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# Study of Fish Diversity of a Major Distributary of River Ganga that Needs Proper Management and Rehabilitation

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## ABSTRACT

Conservation is curtailed for bioresource management that enhances the bioeconomy's needs. The ichthyofaunal diversity of one of the major distributaries of the Ganga, the Mridangabhanga River and its adjacent areas of water bodies was studied. The river flows through the area, which is the world's heritage site, the Biosphere Reserve, and the largest forest area in the world, the Sunderban. A constant anthropogenic pressure is destroying the natural resources of this area. This alteration has adversely affected water quality and, definitely, its fishery potential. The present study reveals that the river houses a good number of edible fish, which belong to fresh water as well as marine water. The fish catch survey reveals that the quantity of fish caught was decreasing rapidly, which was a threat to the villagers as fishing was the basic tool for earning bread. The causes of these destructions should be identified and eradicated with immediate effect to conserve the natural breeding grounds. Therefore, implementation of strong conservation strategies is earnestly required to revive river wealth; on the other hand, sustainable use of natural resources is the only solution for the restoration of this bioresource. This study reveals that the river houses 110 fish species belonging to 33 families and 63 Genera. The study also reveals that river pockets in this catchment area are safer places for fish spawns to survive. The heavy metal analysis of the fish tissue shows that the upper range limits of some metals are higher than the permissible limits.

***Keywords**: Distributaries; Tidal Effect; Estuarine Fishes; Fish Seeds; Breeding Ground*

## Introduction

The Sunderban is the pride of West Bengal. It is the wealth of India as well. The Sunderban is situated between N' 21º 30' to 22 º 40' and E' 88º 05' to 89 º 55'. This is one of the largest forests in the world and covers an area of about 140,000ha. This area was inscribed as a biosphere reserve and world heritage site in 1987. The Sunderban lies on the delta of the Ganges, Brahmaputra, and Meghna rivers. The total area, which includes the area between the Bay of Bengal in India and spreads throughout the south-west of Bangladesh between the river Baleswar in East and Harinbhanga in the West. The area is a mosaic of large rivers, many rivulets, various tributaries, and many distributaries. Mridangabhanga is one of the most important distributaries of river Ganges which originates from Ganga and flows south wards and meets Bay of Bengal at Sunderban. This area houses an immense treasure of flora and fauna. It is a unique habitat and also a good breeding ground for a

large number of threatened and endangered species. Being a unique ecological sphere, Sunderban is always an undulating ecosystem moving through an ongoing process in a wider range. The meshwork of rivers and rivulets has formed the world's largest delta and this area houses the largest faunal composition of the Sundarban. In this area, the aquatic flora and fauna are enriched due to the constant inflow of fresh tidal water from the sea and the Bay of Bengal. The present study was conducted on the Mridangabhanga River and also on the large Bheris, backwater areas, and ponds where local people use those waterbodies for fish culture. The study also included lowland areas, marshy lands, and canals. The Mridangabhanga River is one of the distributaries of the River Ganga; it joins Mathurapur and Pathorprotima blocks of South 24 Pargana, West Bengal. The studied river and the adjacent area river are fed by sea tides twice daily, which is an important factor that influences the aquatic population of this river. In the valley of the Mridangabhanga River, during high tide, the river water rises and covers lowland, marshy areas, and other water bodies. When low tide comes, the water ceases, and the lowland area becomes exposed as semi-dried muddy patches, except for the ponds and bheries. Moreover, during high tide, many estuarine and marine fish enter the river flow, which might increase the diversity of the fish population. The research findings of Allison *et al.* (1998), Allison and Kepple (2001), and Allison (1998) revealed that the topography as well as the extent of the forest boundary had changed due to anthropogenic intervention. The yearly fish catch data reveals that this resource is a good revenue earning system for the state. A large group of residents of this area are dependent on capture fishery activity, which is the backbone of the Sundarban economy as well as the state of West Bengal. A year's worth of 3355 MT of fish catch is recorded from the Sunderban area (Huq *et al*., 2004). The diversity of fish fauna in several rivers was studied by several authors, and results indicated that the meshwork of rivers in Sunderban houses a rich diversity of ichthyofauna (Chakraborty *et al*., 2021; Paul *et al*., 2021; Sen & Mandal, 2019; Saha *et al*., 2018; Islam *et al*., 2017; Mishra & Gopi, 2017; Chakraborty & Adhikary, 2014; Rahaman *et al*., 2012; Sarkar & Banerjee, 2012, Dhara & Paul, 2016; Mitra, Banerjee & Banerjee, 2006).

A detailed study on fish diversity and its metal absorption limits in fish tissue was conducted during the present research, which aimed to satisfy the local people's needs and also stratify the conservation strategies for the river valley.

## Methodology

The recent study was on the River Mridangabhanga, one of the distributaries of the River Ganga. The study sites, 1. Bolerhat Bazaar Bridge, 2. Dwarakapur Purbo Haribasar, and 3. Kedarpur (Figure 1), were chosen at proper intervals and covered the area of the riparian zone. Figure 1 depicts the sampling sites along with the adjoining lowland area and fish culture ponds. Fishermen were engaged in fishing from 6 a.m. to 6 p.m. Each month for 10 days (Sarkar & Banerjee, 2012) at each landing station, sampling was done at local fish landing stations. Fish were caught by various gears (Cast net, Lift net,Gill net) and traps were used for catfish and mud species collection. All collected fish were assorted into three groups: oozing females, adults, and fries. Identification was done according to the standard

taxonomic procedure (Day, 1876; Talwar & Jhingran, 1991; Jayaram, 1999; Sarkar & Banerjee, 2012). The fish diversity of the Mridangabhanga River is listed in Table 1. The toxic metals were estimated by following standard methods (American Public Health Association, 1999). Quantitative estimation of Cu, Zn, and Ni in two fish samples was done using an atomic adsorption spectrophotometer.


