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Diversity of Fresh Water Fishes and Their Conservation Status in Eastern Uttar Pradesh, India

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ABSTRACT:
A comprehensive investigation was conducted on the diversity of freshwater fish species by the collection of monthly samples from various fish markets located in different districts of eastern Uttar Pradesh. The study period spanned from August 2021 to July 2022.In recent decades, there has been a significant impact on fresh-water ecosystems due to extensive human interference, leading to the loss and degradation of habitats. Consequently, numerous fish species have faced a heightened risk of endangerment, particularly in regions where there is substantial demand for fresh-water resources. The current study identified a total of 69 fish species, which were classified into 7 orders, 20 families, and 39 genera. These fish were collected from various districts in eastern Uttar Pradesh, specifically Sultanpur, Ambedkar Nagar, Ayodhya, Gonda, Basti, Sant Kabir Nagar, Siddharth Nagar, Gorakhpur, Maharajganj, Azamgarh, and Jaunpur, through the procurement of fishes from local fish markets. Cypriniformes emerged as the predominant order in terms of overall fish diversity, with Perciformes, Clupeiformes, Ophiocephaliformes, Mastacembeliformes, Mugiliformes, and Beloniformes following suit. In this study, the family Cyprinidae exhibited the highest level of dominance in terms of fish diversity, followed by the families Siluridae, Schilbeidae, Ophiocephalidae, Anabantidae, Clupeidae, Mastacembelidae, Notopteridae, Cobitidae, Claridae, Centropomidae, Nandidae, Engraulidae, Sissoridae, Heteropneustidae, Pangasidae, Belonidae, Mugilidae, Sciaenidae, and Goboidae. The fish populations in these regions are facing significant challenges as a result of human activities, specifically overfishing and pollution. Consequently, the author strongly advocates for the implementation of a feasible conservation action plan in order to mitigate the potential loss of fish diversity.
KEYWORDS: *Fish diversity, Conservation status, Fresh water, Eastern Uttar Pradesh.*

I. INTRODUCTION

Fish exhibit a remarkable level of diversity and can be classified into many categories based on factors like as eating behaviour, visual capabilities, body form, motility, and toxicity, among others. While the majority of fish species have likely been identified and documented, some 250 novel species are still being discovered year. As of September 2020, Fish Base reported that a total of 34,300 fish species have been documented. This figure surpasses the cumulative count of all other vertebrate taxa, namely amphibians, reptiles, birds, and mammals. The majority of aquatic-dwelling higher vertebrates rely on fish as their primary source of sustenance. The preservation of biodiversity holds particular significance within developing nations, as the local population relies heavily on natural resources, such as forests and fisheries, for their sustenance and economic well-being (Corbacho and Sanchez, 2001). The utilisation of illicit fishing techniques such as electro-fishing, pesticide usage, and dynamite poses significant risks to fish variety on a global scale (Bhakta and Bandyopadhyay, 2008), (Groombridge, 1992). The phenomenon of water pollution, particularly the occurrence of spills containing hazardous substances such as oil, petroleum products, industrial acids, pesticides, and fertilisers, has a significant impact on the decline of fish species and the destruction of their natural habitats (Bunn and Arthington, 2002).

Fishes are widely recognised as the most prominent species of aquatic organisms and provide the sole source of sustenance derived from natural populations (Barman, 2007). Moreover, fish species occupy a prominent position throughout the food chain, either at the top or in close proximity, and can function as a reliable indication of the equilibrium within an aquatic environment (Talwar & Jhingran, 1991). Fish diversity encompasses two main components: species richness, which refers to the total number of species within a specific geographical area, and species abundance, which represents the relative abundance of each species within that area (Flores et al., 2009). Currently, the management of fish diversity and the preservation of associated habitats pose significant challenges. It is crucial to possess the capacity to assess the consequences of habitat alterations and other influences on fish populations both prior to and following such changes (Bhattacharya, et al., 2018). In recent years, numerous comprehensive studies have been conducted to identify the fundamental factors that pose a threat to the conservation of freshwater fishes and communities. These studies have consistently highlighted the modification and loss of aquatic habitat as one of the key factors (Basu,

et al., 2012). The diversity of fish, as well as the structure of their communities and the assemblages of species found in streams and rivers, are influenced by a variety of abiotic and biotic factors (Chaube, 1988). The success or failure of fish species assemblages in river ostreams within their spatial distribution limitations is determined by various factors (Dawson, et. al., 2003).

