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Diversity analysis of freshwater fishes in paddy field ichthyofauna in Sutahata and Haldia block of Purba Medinipur, West Bengal, India

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Abstract
Freshwater fish diversity in paddy field ichthyofauna and their plenty vary to a great scope in respect to a variety of pollution. Existences of 15 species belonging to 5 orders have been noted during the study period. Instability in occurrence and abundance of the species are influenced by number of pollution *viz*. industrial pollution, pollution from pesticides, brickfield pollution, pollution from shrimp culture etc. To stop pollution which causes decreases the paddy field ichthyofauna Government should take necessary steps to save the diversity of paddy field ichthyofauna, otherwise the diversity exists permanently.

Keywords: Sutahata and Haldia block, paddy field ichthyofauna diversity, species abundance, causes of threaten

Introduction
Freshwater resources are essential for aquatic life. It is, therefore, imperative to protect them. Freshwater ecosystems are globally incompletely protected. Fish is an vital source of protein and it is also a cash crop in the world and water is the main support in which they complete their life functions like swimming, breeding, feeding, digestion and excretion. Inland water bodies such as rivers, ponds, tanks, wetlands and lakes are the main source of sufficient amount of fish fauna. The diversity of fish species have continuously damaged by several human activities directly or indirectly. The paddy field ichthyofaunal fish diversity represents the actual facts of fish diversity and their availability. As local people depends on the fishes available in river or market or paddy field not only for consumption but also for commercial purpose to gain money. Fish culture is no well suited with paddy field wherever the latest varieties of paddy are cultivated. These developments have reduced fish culture in paddy field in Japan, where a greater crop of rice is cultivated alone over a additional crop of fish with rice crop (Jhingram, 1991) [1, 7]. Wherever paddy continues to be cultivated on traditional way, paddy cum fish culture is common in countries like Japan, Italy, Malaysia, Taiwan, African countries and some parts of India. Paddy cum fish culture has been reported in India Rice and fish are considered to be the two important sources of food in Sutahata and Haldia region.

Materials and Methodology
Study Area
Purba Medinipur district is an administrative unit in the Indian state of West Bengal. It is the southernmost district of Medinipur division – one of the five administrative divisions of West Bengal. The headquarters in Tamluk. It was formed on 1 January 2002 after the Partition of Medinipur into Purba Medinipur and Paschim Medinipur which lies at the northern and western border of it. The state of Odisha is at the southwest border; the Bay of Bengal lies in the south; the Hooghly river and South 24 Parganas district to the east; and Howrah district to the north-east. Purba Medinipur is formed of the sub-divisions of Tamluk, Contai and Haldia of erstwhile Medinipur district. Another sub-division, Egra has been created out of the erstwhile Contai sub-division during the partition of Medinipur. In 2011, the state government has proposed to rename the district as Tamralipta district after the ancient port city of Tamralipta which used to lie near the modern district headquarters.

Purba Medinipur saw many political movements during the British Raj. A parallel government named the Tamralipta Jatiya Sarkar was formed during the Quit India Movement in Tamluk. In 2007, Purba Medinipur witnessed the Nandigram violence, an incident of police firing that killed 14 farmers.

Sutahata is in Ward No. 1 of Haldia municipality in Haldia subdivision of Purba Medinipur district in the state of West Bengal, India.

Haldia is a city and a municipality in Purba Medinipur district in the Indian state of West Bengal. It is a major riverport and industrial belt located approximately 125 kilometres southwest of Kolkata near the mouth of the Hooghly River, one of the distributaries of the Ganges.

The Haldia Township is bordered by the Haldia River an offshoot of the Ganges River. Haldia is a centre for many petrochemical businesses, and is being developed as a major trade port for Kolkata.