***Figure 1. Map showing the study sites (Google Map)***

***Table 1: List of fishes of Mridangabhanga River valley***

| Sl.No. | Order | Family | Name of the Fish | Status |
|---|---|---|---|---|
| 1 | Beloniformes | Belonidae | ***Xenentodoncancila*** | LC |
| 2 | Synbranchiformes | Mastacembelidae | ***Macrognathuspancalus*** | LC |
| 3 | Synbranchiformes | Mastacembelidae | ***Mastacembelusarmatus*** | LC |
| 4 | Synbranchiformes | Synbranchidae | ***Monopteruscuchia*** | LC |
| 5 | Perciformes | Latidae | ***Lates calcarifer*** | LC |
| 6 | Perciformes | Serranidae | ***Epinepheluslanceolatus*** | LOC |
| 7 | Perciformes | Serranidae | ***Epinephelusmalabaricus*** | LC |
| 8 | Perciformes | Ambessidae | ***Ambassiskopsii*** | NE |
| 9 | Perciformes | Terapontidae | ***Terapon puta*** | LC |
| 10 | Perciformes | Ambessidae | ***Chanda nama*** | LC |
| 11 | Perciformes | Ambessidae | ***Parambassisbaculis*** | LC |
| 12 | Perciformes | Ambessidae | ***Parambassisranga*** | LC |
| 13 | Perciformes | Polynemidae | ***Polynemusparadiseus*** | LC |
| 14 | Carcharhiniformes | Carcharhinidae | ***Carcharhinus limbatus*** | VU |
| 15 | Carcharhiniformes | Carcharhinidae | ***Carcharhinus leucas*** | LC |
| 16 | Carcharhiniformes | Carcharhinidae | ***Carcharhinus sorrah*** | LC |

| | | | | |
|---|---|---|---|---|
| 17 | Carcharhiniformes | Carcharhinidae | ***Carcharhinus hemiodon*** | LC |
| 18 | Torpediniformes | Narcinidae | ***Narcinebrunnea*** | LC |
| 19 | Rhinopristiformes | Pristidae | ***Pristis clavate*** | EN |
| 20 | Rhinopristiformes | Rhinobatidae | ***Rhinobetosannadalei*** | DD |
| 21 | Myliobatiformes | Gymnuridae | ***Gymnura japonica*** | VU |
| 22 | Osteoglossiformes | Notopteridae | ***Notopterusnotopterus*** | LC |
| 23 | Osteoglossiformes | Notopteridae | ***Chitalachitala*** | NT |
| 24 | Anguilliformes | Anguillidae | ***Anguilla bengalensis*** | NT |
| 25 | Anguilliformes | Anguillidae | ***Anguilla bicolor*** | NT |
| 26 | Clupeiformes | Clupeidae | ***Coricasoborna*** | LC |
| 27 | Clupeiformes | Clupeidae | ***Gonialosamanmina*** | LC |
| 28 | Clupeiformes | Clupeidae | ***Gudusiachapra*** | LC |
| 29 | Clupeiformes | Clupeidae | ***Nematalosagalatheae*** | LC |
| 30 | Clupeiformes | Clupeidae | ***Tenualosailisha*** | LC |
| 31 | Clupeiformes | Pristigasteridae | ***Llisha elongate*** | LC |
| 32 | Clupeiformes | Engraulidae | ***Setipinnaphasa*** | LC |
| 33 | Clupeiforms | Engraulidae | ***Setipinnatenuifilis*** | DD |
| 34 | Clupeiformes | Engraulidae | ***Setipinnataty*** | |
| 35 | Clupeiformes | Danionidae | ***Parluciosomadaniconius*** | LC |
| 36 | Cypriniformes | Cyprinidae | ***Amblypharyngodon mola*** | LC |
| 37 | Cypriniformes | Cyprinidae | ***Aspidoporiajaya*** | LC |
| 38 | Cypriniformes | Cyprinidae | ***Chaguniuschagunio*** | LC |
| 39 | Cypriniformes | Cyprinidae | ***Barilusbarila*** | LC |
| 40 | Cypriniformes | Cyprinidae | ***Barilusbarna*** | LC |
| 41 | Cypriniformes | Cyprinidae | ***Barilusvagra*** | LC |
| 42 | Cypriniformes | Cyprinidae | ***Cirrhinusreba*** | LC |
| 43 | Cypriniformes | Cyprinidae | ***Esumusdanricus*** | LC |
| 44 | Cypriniformes | Cyprinidae | ***Laubukalaubuca*** | NT |
| 45 | Cypriniformes | Cyprinidae | ***Labeopangusia*** | LC |
| 46 | Cypriniformes | Cyprinidae | ***Labeoangara*** | LC |
| 47 | Cypriniformes | Cyprinidae | ***Puntius sarana*** | LC |
| 48 | Cypriniformes | Cyprinidae | ***Puntius chelynoides*** | LC |
| 49 | Cypriniformes | Cyprinidae | ***Puntius chola*** | LC |
| 50 | Cypriniformes | Cyprinidae | ***Puntius conchonius*** | LC |
| 51 | Cypriniformes | Cyprinidae | ***Puntius amphibious*** | DD |
| 52 | Cypriniformes | Cyprinidae | ***Puntius binotatus*** | LC |
| 53 | Cypriniformes | Cyprinidae | ***Puntius puntio*** | NE |
| 54 | Cypriniformes | Cyprinidae | ***Puntius phutunio*** | LC |
| 55 | Cypriniformes | Cyprinidae | ***Puntius sophore*** | LC |
| 56 | Cypriniformes | Cyprinidae | ***Puntius terio*** | LC |
| 57 | Cypriniformes | Cyprinidae | ***Puntius ticto*** | LC |
| 58 | Cypriniformes | Cyprinidae | ***Salmostomabacaila*** | LC |
| 59 | Cypriniformes | Cyprinidae | ***Salmostomaphulo*** | LC |
| 60 | Cypriniformes | Cyprinidae | ***Tor putitora*** | EN |
| 61 | Cypriniformes | Cyprinidae | ***Tor tor*** | EN |
| 62 | Cypriniformes | Cyprinidae | ***Pethiaconchonius*** | LC |
| 63 | Cypriniformes | Cyprinidae | ***Pethiagelius*** | LC |
| 64 | Cypriniformes | Cyprinidae | ***Securiculagora*** | LC |
| 65 | Cypriniformes | Cyprinidae | ***Rasbora daniconius*** | LC |
| 66 | Cypriniformes | Cyprinidae | ***Danio rerio*** | LC |