The reduction of freshwater fish variety is observed throughout many regions of India. A significant number of these items have been irretrievably lost, with limited scholarly investigations conducted thus far pertaining to this particular facet. The primary factors contributing to extinction were primarily recognised as over harvesting, competition from newly introduced exotic fishes, pollution, and the use of illegal and harmful fishing practises (Sarkar and Bain, 2007). Based on the findings of a workshop conducted by the National Bureau of Fish Genetic Resources, it has been determined that a collective count of 227 freshwater fish species in India are currently at risk, as per the classification system outlined by the International Union for Conservation of Nature and Natural Resources (IUCN) Red List Categories of 1994. Additional causes are also playing a role in the decline of fish variety (Lakra & Sarkar, 2007). When the flow of water is halted in the irrigation canal, it causes the water to become confined in proximity to the gate, facilitating the process of extracting fish from the canal. The small streams and pools, particularly those located at the foot of waterfalls, have been adversely affected by the widespread use of dynamite due to extensive quarrying and road construction activities in the nation (Boruah and Biswas, 2002). The blast's shock waves result in the complete annihilation of all fish within the immediate region. According to Shahnawaz et al. (2010), the contamination of India's freshwater resources is mostly attributed to the discharge of sewage, industrial effluents, chemical fertilisers, and pesticides. The significant alteration of freshwater environments through the construction of dams on streams and rivers, as well as the accumulation of silt resulting in decreased depth, has had a profound impact on the diversity of fish species (Basudev, et al., 2015). The general degradation of habitats has made numerous fish species vulnerable to various illnesses. One of the most significant concerns is the epizootic ulcerative syndrome sickness, which has resulted in widespread mortality and the extinction of certain species within the freshwater fish population in India.

II. MATERIAL AND METHODS

STUDY AREA:

The research was undertaken for a duration of twelve months, commencing in August 2021 to July 2022. The fish sampling was conducted on a monthly basis at numerous fish markets located in different districts, including Sultanpur, Ambedkar Nagar, Ayodhya, Gonda, Basti, Sant Kabir Nagar, Siddharth Nagar, Gorakhpur, Maharajganj, Azamgarh, and Jaunpur, in the eastern region of Uttar Pradesh, India.

COLLECTION AND IDENTIFICATION OF FISHES:

The data pertaining to fish was gathered from diverse fish markets located in different areas of eastern Uttar Pradesh, India. The survey and collection of samples from the fish market were conducted during the early morning hours, specifically between 08:00 and 11:00 AM, so order to take advantage of the favourable fish availability during this time period. A market survey and questionnaire survey were conducted to ascertain the number of fish species, with retailers and fishermen as participants. The fish samples were subjected to a thorough washing process and subsequently preserved in a 10% formaldehyde solution at the sampling site. They were then transported to the nearest laboratory, specifically the Department of Zoology at Ganpat Sahai P.G. College in Sultanpur, Tilak Dhari P.G. College in Jaunpur, and L.B.S.S. P.G. College in Anand Nagar, Maharajganj, Uttar Pradesh, India. The fish samples were identified using standard reference books, including those authored by Talwar and Jhingran (1991), Jhingran (1991), Dutta Munshi and Srivastava (1998), Srivastava (2010), and Jayaram (2010). The evaluation of the current conservation status of the species was conducted by referring to the Red List of Threatened Species, as published by the International Union for Conservation of Nature (IUCN) in 2018. The utilisation of fresh fish specimens primarily involved the identification of their natural colour, scale patterns, mouth patterns, and distinctive markings. Preserved specimens, on the other hand, were employed for the examination of morphometric properties. The indigenous nomenclature of the aquatic species was acquired through interactions with vendors, agriculturalists, and those engaged in fishing activities within the region.

III. RESULTS

The present study presents an analysis of the fish diversity in eastern Uttar Pradesh, India. The collected and recognised fish species from different sites across multiple districts are documented in Table-1, along with their respective conservation status. Additionally, Table-2 provides information on the presence of fish species in the various districts.

Table 1: Taxonomic position and conservation status of different fresh water fishes of various Districts of eastern Uttar Pradesh, India.

