the last 60 years. *Cyprinus carpio,* listed as Vulnerable in its native wild range, has been introduced, due to its faster growth and fecundity, to almost all parts of the world for aquaculture puposes (Wang *et al.* 2024) and is the third most frequently introduced fish species worldwide (Saikia *et al*. 2009). It degrades water quality and aquatic habitat (GIS, 2025) and is also categorized as an Invasive Species for native major carps (Kadwalia, 2025).

Fisheries in the Lakhandei at Aurai region provide income to thousands of rural families. Fishes with food, ornamental and medicinal values are found. Fish from the Lakhandei are sold at the Aurai local market and transported to Muzaffarpur city. The "*Desi*" (native) fish fetch a 40–60% higher price than "*Challani*" (farmed) fish from Andhra Pradesh. The Mallah (fishermen) community in Aurai uses indigenous gear like bamboo traps and cast nets, creating an additional source of income. Bihar ranks 4th in inland fish production in India as of 2024 (PIB, 2024).

The Lakhandei River remains a vital biodiversity hotspot in the Aurai block. However, it is under threat. Seasonal drying leads to habitat fragmentation, while heavy siltation and pesticide use in the agricultural plains of Muzaffarpur degrade water quality. Anthropogenic stressors also include overfishing of juveniles and use of unauthorized gear (e.g., zero- or small-mesh mosquito nets locally called *chhatri* jal). The declining population of air-breathing catfishes and other sensitive species signals an urgent need for sustainable management. Future conservation efforts should focus on river ranching, strict enforcement of fishing regulations during the breeding season, and the restoration of connecting channels (mauns).

The Lakhandei River is more than a waterway; it is a biological lifeline for the Aurai block. While the diversity remains significant in 2025, the shift in species composition toward invasive and hardy species indicates an ecosystem under stress. Protecting this "ichthyological heritage" requires a blend of modern science and traditional conservation wisdom.

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