| | | | | |
|---|---|---|---|---|
| 67 | Cypriniformes | Cyprinidae | *Chela laubuca* | LC |
| 68 | Cypriniformes | Cyprinidae | ***Danio aequipinnatus*** | LC |
| 69 | Cypriniformes | Cyprinidae | ***Lepidocephalichthysguntea*** | LC |
| 70 | Cypriniformes | Cyprinidae | ***Pethiaconchonius*** | LC |
| 71 | Siluriformes | Siluridae | ***Wallago attu*** | VU |
| 72 | Siluriformes | Siluridae | ***Ompokpabda*** | NT |
| 73 | Siluriformes | Siluridae | ***Ompokbimaculatus*** | NT |
| 74 | Siluriformes | Bagridae | ***Batasiobatasio*** | LC |
| 75 | Siluriformes | Bagridae | ***Mystusbleekeri*** | LC |
| 76 | Siluriformes | Bagridae | ***Mystuscavasius*** | LC |
| 77 | Siluriformes | Bagridae | ***Mystusgulio*** | LC |
| 78 | Siluriformes | Bagridae | ***Mystustengra*** | LC |
| 79 | Siluriformes | Bagridae | ***Mystusvittatus*** | LC |
| 80 | Siluriformes | Bagridae | ***Ailiacoila*** | NT |
| 81 | Siluriformes | Bagridae | ***Siloniasilondia*** | LC |
| 82 | Siluriformes | Pangasilidae | ***Pangasius pangasius*** | LC |
| 83 | Siluriformes | Clariidae | ***Clarias batrachus*** | LC |
| 84 | Siluriformes | Heteropneustidae | ***Heteropneustesfossilis*** | LC |
| 85 | Aulopiformes | Synodontidae | ***Harpadonnehereus*** | NT |
| 86 | Mugiliformes | Mugilidae | ***Planilizamacrolepis*** | LC |
| 87 | Mugiliformes | Mugilidae | ***Chelonparsia*** | LC |
| 88 | Mugiliformes | Mugilidae | ***Rhinomugilcorsula*** | LC |
| 89 | Mugiliformes | Mugilidae | ***Valamugilbuchanani*** | LC |
| 90 | Gobiliformes | Oxudercidae | ***Apocryptesbato*** | LC |
| 91 | Gobiliformes | Oxudercidae | ***Apocryptodonmadurensis*** | LC |
| 92 | Gobiliformes | Oxudercidae | ***Glossogobiusgiuris*** | LC |
| 93 | Gobiliformes | Oxudercidae | ***Parapocryptesserperaster*** | LC |
| 94 | Gobiliformes | Oxudercidae | ***Parapocryptesbatoides*** | LC |
| 95 | Gobiliformes | Oxudercidae | ***Periophthalmuskalolo*** | LC |
| 96 | Kurtiformes | Kurtidae | ***Kurtus indicus*** | NE |
| 97 | Anabantiformes | Osphronemidae | ***Trichogasterfasciata*** | LC |
| 98 | Anabantiformes | Osphronemidae | ***Trichogasterlalius*** | LC |
| 99 | Anabantiformes | Osphronemidae | ***Trichogasterchuna*** | LC |
| 100 | Anabantiformes | Channidae | ***Channa orientalis*** | VU |
| 101 | Anabantiformes | Channidae | ***Channa punctate*** | LC |
| 102 | Anabantiformes | Channidae | ***Channa striata*** | LC |
| 103 | Anabantiformes | Badidae | ***Badisbadis*** | LC |
| 104 | Anabantiformes | Nandidae | ***Nandus nandus*** | LC |
| 105 | Pleuronectiformes | Cynoglossidae | ***Cynoglossusmacrostomus*** | VU |
| 106 | Pleuronectiformes | Cynoglossidae | ***Cynoglossus lingua*** | LC |
| 107 | Pleuronectiformes | Cynoglossidae | ***Cynoglossusarel*** | LC |
| 108 | Pleuronectiformes | Soleidae | ***Synapturaalbomaculata*** | NE |
| 109 | Tetraodontiformes | Triacanthidae | ***Triacanthusbiaculeatus*** | NE |
| 110 | Tetraodontiformes | Tetraodontidae | ***Leiodoncutcutia*** | LC |

