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Diversity of freshwater fishes in the eastern part of Purba Medinipur district of West Bengal

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Abstract
Present study emphasis the availability of freshwater fishes in the Kolaghat, Panskura-1, and Sahid matangini block of Purba Medinipur district in West Bengal, India. In this study total of 61 fish species were found in the different fish market that is Mecheda Bazar, Siddha Bazar, Sagarbar Bazar of Kolaghat block, Panskura station road market, Chakdaha Bazar, Keshapat Bazar of Panskura-1 block, and Dhalhara Bazar, Kaktia Bazar of Sahid matangini block from January-2020 to March-2020. Among the species, Cypriniformes were the most leading order of the total fish diversity followed by Perciformes, Siluriformes, Synbranchiformes, Osteoglossiformes, Mugiliformes, Characiformes, and Decapoda. The major groups belongs to according to species abundance *Labeo rohita, Labeo bata, Labeo boga, Cirrhinus reba, Labeo calbasu, Catla catla, Cirrhinus mrigala, Hypophthalmicthys molitrix, Hypophthalmicthys nobilis, Cyprinus carpio, Ctenopharyngodon idella, Carassius auratus, Puntius sarana, Puntius ticto, Puntius chola, Puntius sophore, Chagunius chagunio, Puntius javanicus, Puntius conchonius, Amblypharyngodon mola, Esomus danricus* (Cypriniformes); *Chanda nama, Parambassis ranga, Anabas testudineus, Channa punctata, Channa marulius, Channa striata, Channa gachua, Channa orientalis, Oreochromis mossambica, Oreochromis niloticus, Nandus nandus, Trichogaster fasciata, Trichogaster lalius* (Perciformes); *Pangasianodon hypophthalmus, Pangasius pangasius, Mystus tengara, Mystus vittatus, Mystus aor, Wallago attu, Ompok bimaculatus, Ompak pabda, Ompak pabo, Heteropneustes fossilis, Clarias batrachus, Clarias gariepinus, Clarias dussumieri* (Siluriformes); *Macrognathus pancalus, Macrognathus aral, Macrognathus aculeatus, Mastacembelus armatus* (Synbranchiformes); *Chitala chitala, Notopterus notopterus* (Osteoglossiformes); *Rhinomugil corsula* (Mugiliformes); *Colossoma macropomum* (Characiformes); *Macro brachium rosenbergii, Macro brachium malcolmsonii, Macro brachium idea, Macro brachium villosimanus, Macro brachium americanum, Macro brachium assamense* (Decapoda). This study will lead to a better understanding of the freshwater fish diversity of Kolaghat, Panskura-1, and Sahid matangini block for development and conservation planning processes.

Keywords: fish diversity, abundance, Purba Medinipur, conservation, freshwater

1. Introduction
Fish diversity is an integral part of an aquatic ecosystem. Most of the higher vertebrates residing in an aquatic environment are dependent on fishes for their food. Biodiversity conservation is especially important in developing countries where people are directly dependent on natural resources such as forests and fisheries for their livelihoods. Fishing using illegal methods like electro-fishing, pesticides, dynamite is also major threats to fish diversity all over the globe. Water pollution especially spills of toxic wastes (oil and petroleum products, industrial acids, pesticides, and fertilizers) contributes greatly to the loss of fish biodiversity and their habitat degradation. Water pollution like heated water (thermal discharge), low dissolved oxygen levels, toxic chemicals (gasoline and oil), and coal-mine acids have deeply threatened water quality and fish diversity.
Water is a prime and basic natural resource for all living organisms and a precious natural asset. It is essential for sustaining all forms of life, food production, and economic development for general well-being; hence its use needs appropriate planning, development, and management. Of all the renewable resources of the planet, water has a unique place (Vencatesan, 2007) [22]. Fish and other aquatic organisms live in water, thus it is no surprise that water quality determines to a great extent the presence and abundance of species in a