Scientific Name of Fish	**Common/ Local Name**	**Order**	**Family**	**IUCN Status**
Notopterus chitala	Moya	Clupeiformes	Notopteridae	NT
Notopterus notopterus	Patra	"	"	LC
Gadusia chapra	Suhia	"	Clupeidae	VU
Gadusia godanahia	Godnahia Suhia	"	"	VU
Goniolosa manmina	Majhali Suhia	"	"	VU
Setipinna phasa	Phansi	"		
Catla catla	Bhakur	Cypriniformes	Cyprinidae	NE
Cirrhinus mrigala	Nain	"	"	LC
				LC
Cirrhinus reba	Raia	"	"	LC
Labeo rohita	Rohu	"	"	LC
Labeo bata	Bata	"	"	LC
Labeo calbasu	Karaunchar	"	"	LC
Labeo gonius	Kurshi	"	"	LC
Cyprinus carpio	Common carp	"	"	VU
Hypopthalmicthys molitrix	Silver carp	"	"	NT
Ctenopharyngodon idella	Grass carp	"	"	NE
Oxygaster bacaila	Chalhawa	"	"	LC
Oxygaster clupeioides	Silhani	"	"	LC
Puntius chola	Chela Punti	"	"	EN
Puntius sarana	Darahee	"	"	LC
Puntius sophpore	Sidhari	"	"	LC
Puntius ticto	Punti	"	"	
Puntius titius	Tit Punti	"	"	LC
Puntius javanicus	Japani Punti	"	"	LC
Puntius conchonius	Kanchan Punti	"	"	LC
Amblypharyngodon mola	Dhawai	"	"	LC
Barilius bola	Bhola	"	"	DD

Esomus danricus	Dendua	"	"	DD
Osteobrama cotio	Gurda	"	"	VU
Nemacheilus botia	Carri	"	Cobitidae	EN
Botia dario	Baghaua	"	"	LC
Wallago attu	Parhin	"	Siluridae	VU
Mystus cavasius	Sutahava Tenger	Cypriniformes	Siluridae	LC
Mystus menoda	Belaunda	Cypriniformes	Siluridae	LC
Mystus tengara	Tengana	Cypriniformes	Siluridae	LC
Mystus vittatus	Tengana	Cypriniformes	Siluridae	EN
Mystus aor	Dariai Tengar	Cypriniformes	Siluridae	LC
Mystus seenghala	Dariai Tengar	Cypriniformes	Siluridae	LC
Rita rita	Belgagara	Cypriniformes	Siluridae	EN
Ompak bimaculatus	Jalkapoor	Cypriniformes	Siluridae	NT
Bagarius bagarius	Gonch			
Ailia coila	Patasi	Cypriniformes	Schilbeidae	EN
Clupisoma garua	Baikari	Cypriniformes	Schilbeidae	LC
Eutropichthys vacha	Banjhoo	Cypriniformes	Schilbeidae	LC
Eutropichthys murius	Golmuhi	Cypriniformes	Schilbeidae	EN
Silonia silondia	Silund	Cypriniformes	Schilbeidae	EN
Heteropneustes fossilis	Singhi	Cypriniformes	Heteropneustidae	EN
Pangasius pangasius	Pangus	Cypriniformes	Pangasidae	EN
Clarias batrachus	Mangur	Cypriniformes	Claridae	EN
Clarias gariepinus	Hybrid Mangur	Cypriniformes	Claridae	LC
Xenentodon cancila	Kauwa	Beloniformes	Belonidae	LC
Channa striatus	Sauri	Ophiocephaliformes	Ophiocephalidae	NT
Channa punctatus	Girai	Ophiocephaliformes	Ophiocephalidae	LC
Channa marulius	Saur	Ophiocephaliformes	Ophiocephalidae	LC
Channa gachua	Chanaga	Ophiocephaliformes	Ophiocephalidae	LC
Rhinomugil corsula	Hunra	Mugiliformes	Mugilidae	LC
Mastacembelus armatus	Baam		Mastacembelidae	EN

		Mastacembeliformes		
Mastacembelus pancalus	Malga	Mastacembeliformes	Mastacembelidae	LC
Macrognathus aculeatus	Pataya	Mastacembeliformes	Mastacembelidae	LC
Chanda nama	Chanari	Perciformes	Centropomidae	LC
Chanda ranga	Chanari	Perciformes	Centropomidae	LC
Sciaena coitor	Patharchatti	Perciformes	Sciaenidae	LC
Badis badis	Sumha	Perciformes	Nandidae	NE
Nandus nandus	Dhebari	Perciformes	Nandidae	LC
Anabas testudinius	Kawai	Perciformes	Anabantidae	LC
Colisa fasciatus	Khosti	Perciformes	Anabantidae	LC
Colisa lilius	Khosti	Perciformes	Anabantidae	LC
Colisa chuna	Kholisa	Perciformes	Anabantidae	LC
Glossogobius giuris	Bulla	Perciformes	Gobioidae	NT

IUCN Red list: **LC**: Least Concern, **VU:** Vulnerable, **NE:** Not Evaluated, **EN:** Endangered, **NT:** Near Threatened, **DD:** Data Deficient.