Table 1 shows 7 species Nearly Threatened Category (NT) , 4 species Vulnerable category(VU) , 3 Endangered category species (EN), 5 species Not Evaluated Category

(NE), 3 species Data Deficient Category() , (LC)least concerned category species, according to “The IUCN Red List of Threatened Species” 2021.

**Result and discussion**

The River Mridangabhanga houses several breeding grounds and pockets of fish in its valley. The huge primary productivity from mangrove habitat, with high organic and inorganic nutrients, might have enriched this river ecosystem, which in turn provides good nurturing grounds for fish. The findings of Mitra, Banerjee and Banerjee (2006) and Sen and Mandal (2019) indicated that the pelagic region of the deltaic region is highly productive due to high nutrients derived from mangrove plants, surface run-off, and anthropogenic origin. The monsoon storm and heavy rainfall damage the embankment of the river, and inundation increases the salinity of river water, which acts as a threat to the natural breeding grounds.

The study of fishes in Mridangabhanga reveals a rich and diverse list of freshwater, estuarine, and marine fishes. A total of 110 fish species belong to 19 orders, 33 families, and 63 genera. Cypriniformes were the most dominant order, comprising 31.8% of the total fish population, followed by the Siluriformes (12.7%), Clupeiformes (9.09%), Anabantiformes (7.27%), Gobiliformes (5.45%), Perciformes (8.18%), Mugiliformes (3.63%), Carcharhiniformes (3.63%), and Pleuronectiformes(3.63%).Synbranchiformes (2.72%), Tetraodontiformes, Rhinopristiformes, Osteoglossiformes, and Anguilliformes represent (1.81%), and Beloniformes, Aulopiformes, Myliobatiformes, Kurtiformes, and Torpediniformes represent 0.9% of the total diversity of the fish fauna.