Table 1: Location of the study area

Area	Lat Long	GPS Cordinates
Purba Medinipur	22.058420	$22^0$3’ 30.312” N
	87.811737	$87^0$48’ 42.2532” E
Haldia	22.067460	$22^0$4’ 2.856” N
	88.137180	$88^0$8’ 13.848” E
Sutahata	22.057460	$22^0$3’ 26.856” N
	87.810420	$87^0$48’ 37.512” E

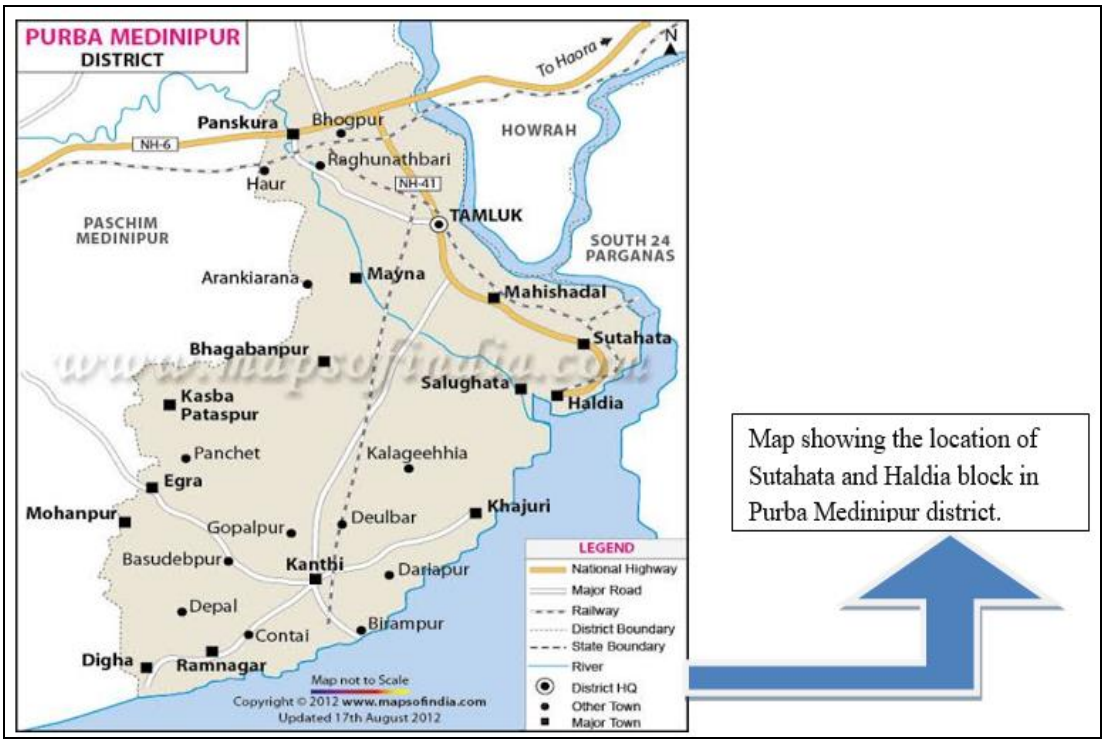

Fig 1: Map showing the location of Sutahata and Haldia block in Purba Medinipur district.

Collection of fish samples and identifications

In the present study, monthly sampling was carried out for 4 months during August 2019 to November 2019, from 2 different blocks of Purba Medinipur districts of West Bengal. The fish species were captured with the gill net or drag net, scoop net as well as the hooks through the local people and fishermen. The fish specimens were identified by Jayaram, Qureshi & Qureshi, Jhingran and also with the help of local people/fishermen and several website.

Fig 2: *Laubuca laubuca*

Fig 3: *Puntius ticto*

Fig 4: *Amblypharyngodon mola*

Fig 5: *Esomus danricus*

Fig 6: *Channa gachua*

Fig 7: *Glossogobius giuris*

Fig 8: *Chanda ranga*

Fig 9: *Colisa lailus*

Fig 10: *Channa punctatus*

Fig 11: *Anabus testudineus*

Fig 12: *Mastacembelus armatus*

Fig 13: *Channa striatus*

Fig 14: *Mystus cavasius*

Fig 15: *Heteropneustes fossilis*

Fig 16: *Xenentodon cancila*

Table 2: Fish species, their local name, human use, feeding habit in Sutahata and Haldia block of Purba Medinipur district.