Table 2: Availability of the Fishes at various Districts of Eastern Uttar Pradesh, India

S.N.	**Scientific Name of Fish**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**
1.	*Notopterus chitala*	+	-	+	-	+ +	+	+	+	-	+	+ +
2.	*Notopterus notopterus*	+ +	+	+	-	+	+	+ +	+	-	+	+
3.	*Gadusia chapra*	+	+	+ +	+	+	-	+	+ +	+	-	+
4.	*Gadusia godanahia*	+	-	+	+	+	-	+	+	+	-	+
5.	*Goniolosa manmina*	-	+	+	-	+	+	+	+	-	+	+
6.	*Setipinna phasa*	-	-	+	+ +	+ +	+	+ +	+ +	+	-	+ +
7.	*Catla catla*	+ +	+	+	+	+	+	+ +	+ +	+	+	+
			+	+	+	+	+			+	+	+
8.	*Cirrhinus mrigala*	+ +	+	+	+	+	+	+	+ +	+	+	+
				+	+	+				+		+
9.	*Cirrhinus reba*	+	-	+	+	+	-	+	+	-	+	+
10.	*Labeo rohita*	+	+	+	+	+	+	+ +	+ +	+	+	+
		+	+	+	+	+				+	+	+
11.	*Labeo bata*	+	-	+	-	+	+	-	+	-	+	+

12.	*Labeo calbasu*	+	+	+	+	+	-	+	+	+	+	+
		+										
13.	*Labeo gonius*	+	-	+	-	+	-	-	+	-	+	+
14.	*Cyprinus carpio*	+	+	+	+	+	+	+	+	+	+	+
		+	+	+	+	+	+	+	+	+	+	+
15.	*Hypopthalmicthys*	+	+	+	+	+	+	+	+	+	+	+
	molitrix	+		+		+	+	+	+		+	+
16.	*Ctenopharyngodon*	+	+	+	+	+	+	+	+	+	+	+
	idella	+		+		+	+				+	+
17.	*Oxygaster bacaila*	+	+	+	+	+	+	+	+	+	+	+
		+	+	+		+		+			+	+
18.	*Oxygaster clupeioides*	+	+	+	+	+	+	+	+	+	+	+
		+	+	+	+	+		+			+	+
19.	*Puntius chola*	+	+	+	+	+	+	+	+	-	+	-
						+		+				
20.	*Puntius sarana*	+	+	+	+	+	+	+	+	+	+	+
		+	+	+		+		+				
21.	*Puntius sophpore*	+	+	+	+	+	+	+	+	+	+	+
		+	+	+	+	+		+	+		+	
22.	*Puntius ticto*	+	+	+	+	+	-	+	+	-	+	+
23.	*Puntius titius*	-	+	+	+	+	-	+	-	-	+	-
24.	*Puntius javanicus*	+	+	+	+	+	+	+	+	+	-	+
				+		+	+	+	+			
25.	*Puntius conchonius*	+	-	+	+	+	-	+	+	+	-	-
								+				
26.	*Amblypharyngodon*	-	+	+	+	+	+	+	+	-	+	+
	mola								+			
27.	*Barilius bola*	+	-	+	-	+	+	+	+	+	-	-
28.	*Esomus danricus*	+	-	+	-	+	+	+	+	-	-	+
29.	*Osteobrama cotio*	+	+	+	+	+	-	+	+	-	+	+
						+						
30.	*Nemacheilus botia*	+	+	+	+	+	-	-	+	+	+	-
					+							
31.	*Botia dario*	-	-	+	+	-	-	+	-	-	+	-
32.	*Wallago attu*	+	+	+	+	+	+	+	+	+	+	+
		+	+	+	+		+		+	+	+	
33.	*Mystus cavasius*	+	+	+	+	+	+	+	+	+	+	+
				+								
34.	*Mystus menoda*	+	-	+	+	+	+	+	+	+	+	-
						+	+		+			
35.	*Mystus tengara*	+	+	+	+	+	+	+	+	-	+	+
		+		+			+		+			
36.	*Mystus vittatus*	+	+	+	+	+	+	-	+	+	+	+
				+								
37.	*Mystus aor*	+	+	+	+	+	+	-	+	+	-	-
38.	*Mystus seenghala*	+	+	+	+	+	+	+	+	+	+	+
		+		+	+	+			+			+
39.	*Rita rita*	+	-	+	+	-	+	-	+	+	-	+
40.	*Ompak bimaculatus*	-	-	+	+	-	+	+	-	-	+	-
41.	*Bagarius bagarius*	+	+	+	-	+	+	+	+	-	+	+
				+				+				
42.	*Ailia coila*	+	-	+	+	+	-	+	+	-	+	+