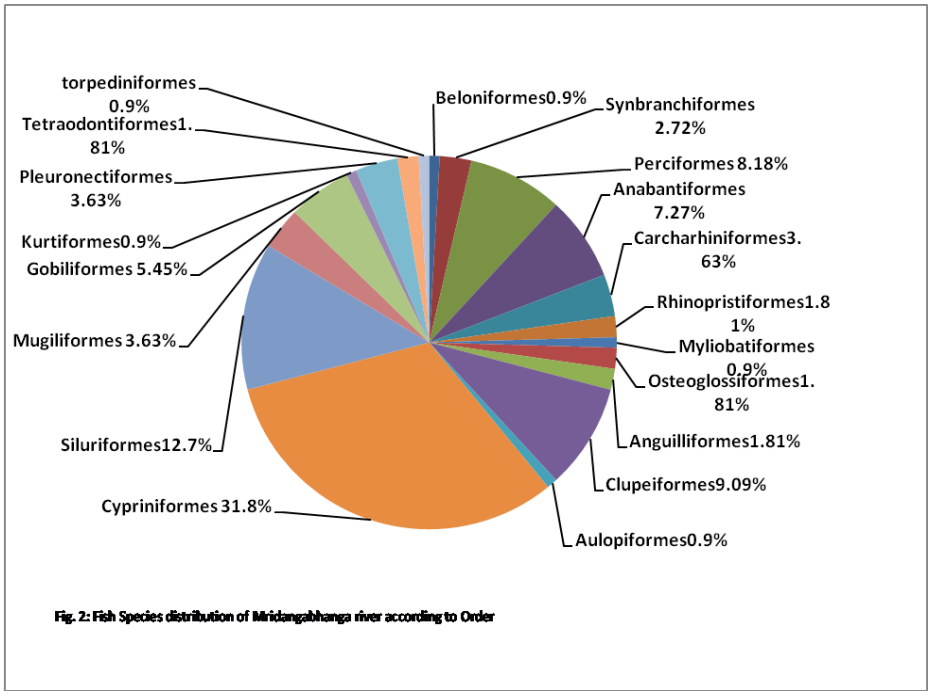


***Figure 2: Fish Species Distribution of Mridangabhanga River According to Order***

Order Cypriniformes represents 2 families; among them, the Family Cyprinidae was the most dominant family, having a total of 21 Genus and 35 Species, and the Family Danionidae represents 1 Genus and 1 Species. Order Siluriformes represents 5 Families among them family Bagridae (4 Genus 8 species), family Siluridae (2 Genus 3 species), Order Clupeiformes represents 4 Families, among which Family Clupeidae represents 5 Genus 5 species. Family Pristigasteridae represents 1 Genus 1 Species, and Family Engraulidae represents 1 Genus 3 Species. The order Anabantiformes represents 4 families, Badidae with one genus and one Species, Nandidae with 1 Genus 1 Species, Osphronemidae 1 Genus 3 Species and Channidae with 1 genus 3 species.Order Gobiliformes represents the Family Oxudercidae with 6 Genus 6 Species,OrderKurtiformes represents 1 Family Kurtidae with 1 Genus 1 Species,Order Pleuronectiformes represents 2 Families among them Family Cynoglossidae represents 1 Genus 3 species and Family Soleidae 1 Genus 1 Species. The order Tetraodontiformes represents 2 families: the Family Triacanthidae with 1 Genus 1 species and the family Tetraodontidae with 1 Genus 1 Species. With 4 genera and 4 species, the order Mugiliformes represents the only family Mugilidae. The order Aulopiformes also represents the only family Synodontidae with 1 Genus 1 species. The order Carcharhiniformes represents Family Carcharhinidae with 1 Genus 4 Species.Order Rhinopristiformes represents two families and both the Families Rhinobatidaeand Pristidaerepresents 1 Genus and 1 Species. Order Osteoglossiformes represents the Family Notopteridae representing2Genus and 2 Species. Order Myliobatiformes represents Family Gymnuridae with 1 Genus and 1 Species, Order Synbranchiformes represents two Families, Mastacembelidae with 2 Genus and 2 Species and Family Synbranchidae with 1 Genus and 1 species.Order Perciformes represents 6 families family Latidae with 1 Genus 1 Species, and Family Ambessidae with 3 Genus 4 Species, family Terapontidae 1 genus 1Species. Order Beloniformes represents Family Belonidae with1 Genus, 1 Species.

During the present study, 110 fish species were recorded from the Mridangabhanga river (Table 1). Among these fishes 7 species Nearly Threatened Category, 4 species Vulnerable category, 3 Endangered category species, 3 least concerned category species, 5 species in the Not Evaluated category, and 3 species in the Data Deficient category, according to "The IUCN Red List of Threatened Species" (IUCN, 2021).

The fish, which are found only during the monsoon season in this area, are sporadic visitors to this river, and they show a higher population. Similarly, the population of freshwater fish species is also found to increase during the heavy flow of the monsoon. There are several pockets of small temporary pools connecting channels at PurbaDwarakapur which houses a large number of oozing females during monsoon and fingerlings were found in the shallow back water in these pockets during the post monsoon. The brackish water fishes as well as spawns of *Anguilla bengalensis, Chanda nama, Xenentodoncancila, Gudusiachapra, Setipinnaphasa, Labucalabuca, Puntius sarana, Mystustengara, Heteropneustesfossilis, Rhinomugilcorsula, Cynoglossuscynoglossus,* were recorded in the backwater of Purbadwarakapur area gives shelter to the freshwater were found during low tide at post

monsoon. The waterlogged area trailing bandh area of the riverbank shows a rich diversity of fishes, and they showed a heterogeneous composition of freshwater, estuarine, and marine fishes. The fish farmers from the local area get those spawns easily and cultivate them in the culture ponds. These indicated a good source of natural fish seeds, which will not only be a source of livelihood but also increase the fish population also. Gram Panchayat controls the fishery at Purba Dwarakapur, and it aims to conserve those spawns and increase production on a large scale. The graphical representation of toxic metal absorption in fish muscle tissue of the Mridangabhanga River (Figure 3A-R) shows that the values were within limits according to the World Health Organization (2008).