Order	Family	Scientific Name	Local Name	Human Use	Feeding Habit
Cypriniformes	Cyprinidae	*Laubuca laubuca* (Fig.1)	Bekichela	Commercial	Herbivore
		Puntius ticto (Fig.2)	Punti	Ornamental Commercial	Herbivore
		Amblypharyngodon mola (Fig.3)	Mourola	Commercial	Herbivore
		Esomus danricus (Fig.4)	Darkina	Ornamental Commercial	Herbivore
Perciformes	Channidae	*Channa gachua* (Fig.5)	Chang	Ornamental Aquaculture	Carnivore
		Channa punctatus (Fig.9)	Lata	Ornamental Aquaculture	Carnivore
		Channa striatus (Fig.12)	Shol	Ornamental Commercial	Carnivore
	Anabantidae	*Colisa lailus* (Fig.8)	Kholse	Ornamental	Omnivore
		Anabus testudineus (Fig.10)	Koi	Ornamental Aquaculture	Insectivore
	Gobidae	*Glossogobius giuris* (Fig.6)	Bele	Ornamental Commercial	Carnivore
	Ambassidae	*Chanda ranga* (Fig.7)	Chanda	Ornamental Commercial	Omnivore
	Mastacembelidae	*Mastacembelus armatus* (Fig.11)	Baim	Commercial	Carnivore
Siluriformes	Bagridae	*Mystus cavasius* (Fig.13)	Tengra	Ornamental Commercial	Carnivore
	Siluridae	*Heteropneustes fossilis* (Fig.14)	Singhi	Commercial	Carnivore
Beloniformes	Belonidae	*Xenentodon cancila* (Fig.15)	Kakia	Aquaculture	Omnivore

Result and Discussion

The fish species recorded during the study period have been shown in Table. 2. It is evident that the recorded 15 fish species are distributed in 9 families and 4 orders. Irrespective of study area members belonging to Perciformes were very common as well as dominant (47.66% in Sutahata and 48.72% in Haldia) while Cypriniformes (30.29% in Sutahata and 29.28% in Haldia), Siluriformes (13.77% in Sutahata and 14.42% in Haldia) and Beloniformes (8.28% in Sutahata and 7.58% in Haldia).

Number of fish species found in sutahata and Haldia block

Sutahata Block: In perusal of Table No. 2 revels that in Sutahata Block fish species of *Puntius ticto* (93) is maximum number available in this study period as well as *Laubauka laubauka* fish species contribute second position with its available number is 73. The fish species *Mastacembelus armetus* is available in minimum number no. 24 only in this study period in Sutahata Block.

Haldia Block: In perusal of Table No. 3 revels that in Haldia Block fish species of *Puntius ticto* (61) is maximum number available in this study period as well as *Channa gachua* fish species contribute second position with its available number is 54. The fish species *Mastacembelus armetus* is available in minimum number no. 10 only in this study period in Haldia Block.

In relation of the two blocks *Puntius ticto* found in maximum number as 93 in Sutahata and 61 in Haldia block and *Mastacembelus armetus* found less in number in the two blocks as 24 in Sutahata and 10 in Haldia.

% of fish species occurrence in sutahata and Haldia block

Sutahata Block: As per study of Table No. 4 it is clear that *Puntius ticto* is the fish species which is found in maximum percentage in the study period of August 2019 to November 2019. Among this months maximum percentage available in the month of September 2019 as 11.55% and minimum in October 2019 i.e. 9.48%

Mastacembelus armatus the fresh water fish species known as spine eel is available minimum percentage in the month of August 2019 i.e. 2.16% and maximum in the month of October 2019 i.e. 3.79%.

Haldia Block: As per study of Table No. 5 it is clear that *Puntius ticto* is the fish species which is found in maximum percentage in the study period of August 2019 to November 2019. Among this months maximum percentage available in the month of August 2019 as 12.74% and minimum in October 2019 i.e. 7.32%.
Mastacembelus armatus the fresh water fish species known as spine eel is available minimum percentage in the month of November 2019 i.e. 1.00% and maximum in the month of October 2019 i.e. 2.44%.

Variation of fish species occurrence in sutahata and haldia block

As per the study of Table-5/Plate-A the indigenous fish species *Laubuka laubuka* is available near about equal in the month of September, 2019 and October, 2019 in both the Sutahata and Haldia block.
In case of Table-5/Plate-B *Xenentodon cancila* is occurring more percentage in the month of August,19, September,19 and November,19 in Sutahata block than Haldia block but in October,2019 month this species found in more percentage in Haldia block (7.11<10.37).