								+				
43.	*Clupisoma garua*	+	-	+	+	+	+	+	-	+	+	+
		+		+		+						+
44.	*Eutropichthys vacha*	+	+	+	-	+	+	+	+	-	+	+
45.	*Eutropichthys murius*	-	-	+	-	-	+	+	+	-	+	-
46.	*Silonia silondia*	-	-	+	+	+	+	+	+	-	+	-
								+	+			
47.	*Heteropneustes fossilis*	+	+	+	+	+	+	-	+	+	+	+
							+					
48.	*Pangasius pangasius*	+	+	+	+	+	+	+	+	+	+	+
							+					+
49.	*Clarias batrachus*	+	+	+	+	+	+	+	+	-	+	+
							+					
50.	*Clarias gariepinus*	+	+	+	+	+	+	+	+	+	+	+
				+		+						
51.	*Xenentodon cancila*	+	+	+	+	+	-	-	+	-	-	-
					+							
52.	*Channa striatus*	+	+	+	+	+	+	+	+	+	+	+
		+			+							
53.	*Channa punctatus*	+	+	+	+	+	+	+	+	+	+	+
		+		+								
54.	*Channa marulius*	+	-	+	-	-	+	-	+	+	-	+
55.	*Channa gachua*	+	+	+	-	+	+	-	+	+	+	+
56.	*Rhinomugil corsula*	+	-	+	-	+	+	+	+	+	+	+
									+			
57.	*Mastacembelus*	+	+	+	-	+	+	-	+	+	+	+
	armatus	+	+				+					+
58.	*Macrognathus*	+	+	+	-	+	+	+	+	+	+	+
	aculeatus		+									+
59.	*Macrognathus*	+	+	+	+	+	+	+	+	+	+	+
	aculeatus	+	+	+						+	+	
60.	*Chanda nama*	-	+	+	+	-	+	-	+	-	+	+
61.	*Chanda ranga*	+	+	+	+	-	+	-	+	-	+	+
62.	*Sciaena coitor*	-	+	+	+	+	+	+	+	+	-	-
									+			
63.	*Badis badis*	-	-	+	+	+	-	+	+	-	-	-
64.	*Nandus nandus*	+	+	+	+	+	-	+	+	+	+	+
									+			
65.	*Anabas testudinius*	+	+	+	+	+	+	+	+	+	+	+
		+		+	+			+	+		+	+
66.	*Colisa fasciatus*	+	+	+	+	+	+	+	+	+	+	+
						+		+	+		+	+
67.	*Colisa lilius*	-	-	+	+	+	+	+	+	+	+	-
68.	*Colisa chuna*	-	+	-	+	+	-	-	+	-	-	-
69.	*Glossogobius giuris*	+	-	+	+	-	+	-	+	+	+	-

Here, I= Sultanpur, II= Ambedkar Nagar, III= Ayodhya, IV= Gonda, V= Basti, VI= Sant Kabir Nagar, VII= Siddharth Nagar, VIII= Gorakhpur, IX= Maharajganj, X= Azamgarh and XI= Jaunpur, + + = Abundant, + = Moderate, - = Least.

Table 3: Name of the Order, Number of species and % of Abundance

S.NO	**Name of the Order**	**Number of Species**	**% of Abundance**
1	Cypriniformes	44	63.77
2	Perciformes	10	14.49
3	Clupeiformes	06	08.70
4	Ophiocephaliformes	04	05.80
5	Mastacembeliformes	03	04.34
6	Mugiliformes	01	01.45
7	Beloniformes	01	01.45

Table 4: Name of the family, Number of species and Percentage (%) of Abundance

S.NO	**Name of the Family**	**Number of Species**	**% of Abundance**
1	Notopteridae	02	2.90
2	Clupeidae	03	4.34
3	Engraulidae	01	1.45
4	Cyprinidae	23	33.33
5	Cobitidae	02	2.90
6	Siluridae	09	13.04
7	Sissoridae	01	1.45
8	Schilbeidae	05	7.25
9	Heteropneustidae	01	1.45

10	Pangasidae	01	1.45
11	Claridae	02	2.90
12	Belonidae	01	1.45
13	Ophiocephalidae	04	5.80
14	Mugilidae	01	1.45
15	Mastacembelidae	03	4.34
16	Centropomidae	02	2.90
17	Sciaenidae	01	1.45
18	Nandidae	02	2.90
19	Anabantidae	04	5.80
20	Gobioidae	01	1.45

Table 5: Number of species and percentage of fish fauna as per IUCN red list category