particular aquatic environment (Piper *et al*., 1982) [18]. Freshwater fishes are one of the most threatened taxonomic groups (Darwall & Vie, 2005) [7], Because of their high sensitivity to quantitative and qualitative alteration of aquatic habitats (Laffaille *et al*., 2005) [12]. As a result, they are often used as bio-indicators for the assessment of water quality (Osorio *et al*., 2014) [14]. Fish constitutes half of the total number of vertebrates in the world, and they live in almost all conceivable habitats. Fishes are one of the most important elements in the economy of many nations as they have been a staple item in the diet of many people. Mandal *et al*. in 2015 studied the seasonal availability of crabs and their distribution in the Digha coast of Purba Medinipur district [4]. Ichthyofaunal diversity in Negua Diversion canal of Purba Medinipur District has studied by Payra *et al*. in 2018 [16]. Payra *et al*. in 2013 also studied the seasonal variation of plankton in the brackish water-fed canal of Purba Medinipur district and their role in fish production [17].

West Bengal as well as Purba Medinipur district has the potentiality of large freshwater resources. By utilizing these vast water resources there is a great prospect of aquaculture. This large number of water resources can be divided into inland water resources and marine water resources. Inland resources constitute ponds, rivers, marshy lands, canals, reservoirs. The different researchers are studied differently about fish diversity in West Bengal. Barman. R.P. [2007] [2] recorded 239 freshwater species belonging to 147 genera, 49 families, and 15 orders from West Bengal. Basu *et al*. [2012] [3] reported 70 indigenous ornamental fish species belonging to 45 genera, 30 families, and 9 orders from West Bengal. Paul and Chanda [2014] [15] reported 48 species belonging to 32 genera under 18 families of 7 orders from Paschim Medinipur District.

The present study is an attempt to know the diversity of freshwater fish species of Kolaghat, Panskura-1, and Sahid matangini block in Purba Medinipur District, West Bengal. The results presented here provide an insight into the diversity of the freshwater ecosystem of the study area, and have established a baseline for future studies.

2. Materials and Methods

2.1 Study area

The study was conducted for three months from January-2020 to March-2020 in the different fish markets is Mecheda Bazar, Siddha Bazar, Sagarbar Bazar of Kolaghat block, Panskura station road market, Chakdaha Bazar, Keshapat Bazar of Panskura-1 block, and Dhalhara Bazar, Kaktia Bazar of Sahid matangini block. The selected fish market of the three-block under the Tamluk subdivision was taken for the survey. Geographically, Kolaghat block situated at 22025|58.5192||N (Latitude) 87051|35.5896||E (Longitude), Panskura-1 block situated at 22023|44.0952||N (Latitude) 87044|30.7752||E (Longitude) and Sahid matangini block situated at 22024|31||N (Latitude) 87054|46||E (Longitude) in Purba Medinipur district. (Figure-1)