Table 3: List of common fish species found in the study area of sutahata block in the month of august-2019, september-2019, october-2019 and november-2019.

SL. NO.	Scientific Name	Sutahata							
		August		September		October		November	
		No	%	No	%	No	%	No	%
1	*Laubuka laubuka*	20	8.66	23	9.16	19	9	11	6.36
2	*Xenentodon cancila*	18	7.99	21	8.37	15	7.11	17	9.83
3	*Puntius ticto*	25	10.82	29	11.55	20	9.48	19	10.98
4	*Channa gachua*	16	6.93	20	7.97	18	8.53	12	6.94
5	*Amblypharyngodon mola*	16	6.93	14	5.58	10	4.74	8	4.62
6	*Glossogobius giuris*	18	7.79	16	6.37	19	9	10	5.78
7	*Chanda ranga*	11	4.76	18	7.17	10	4.74	8	4.62
8	*Colisa lailus*	11	4.76	15	5.98	10	4.74	9	5.20
9	*Channa punctatus*	14	6.07	18	7.17	16	7.59	10	5.78
10	*Mystus cavasius*	15	6.49	12	4.78	19	9	18	10.40
11	*Channa striatus*	17	7.36	19	7.37	15	7.11	10	5.78
12	*Esomus danricus*	17	7.36	15	5.98	10	4.74	9	5.20
13	*Anabus testudineus*	12	5.19	10	3.98	12	5.69	16	9.25
14	*Heteropneustes fossilis*	16	6.93	14	5.78	10	4.74	12	6.95
15	*Mastacembelus armetus*	5	2.16	7	2.79	8	3.79	4	2.31

Table 4: List of common fish species found in the study area of Haldia block in the month of august-2019, september-2019, october-2019 and november-2019**.**

SL. NO.	Scientific Name	Sutahata							
		August		September		October		November	
		No	%	No	%	No	%	No	%
1	*Laubuka laubuka*	10	6.37	13	7.69	15	9.14	8	8
2	*Xenentodon cancila*	11	7.01	10	5.92	17	10.37	7	7
3	*Puntius ticto*	20	12.74	19	11.24	12	7.32	10	10
4	*Channa gachua*	13	8.28	18	10.65	14	8.54	9	9
5	*Amblypharyngodon mola*	14	8.92	12	7.10	11	6.71	5	5
6	*Glossogobius giuris*	10	6.37	14	8.28	16	9.76	8	8
7	*Chanda ranga*	9	5.73	12	7.10	5	3.05	3	3
8	*Colisa lailus*	9	5.73	13	7.69	7	4.27	5	5
9	*Channa punctatus*	11	7.01	15	8.88	13	7.93	7	7
10	*Mystus cavasius*	12	7.64	8	4.73	16	9.73	13	13
11	*Channa striatus*	12	7.64	14	8.28	11	6.71	6	6
12	*Esomus danricus*	7	4.46	5	2.96	9	5.49	4	4
13	*Anabus testudineus*	7	4.46	4	2.37	6	3.66	8	8
14	*Heteropneustes fossilis*	10	6.37	9	5.33	8	4.88	6	6
15	*Mastacembelus armetus*	2	1.27	3	1.78	4	2.44	1	1

Table 5: Order wise percentage

Block Name	Order			
	Perciformes	Cypriniformes	Siluriformes	Beloniformes
Sutahata	47.66%	30.29%	13.77%	8.28%
Haldia	48.72%	29.28%	14.42%	7.58%