S.No.	IUCN Status	Number of Species	Percentage
1.	Least Concern (LC)	42	60.87
2.	Vulnerable (VU)	06	8.70
3.	Not Evaluated (NE)	03	4.34
4.	Endangered (EN)	12	17.39
5.	Near Threatened (NT)	05	7.25
6.	Data Deficient (DD)	01	1.45

The current study involved the collection of a total of 69 fish species from several fish markets located in the sampling districts of eastern Uttar Pradesh, India. These species were classified into 7 orders and 20 families. Among the seven orders examined, the order Cypriniformes exhibited the highest level of dominance in terms of species richness and percentage composition, with a total of 44 species. Following Cypriniformes, the order Perciformes had 10 species, Clupeiformes had 6 species, Ophiocephaliformes had 4 species, Mastacembeliformes had 3 species, and both Mugiliformes and Beloniformes had 1 species each (Table-3; Figure-1). Based on the analysis of species richness and percentage composition, it is evident that among the 20 families examined, the family Cyprinidae exhibited the highest dominance with a total of 23 species. Following Cyprinidae, the family Siluridae was found to have 9 species, Schilbeidae had 5 species, Ophiocephalidae and Anabantidae each had 4 species, Clupeidae had 3 species, and Notopteridae, Cobitidae, Claridae, Centropomidae, Nandidae, Engraulidae, Sissoridae, Heteropneustidae, Pangasidae, Belonidae, Mugilidae, Sciaenidae, and Gobioidae each had 2 or 1 species (Table-4; Figure-2). According to the International Union for Conservation of Nature (IUCN, 2018), a total of 69 species were identified in various districts of eastern Uttar Pradesh, India. Among these species, 42 are categorised as Least Concern (LC), accounting for 60.87% of the total. Additionally, 6 species are classified as Vulnerable (VU), contributing 8.70% to the overall species count. Three species have not been evaluated (NE), representing 4.34% of the total. Furthermore, 12 species are considered Endangered (EN), making up 17.39% of the species count. Five species are categorised as Near Threatened (NT), accounting for 7.25% of the total, while one species is classified as Data Deficient (DD), contributing 1.45% (Table-5; Figure-3).