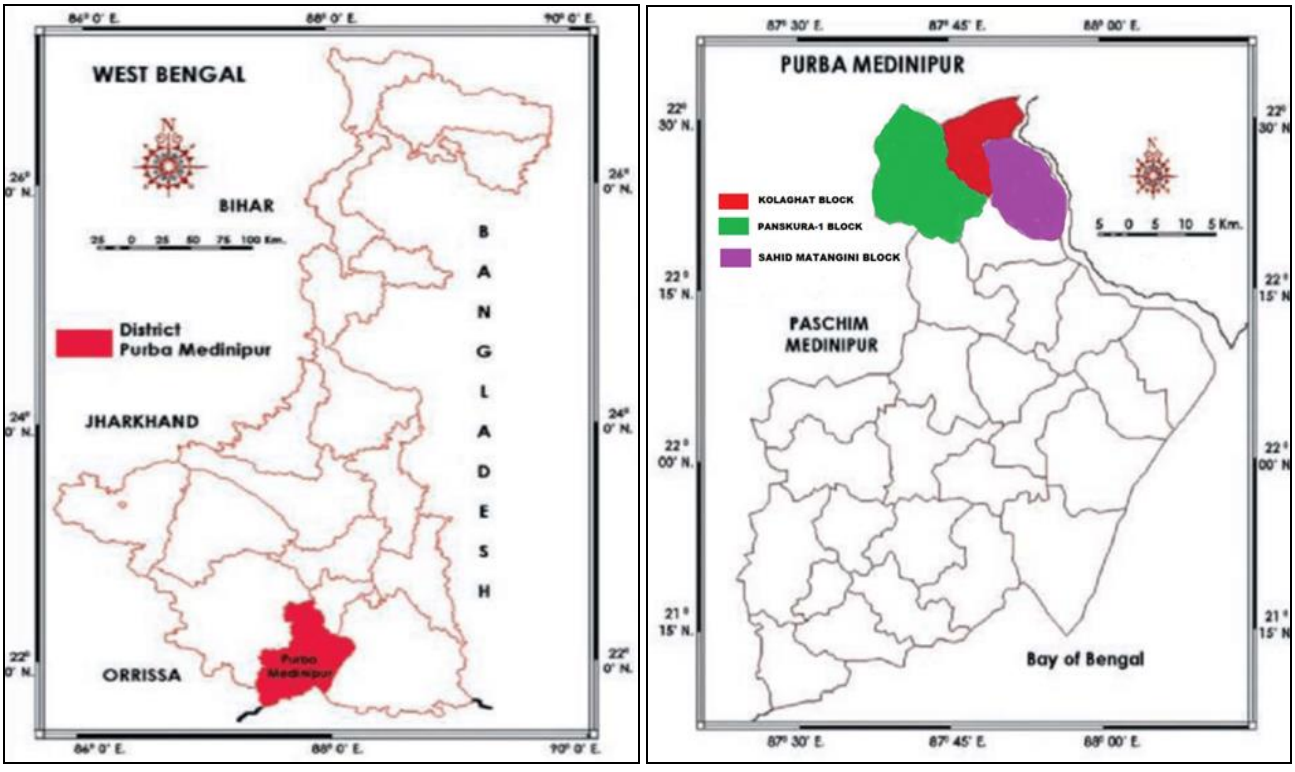

Fig 1: Location map of the study area.

2.2 Collection and identification of fishes

The fish data were collected from different fish markets of Kolaghat, Panskura-1, and Sahid matangini block. For the collection of fish data, the popular or major 3 fish markets of Kolaghat, Panskura-1 block, and 2 fish markets of Sahid matangini block were selected. The fish market surveys were carried out in the early morning (07:00 - 10:00 AM) due to the good availability of fish. The market survey and questionnaire survey with retailers and fishermen was carried out to know the abundance of fish species. Identification and subsequent taxonomic classification of these fishes have been done based on literature like Talwar-Jhingran (1991); Jayaram, K.C. (1999); & http://www.fishbase.org [21, 11, 23]. Secondary data were also collected through observation and interviews with fishermen through questionnaires at the studied area. The International Union for Conservation of

Nature (IUCN, 2018) [10] red list of threatened species was followed to evaluate the present conservation status of the species. The local names of the fishes were acquainted from retailers and farmers.

3. Results

During the study period a total of 61 species of fishes belonging to eight orders, 17 families were recorded in Kolaghat, Panskura-1, and Sahid matangini block (Table-1). Based on species richness and percentage composition the order Cypriniformes was most dominant (21 species), followed by Perciformes (13 species), Siluriformes (13 species), Synbranchiformes (04 species), Osteoglossiformes (02 species), Mugiliformes (01 species), Characiformes (01 species) and Decapoda (06 species) (Table-2, Figure-2). Cyprinidae is the most abundant family, contributing 34.43% of the fish fauna of the Kolaghat, Panskura-1, and Sahid matangini block. The family Palaemonidae is second most abundant with 9.84% of the total species (Table-3, Figure-3). In the present study as per IUCN (2018) out of 61 species found in Kolaghat, Panskura-1, and Sahid matangini block, 46 species are in the Least Concern (LC) with a contribution of 75.41%, five species is vulnerable (VU) with a contribution of 8.20%, two species is Not Evaluated (NT) with the contribution of 3.28%, one species are Endangered (EN) and contribution of 1.64%, six species are Near Threatened (NT) with a contribution of 9.84% and one species is Data Deficient (DD) with 1.64% contribution (Table-4, Figure-4).

Table 1: Taxonomic position and conservation status of different fishes of Kolaghat, Panskura-1 and Sahid matangini block, West Bengal.