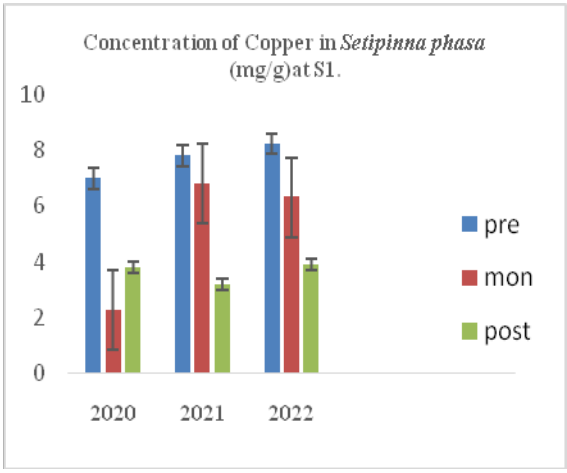


**Figure 3A: Copper accumulation limit in Fish Tissue, Station S1**

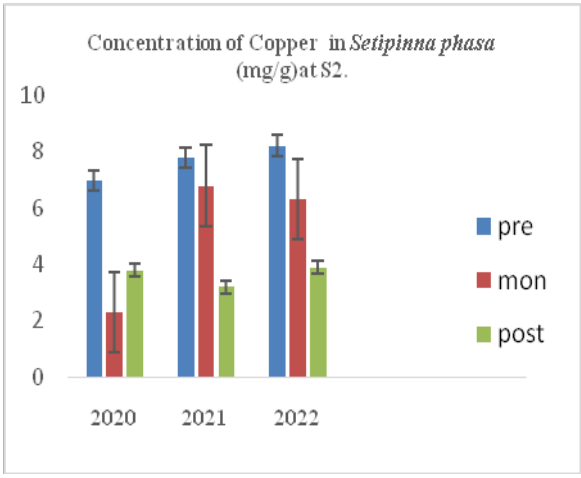


**Figure 3B: Copper accumulation limit in Fish Tissue, Station S2**

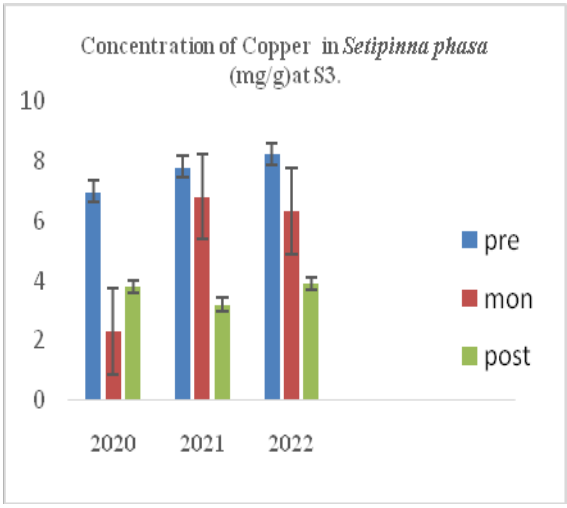


**Figure 3C: Copper accumulation limit in Fish Tissue Station, S3**

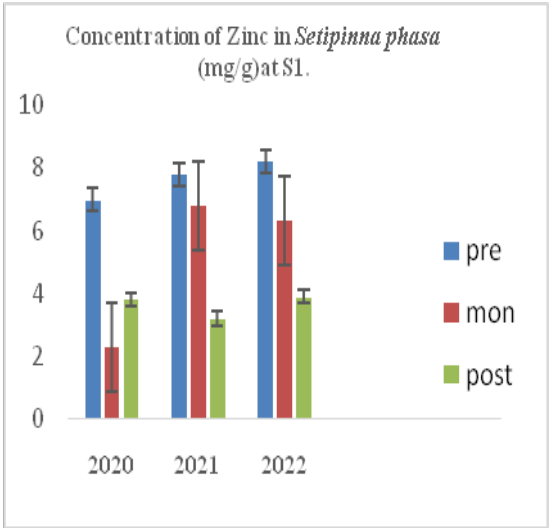


**Figure 3D: Zinc accumulation limit in Fish Tissue Station, S1**

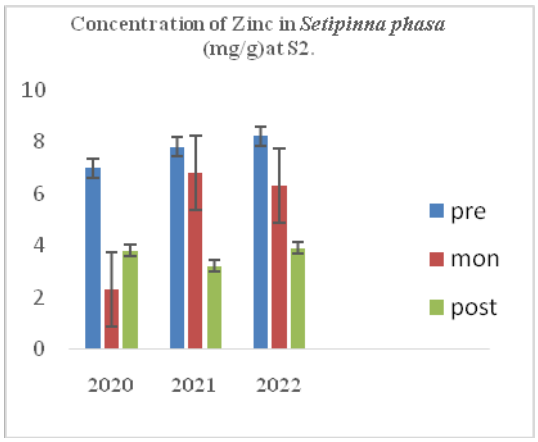


**Figure 3E: Zinc accumulation limit in Fish Tissue Station, S2**

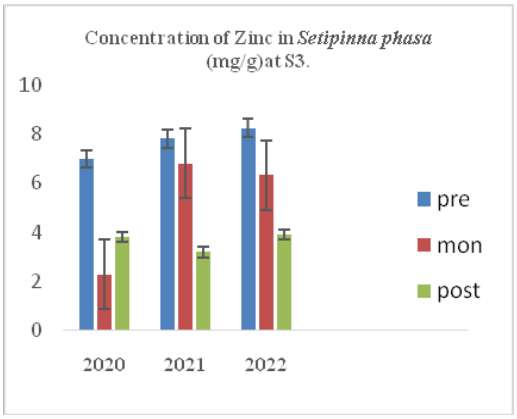


**Figure 3F: Zinc accumulation limit in Fish Tissue Station, S3**

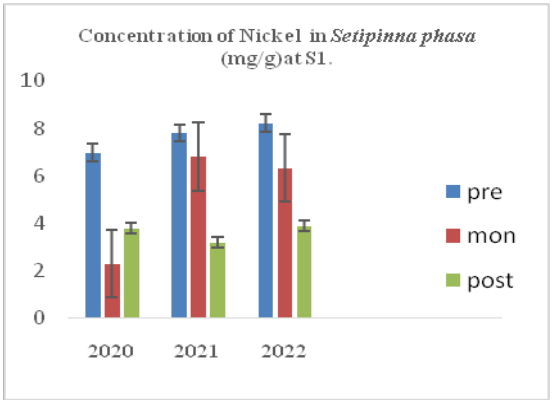


**Figure 3G: Nickelaccumulation limit in Fish Tissue Station, S1**

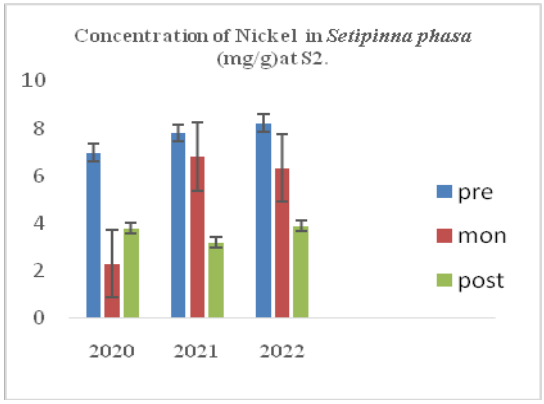


**Figure 3H: Nickelaccumulation limit in Fish Tissue Station, S2**

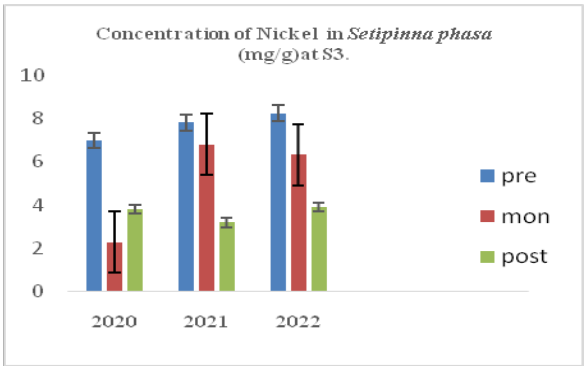


**Figure 3I: Nickel accumulation limit in Fish Tissue Station, S3**

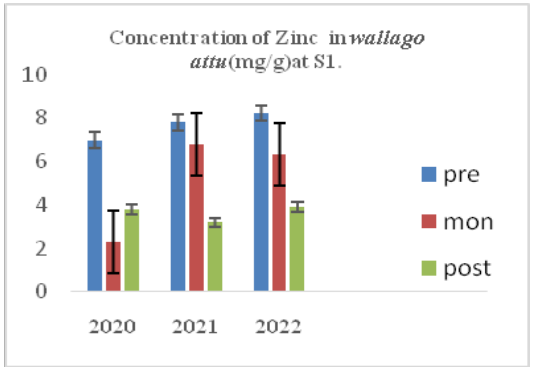


**Figure 3J: Zinc. accumulation limit in Fish Tissue Station, S1**

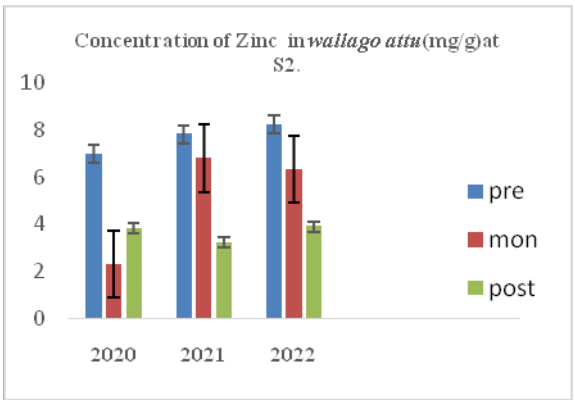


**Figure 3K: Zinc accumulation limit in Fish Tissue Station, S2**

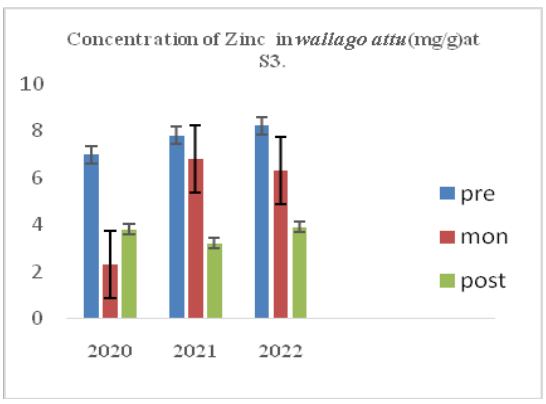