Fig. 1: Relationship between Order and Species Abundance of Fish

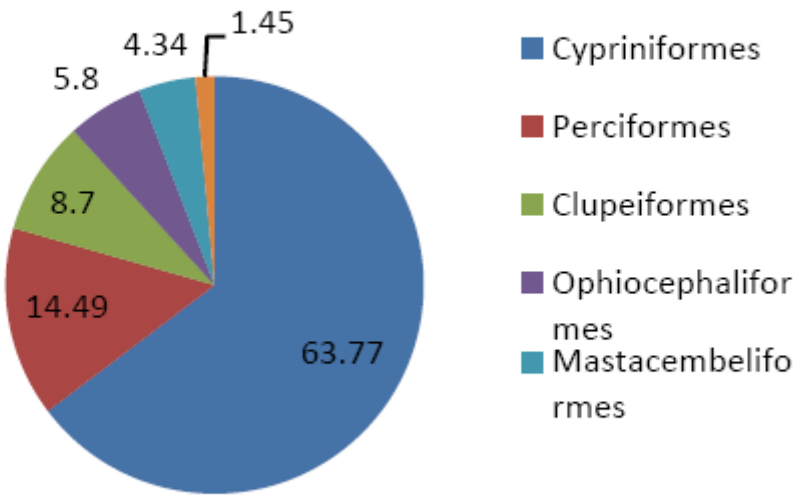
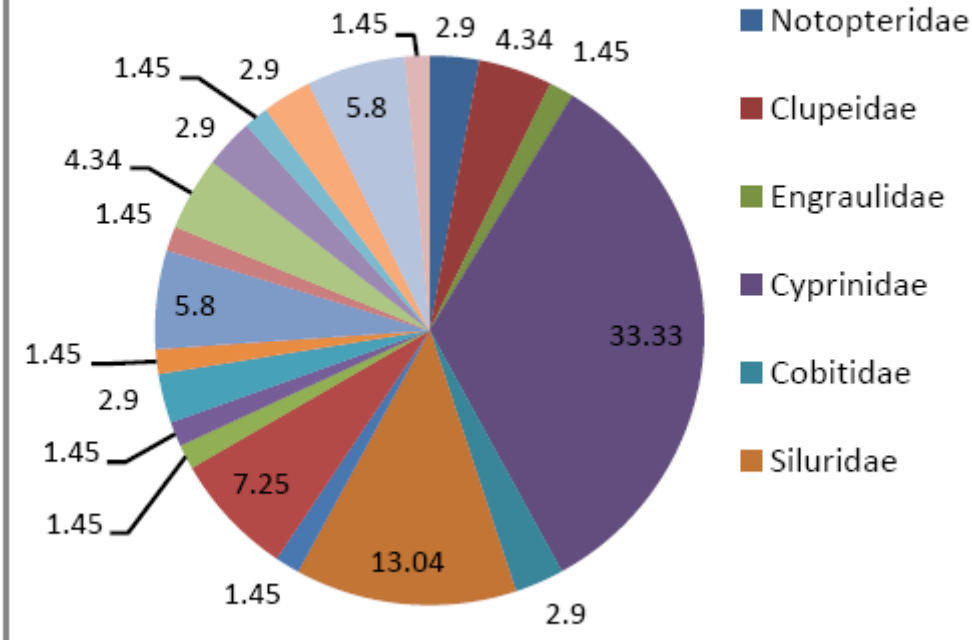
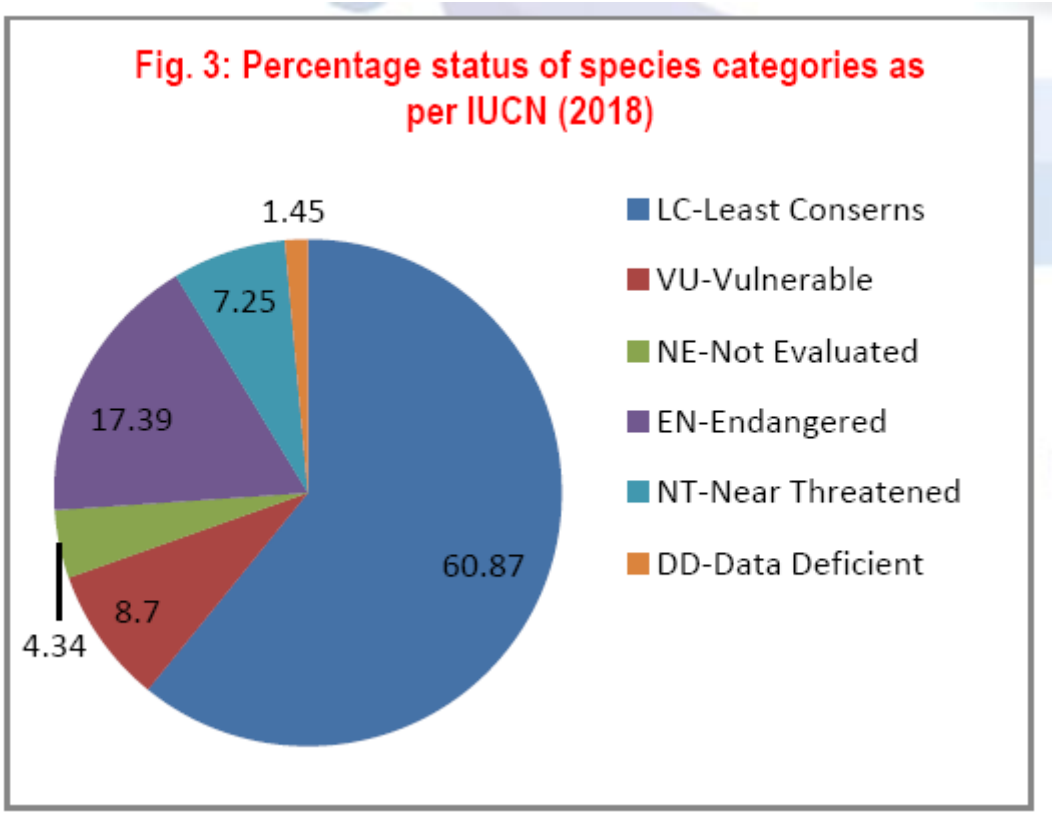


Fig. 2: Relationship between Family and Species Abundance





IV. DISCUSSION

The current study unveiled that a total of approximately 69 fish species were documented, categorised into 7 orders and 20 families. The data obtained from the local fish vendor in the region indicates a significant decrease in the fish population over the past few years. Several species like as Channa, Heteropneustes, Clarias, Rita, Puntius, Mystus, Mastacembelus, Nandus, Anabas, among others, were formerly observed and captured by fishermen. However, their presence in fishing activities has become infrequent or nonexistent in recent years. There is a pressing requirement to reassess the endangered status of certain fish species, as their availability in significant quantities does not align with their high market demand. This phenomenon may be attributed to unregulated fishing practises driven by the substantial market demand for local fish species. Furthermore, the fishing endeavours experienced a heightened level of intensity as a result of the implementation of contemporary fishing equipment and methodologies (Johal, et. al., 2002).