Order	Family	Sl. no	Scientific name	Local name	IUCN Status	Availability status		
						1	2	3
Cypriniformes	Cyprinidae	1	*Labeo rohita* (Hamilton. 1822)	Rui	LC	+	+	+
		2	*Labeo bata* (Hamilton, 1822)	Bata	LC	+	+	+
		3	*Labeo boga* (Hamilton, 1822)	Bata	LC	+	+	+
		4	*Cirrhinus reba* (Hamilton, 1822)	Bata	LC	+	+	+
		5	*Labeo calbasu* (Hamilton, 1822)	Kalbose	LC	+	+	+
		6	*Catla catla* (Hamilton, 1822)	Katla	LC	+	+	+
		7	*Cirrhinus mrigala* (Hamilton, 1822)	Mrigal	LC	+	+	+
		8	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Silver Carp	NT	+	+	+
		9	*Hypophthalmichthys nobilis* (Richardson, 1845)	Silver Carp	DD	+	+	+
		10	*Cyprinus carpio* (Linnaeus, 1758)	Cyprinus	VU	+	+	+
		11	*Ctenopharyngodon idella* (Valenciennes, 1844)	Grass Carp	NE	+	+	+
		12	*Carassius auratus* (Linnaeus, 1758)	Golden carp	LC	+	+	+
		13	*Puntius sarana* (Hamilton, 1822)	Sarpunti	LC	+	+	+
		14	*Puntius ticto* (Hamilton, 1822)	Titpunti	LC	+	+	+
		15	*Puntius chola* (Hamilton, 1822)	Chela Punti	LC	+	+	+
		16	*Puntius sophore* (Hamilton, 1822)	Punti	LC	+	+	+
		17	*Chagunius chagunio* (Hamilton, 1822)	Lal Punti	LC	+	+	+
		18	*Puntius javanicus* (Bleeker,1855)	Japani Punti	LC	+	+	+
		19	*Puntius conchonius* (Hamilton, 1822)	Kanchan Punti	LC	+	+	+
		20	*Amblypharyngodon mola* (Hamilton, 1822)	Morala	LC	+	+	+
		21	*Esomus danricus* (Hamilton, 1822)	Darke	LC	-	+	+
Perciformes	Ambassidae	22	*Chanda nama* (Hamilton, 1822)	Chada	LC	+	+	+
		23	*Parambassis ranga* (Hamilton, 1822)	Chada	LC	+	+	-
	Anabantidae	24	*Anabas testudineus* (Bloch, 1792)	Koi	LC	+	+	+
	Channidae	25	*Channa punctata* (Bloch, 1793)	Lata	LC	+	+	+
		26	*Channa marulius* (Hamilton, 1822)	Shal	LC	+	+	+
		27	*Channa striata* (Bloch, 1793)	Shol	LC	+	+	+
		28	*Channa gachua* (Hamilton, 1822)	Cheng	LC	+	+	+
		29	*Chana orientalis* (Bloch & Schneider, 1801)	Cheng	VU	+	+	+
	Cichlidae	30	*Oreochromis mossambica* (Peters, 1852)	Tilapia	VU	+	+	+
		31	*Oreochromis niloticus* (Linnaeus, 1758)	Nilontica	LC	+	+	+
	Nandidae	32	*Nandus nandus* (Hamilton, 1822)	Bheda	LC	+	+	+
	Osphronemidae	33	*Trichogaster fasciata* (Bloch and Schneider, 1801)	Kholse	LC	+	+	+
		34	*Trichogaster lalius* (Hamilton, 1822)	Kholse	LC	-	+	-
Siluriformes	Pangasiidae	35	*Pangasianodon hypophthalmus* (Sauvage, 1878)	Pangus	EN	+	+	+
		36	*Pangasius pangasius* (Hamilton, 1822)	Pangus	LC	+	+	+
	Bagridae	37	*Mystus tengara* (Hamilton, 1822)	Tangra	LC	+	+	+
		38	*Mystus vittatus* (Bloch, 1794)	Tangra	LC	+	+	+
		39	*Mystus aor* (Hamilton, 1822)	Aar	LC	+	+	+
	Siluridae	40	*Wallago attu* (Bloch and Schneider, 1801)	Boal	VU	+	+	+
		41	*Ompok bimaculatus* (Bloch, 1794)	Pabda	NT	+	+	+
		42	*Ompok pabda* (Hamilton, 1822)	Pabda	NT	+	+	+
		43	*Ompok pabo* (Hamilton, 1822)	Pabda	NT	+	+	+
	Heteropneustidae	44	*Heteropneustes fossilis* (Bloch, 1794)	Singhi	LC	+	+	+
	Clariidae	45	*Clarias batrachus* (Linnaeus, 1758)	Desi Magur	LC	+	+	+
		46	*Clarias gariepinus* (Burchell, 1822)	Hybrid Magur	LC	+	+	+
		47	*Clarias dussumieri* (Valenciennes, 1840)	Magur	NT	+	+	+
Synbranchiformes	Mastacembelidae	48	*Macrognathus pancalus* (Hamilton, 1822)	Pankal	LC	+	+	+
		49	*Macrognathus aral* (Bloch and Schneider, 1801)	Pankal	LC	+	+	+