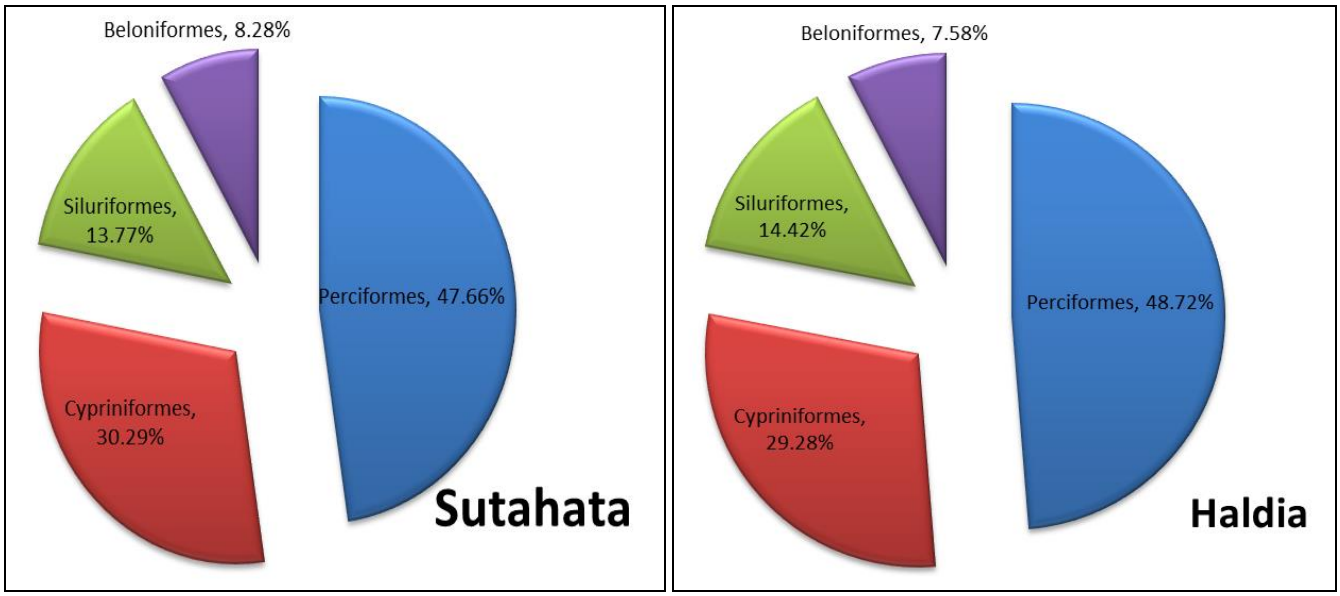

Fig 17: Order wise percentage in Sutahata and Haldia block

Causes of Threatning

1) Habitat loss

- Extension and development of commercial construction and activities and capturing the freshwater activities.
- Fish farming & shrimp cultivation replacing natural habitats.
- Brick manufacturing covering the natural habitats as well as riverine or road side wetlands.

2) **Habitat pollution**

- Pesticides and pollution from modern agriculture.
- Pollution from fish farming and shrimp cultivation.
- Pollution from Brick manufacturing.

Fig 18: Pollution from different sites.

Conclusion

The entire research work carries on finding out the status of ecosystem in between the various fish species and the paddy field. At first in this study period it is clear that there has been a relationship in between the paddy field and its local ichthyofauna. Various type of fresh water fish species also have been found as well as their quantity also vary which is depend upon the impact of water pollution and other parameters of the selected paddy field. As per study it is clear that the availability of the fish species become vary monthly as well as block wise. On the other hand through the research study which fish species are generally found from the selected paddy field are generally endanger in types. The availability of the species gradually decreases due to the effects of pesticides, insecticides and use of various chemicals in the paddy field. Without any supervision it is very much harmful

to use of insecticides and pesticides for the paddy field ichthiofauna. So, through this research work it is clear that if the trends are carry continuously, after a certain period the entire freshwater species diversity will be exists permanently from the ecosystem. Therefore they have been compulsory to supervised on application of the pesticides, insecticides or chemicals in the freshwater paddy field. On the economic point of view the availability of the various fish species from the study area have some market value. As per market assessment from the local market at the study area these species are consumed by the local people as their daily menu. So, if the species are selected for the aquaculture purpose they are have been a great chance to increasing the production of from the purely native fish species. So, in the multidimensional point of view through the research work concluded that to keep the fish species diversity to maintain the ecological balance of paddy field ichthiofauna to maintain the livelihood of the local fisherman by catch in the local paddy field, this research work have some significant. On the other side of the research work concluded that for the use of pesticide, insecticide and various chemical, the supervision from the Govt. level is become essential and compulsory. Hence it is concluded that for the mankind to keep the entire ecosystem with the proper balance for sustainable aquaculture, as well as to maintain the species diversity in our biosphere.

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