The diversity of fish species is currently facing threats as a result of various factors, including illegal and harmful fishing practises, pollution, alterations to their natural habitats, eutrophication, siltation, and water abstraction. The aforementioned elements have a significant impact on the overall fish variety to a considerable degree (Jayaram, 1981). The utilisation of unlawful and detrimental fishing techniques, such as the implementation of nets with small mesh sizes, the employment of poisonous substances, the deployment of destructive equipment, the excessive exploitation of fish stocks, and the capture of fish at all phases of their life cycle, are significant factors contributing to the decline in fish variety (Gibbs, 2000). According to Habit et al. (2006), the utilisation of fine mesh size long nylon nets has been found to result in the indiscriminate mortality of fish, regardless of their early life stage or breeding status, particularly during the breeding season.20. The adoption of such practises, driven by a focus on short-term profitability, ultimately results in the unsustainable depletion of fish populations and subsequent declines in the overall diversity of fish species (Allan, et al., 2005).The exponential growth of the human population has led to a corresponding surge in food demand. Consequently, individuals have encroached upon beel areas for agricultural purposes, exerting significant pressure on wetlands and converting them into croplands. To enhance crop production, farmers employ a variety of chemical fertilisers (Savei, 2012), resulting in eutrophication and a subsequent decline in dissolved oxygen levels within water bodies. This, in turn, adversely affects the diversity of fish species (Fu et al., 2003).The escalating reliance of the human population on aquatic fishery resources, such as water, along with the ongoing introduction of non-native species into natural water bodies in eastern Uttar Pradesh, is anticipated to exacerbate the decline in freshwater fish diversity unless appropriate conservation strategies are promptly enacted.

The optimal strategy for species conservation involves the widespread dissemination of information, education, and conservation practises to all stakeholders, including fishermen. This approach aims to raise

awareness about the imminent threat of species extinction and emphasise the importance of conservation efforts (Darwall and Vie, 2005).11. This measure will significantly contribute to the protection and conservation of the species. According to Rahel et al. (2008), it is more advantageous and cost-effective to prioritise prevention measures rather than investing resources in efforts to recover extinct species. Once an extinction event takes place, it is difficult to reverse or undo. Fish biologists, limnologists, aquatic ecologists, and conservationists play a significant role in raising public awareness and garnering support for conservation mechanisms (Sarkar, et. al., 2008; 2010). These experts have emphasised the importance of scientists generating awareness for the conservation of fish species (Das and Chakrabarty, 2007). This study emphasised the importance of stakeholders being vigilant regarding autogenic and anthropogenic threats, activities, and detrimental practises (Wolter et al., 2000) that could potentially lead to the extinction of fish species in eastern Uttar Pradesh. Additionally, it examined the consequences of such extinction and explored potential preventive measures (Shaffer et al., 2009). Das et al. (2011) propose that an effective conservation strategy for fish species in the fresh water reservoir should involve the integration of conservation management strategies into the existing water quality and production management programmes.. This will facilitate the assessment of the current and future status of the species in the freshwater reservoirs of eastern Uttar Pradesh and its capacity to support ongoing and future utilisation.

The jurisdiction for legislation pertaining to agriculture, allied activities, and fisheries lies within the purview of State Governments. The Department of Fisheries within the Government of Uttar Pradesh is implementing various efforts to conserve endangered fish species. These actions include the enforcement of a fishing prohibition, implementation of closed seasons, regulation of fishing activities, and the promotion of gear selectivity. Both governmental bodies and non-governmental organisations (NGOs) play a significant role in raising awareness and garnering support for the conservation of fish species. Consumer knowledge regarding the purchase of threatened fish species from the market is a crucial prerequisite for the conservation of these vulnerable resources. Nevertheless, there is a need for increased awareness and motivation regarding the significance of freshwater fish diversity and the importance of its conservation.

V. CONCLUSION

The findings of the market-based survey indicate a decline in fish diversity over the past five years. The loss of fish diversity can be attributed to various factors, including deforestation, flooding, sand mining, recreational activities, organic and inorganic pollution, overfishing, unregulated use of pesticides in agricultural fields, and irrational fish harvesting practises. Authors are highly advised to implement a practical conservation action plan in order to mitigate the potential loss of fish diversity. The integration of suitable management and conservation measures into the governmental fishing policies is crucial. The authors also suggest the regular maintenance of water bodies and the safeguarding of fish reproductive elements, including eggs, spawns, fry, fingerlings, and small-sized fishes.

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