**Figure 3L: Zinc accumulation limit in Fish Tissue Station, S3**

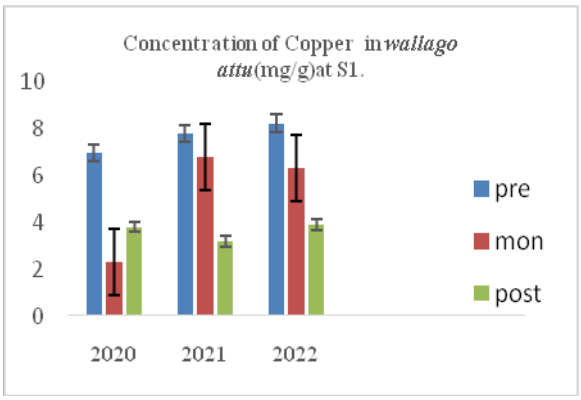


**Figure 3M: Copper accumulation limit in Fish Tissue Station, S1**

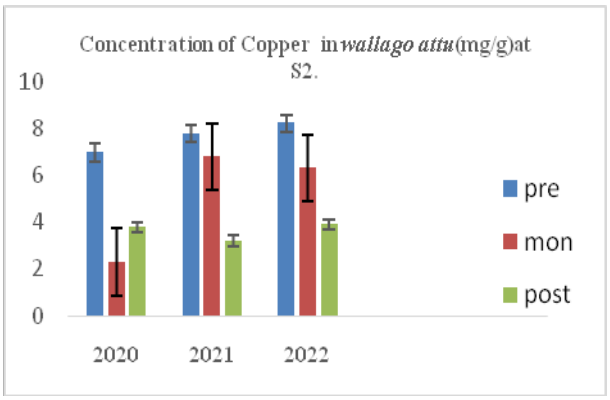


**Figure 3N: Copper accumulation limit in Fish Tissue Station, S2**

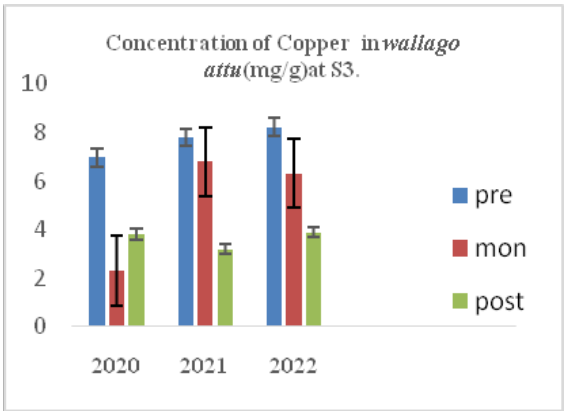


**Figure 3O: Copper accumulation limit in Fish Tissue Station, S3**

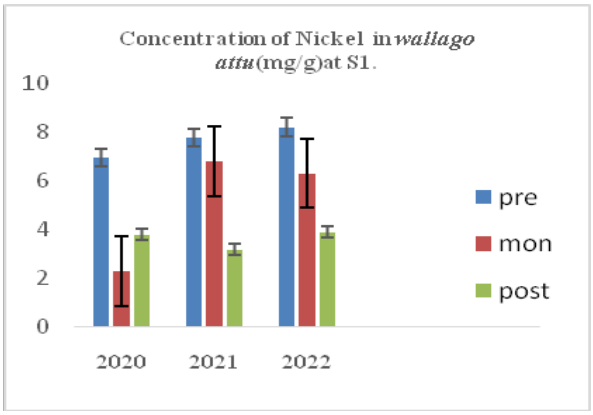


**Figure 3P: Nickelaccumulation limit in Fish Tissue Station, S1**

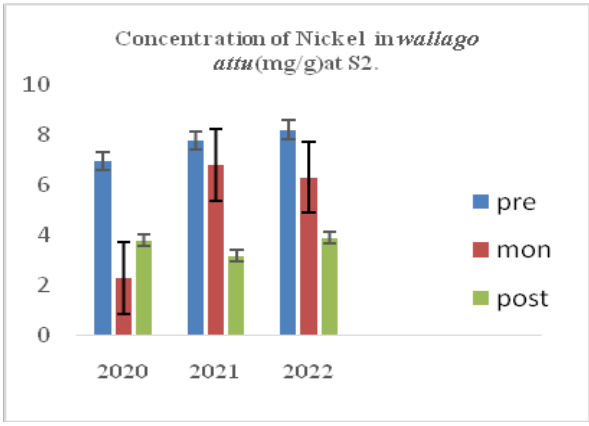


**Figure 3Q: Nickelaccumulation limit in Fish Tissue Station, S2**

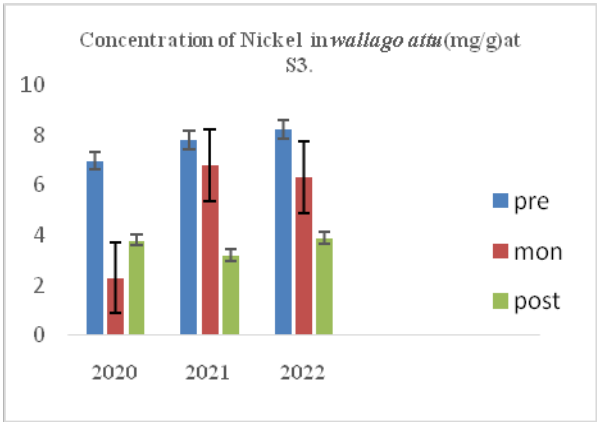


**Figure 3R: Nickel accumulation limit in Fish Tissue Station, S3**

## Conclusion

The anthropogenic interventions have caused undesired changes in the atmosphere and irregular undulations of the sea and have adverse effects on water bodies, which cause irreversible damage to aquatic biota as well as fisheries. The sea has adverse effects on biodiversity, sustainability, and the livelihood of fish resources and fishermen's communities on a large scale. The factors that influenced the fish catch in the Sunderban area were undulating environmental factors. The present study reveals that the ichthyofaunal diversity of the river Mridangabhanga is a good source of freshwater and estuarine food fish. This river also nurtures the breeding grounds of some of the fish, which tolerate a wide range of salinity variations. This river has to face soil erosion every monsoon season. As a result, it affects the aquatic ecosystem, which has an adverse impact on aquatic fauna. The anthropogenic intervention in this river is less, but the environmental hazards are more powerful in damaging the riverine ecosystem. The river shows steady productivity throughout the year, so it may be conserved as a good nurturing ground. The metal absorption limits are within limits. Effective conservation measures are urgently needed to save the natural breeding grounds and protect the diversity of the fish.

The river Mridangabhanga experienced immense damage due to natural disasters as well as anthropogenic adversities. The freshwater fish as well as the brackish-water fish of this river have to withstand wide hydrological changes. Those anthropogenic activities that caused much destruction of the river biota should be stopped immediately, all sorts of threats should be taken care of, and strict conservation actions should be introduced with immediate effect.

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