		50	*Macrognathus aculeatus* (Bloch, 1786)	Baam	LC	+	+	+
		51	*Mastacembelus armatus* (Lacepede, 1800)	Baam	LC	+	+	+
Osteoglossiformes	Notopteridae	52	*Chitala chitala* (Hamilton, 1822)	Chital	NT	+	+	+
		53	*Notopterus notopterus* (Pallas, 1769)	Falui	LC	+	+	+
Mugiliformes	Mugilidae	54	*Rhinomugil corsula* (Hamilton, 1822)	Kharsula	VU	-	-	+
Characiformes	Serrasalmidae	55	*Colossoma macropomum* (Cuvier, 1816)	Rupchand	NE	+	+	+
Decapoda	Palaemonidae	56	*Macro brachium rosenbergii* (De Man, 1879)	Golda chingri	LC	+	+	+
		57	*Macro brachium malcolmsonii* (Milne Edward, 882)	Chamne chingri	LC	+	+	+
		58	*Macro brachium idae* (Heller, 1862)	Chingri	LC	+	+	+
		59	*Macro brachium villosimanus* (Tiwari, 1947)	Chingri	LC	+	+	+
		60	*Macro brachium americanum* (Bate, 1868)	Chingri	LC	-	+	+
		61	*Macro brachium assamense* (Tiwari, 1958)	Chingri	LC	+	+	-

IUCN (International Union for Conservation of Nature and Natural Resources) Red list: LC: Least Concern, VU: Vulnerable, NE: Not Evaluated, EN: Endangered, NT: Near Threatened, DD: Data Deficient. 1= Kolaghat block, 2= Panskura-1 block, 3= Sahid matangini block. + = Found, - = Not Found.

Table 2: Name of the order and number of species and % of abundance

SL. No	Name of the order	Number of species	% of abundance
1	Cypriniformes	21	34.43
2	Perciformes	13	21.31
3	Siluriformes	13	21.31
4	Synbranchiformes	04	6.56
5	Osteoglossiformes	02	3.28
6	Mugiliformes	01	1.64
7	Characiformes	01	1.64
8	Decapoda	06	9.84

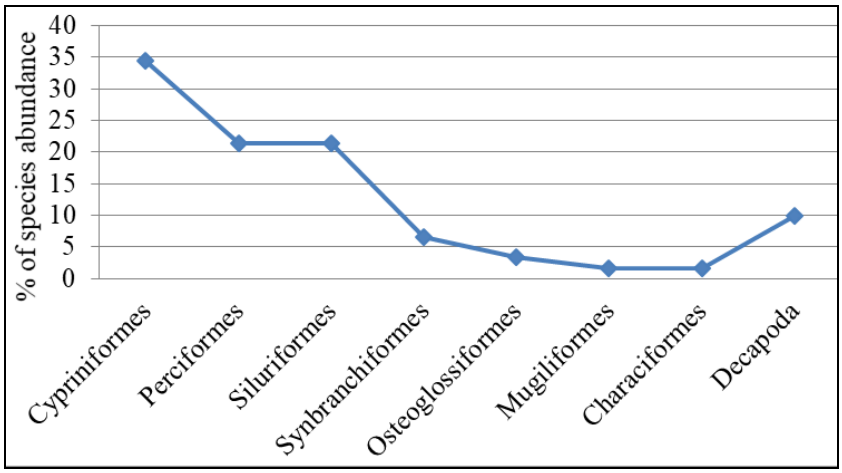

Fig 2: Relationship among order and species abundance.

Table 3: Name of the family and number of species and % of abundance

SL. No	Name of the Family	Number of species	% of Abundance
1	Cyprinidae	21	34.43
2	Ambassidae	02	3.28
3	Anabantidae	01	1.64
4	Channidae	05	8.20
5	Cichlidae	02	3.28
6	Nandidae	01	1.64
7	Osphronemidae	02	3.28
8	Pangasiidae	02	3.28
9	Bagridae	03	4.92
10	Siluridae	04	6.56
11	Heteropneustidae	01	1.64
12	Clariidae	03	4.92
13	Mastacembelidae	04	6.56
14	Notopteridae	02	3.28
15	Mugilidae	01	1.64
16	Serrasalmidae	01	1.64
17	Palaemonidae	06	9.84

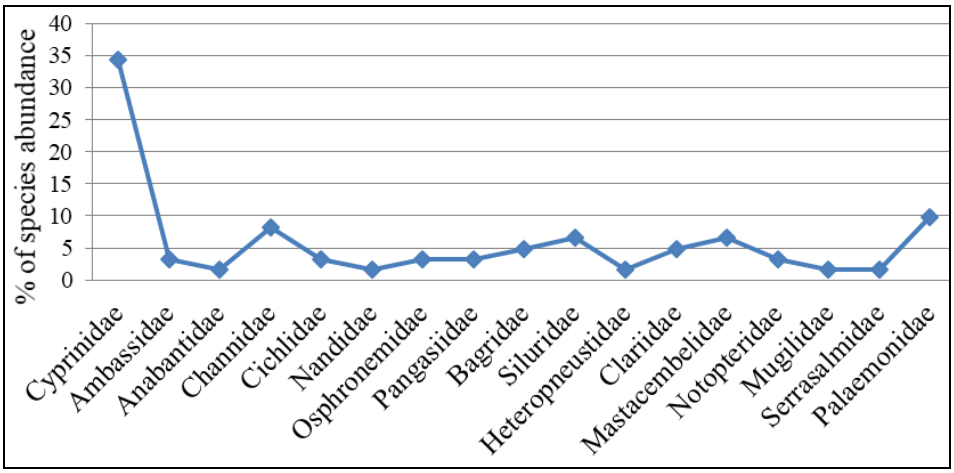

Fig 3: Relationship among family and species abundance.

Table 4: Number of species and percentage of fish fauna as per IUCN red list category

Status	Number of species	%
Least Concern (LC)	46	75.41
Vulnerable (VU)	05	8.20
Not Evaluated (NE)	02	3.28
Endangered (EN)	01	1.64
Near Threatened (NT)	06	9.84
Data Deficient (DD)	01	1.64

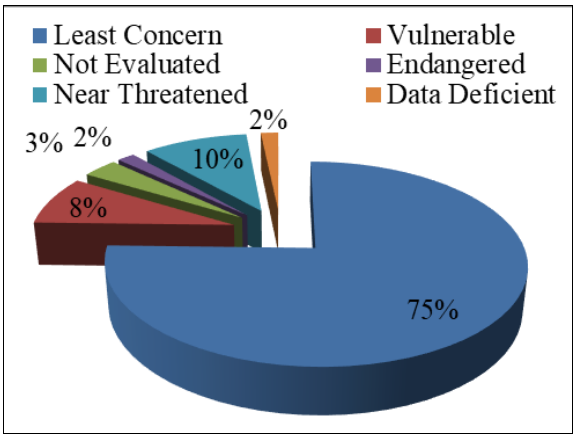

Fig 4: Percentage of species under different threat categories as per IUCN (2018).

4. Discussion

Several authors reported fish diversity from the water resources of West Bengal. Bhakta and Bandyopadhyay (2008) [5] documented 46 fish species from freshwater water bodies in the Purba Midnapore District, Das *et al*. (2011) [8] recorded a total of 52 fin and shellfish species from the three markets in Kolkata, Mogalekar *et al*. (2017) [13] recognized 267 species of freshwater fishes, Bhattacharya (2018) [6] identified 102 freshwater fish species belonging into total 10 orders and 27 families in Bankura district. The present study mainly emphasizes fish species composition and richness in Kolaghat, Panskura-1, and Sahid matangini block in Purba Medinipur district, West Bengal. During the study, a total of about 61 fish species were recorded belonging to 08 different orders and 17 families. The information collected from the local fish seller of the area reveals a high decline in the fish population in the last few years. Some species of Puntius, Macrognathus pancalus, Mastacembelus armatus, Mystus tengara, Channa punctata, Anabas testudineus, Nandus nandus, Channa gachua, Chana orientalis were seen and collected by fishermen before a few years but rarely/do not appear in fishing operations these days. There is a need for re-evaluation of threatened category fishes because these species were not available in very large quantity though its market demand is very high. This may due to uncontrolled fishing to meet the high market demand of the local fishes. Besides, the fishing activities were intensified with the introduction of modern fishing gear and techniques. Because of the unscientific practices, there is a need to take care of certain conservation and approaches to control drastic change in the fishery and to save some valuable species from wiping out of the region.

The fish diversity is threatened due to illegal and destructive fishing methods, pollution, habitat alteration, eutrophication, siltation, and water abstraction and these factors are highly affecting the overall fish diversity to a large extent (Groombridge, 1992 and Allan *et al*., 2005) [9, 1]. Illegal and destructive fishing methods (use of small mesh-sized net, poisoning, destructive gears, overfishing, and catch of all life stages of fish) is one of the major concerns for the loss of fish diversity. The major threat is from the use of fine mesh size long nylon nets (mosquito net) causing the indiscriminate killing of fishes irrespective of early life stage and brooders, particularly in breeding seasons. Such practices, which are adopted for short-term profit, ultimately lead to regular growth in overfishing and consequent reductions in populations.

As the population demand is increasing, the people occupy the area of beel for the agricultural purpose by which the wetlands are heavily pressured and converted to croplands and to increase the crop production, farmers use various chemical fertilizers for increasing production of crops, which causes eutrophication and decreases the dissolved oxygen level in water bodies which simultaneously harms the fish diversity (Rathore *et al*., 2016 and Savci, 2012) [19, 20].

From several decades, fishing has become a major economic industry, due to several uses of fisheries resources. Fish biodiversity conversation will be successful only if it takes into consideration socioeconomic status, people's perception, the knowledge base of local people, and traditional systems of conservation. Documenting the traditional information and complementing it with scientific inputs will help in the revival of local resource conservation which is considered to move efficiently and practicable. Legislation related to agriculture and allied activities including fisheries is the jurisdiction of State Governments. To this may all concern, conservationists, government, and NGO organizations have a major role to play

in creating awareness and support for the conservation mechanism of the fish species. The Department of Fisheries, Government of West Bengal is trying to conserve these threatened fish species by regulating several measures like the fishing ban, closed season, regulate fishing, gear selectivity, consumers awareness regarding buying of threatened fish species from the market is prerequisite to conserve the threatened resources in a better way. The work will provide basic data on fish diversity of Kolaghat, Panskura-1, and Sahid matangini block in Purba Medinipur district, and it may be helpful for development and fish conservation. However, more awareness and motivation are required on the value of freshwater fish diversity and conservation of aquatic resources.

5. Conclusion

The market-based survey showed that there was a drop in productivity in the last few years. Appropriate management and conservation policy of this area could play a significant role in the conservation. Deforestation, flood, sand mining, recreational activities, organic and inorganic pollution, overfishing, unregulated uses of pesticides in the agricultural field, irrational fish harvesting along different activities are the central causes for aquatic diversity loss. Few important management plans have been considered from the study for the conservation of fish biodiversity in the freshwater body which should be inserted into the fishery policies of the Government.

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