

Assessment of Threatened Category of Freshwater Fish Availability in the Western Part of Purba Medinipur District, West Bengal, India

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Abstract

In the current study, a market-based survey was conducted to evaluate the endangered categories of fish and shellfish that are accessible at specific fish markets located in several blocks in the Purba Medinipur district, West Bengal, India. A total of 63 species of fish and shellfish from 18 families were available during the period. Twelve species of carp, eleven catfish species, nine species of barbs and minnows, five species of snakeheads, six species of eels, fifteen species of perches, two species of feather backs, and three species of prawns were mentioned among the 63 species that were accessible. The state of species availability was noted in three categories, with 21 species being often, 20 species being somewhat, and 22 species being seldom accessible. Perches made up the majority of the fish (23.8%). The findings suggest that the western part of Purba Medinipur districts' fish variety has been gradually reducing as a result of both natural and artificial factors. Community-based fisheries management, the use of appropriate fishing gear, the creation and management of fish sanctuaries, the enforcement of fish regulations and laws, fingerling storing, and the removal of beels and canals can all significant aid in the conservation of fish varieties.

Key words: Fish, Shellfish, IUCN threatened, Conservation, Purba Medinipur

In India, rivers, streams, canals, wetlands, natural and artificial water bodies, backwaters, and wetland mangroves all contain large amounts of freshwater. The best fish on earth are found in the interior. China surpasses India in terms of production, placing her second in the globe [1]. Human life and activity depend on the ecosystems of freshwater and their resources, and the health of the fish species those habitats support is a good indicator of that health. Numerous biotic and abiotic factors have an impact on the inclusion community structure, and assemblages of species in a lotic environment [2]. Abundance of species (relative number of species) and biodiversity of species (number of species in a given area) are the two components of fish diversity [3]. The ability to assess the consequences of habitat modification and other influences on fish populations before and after the change happens, as well as fish diversity and the accompanying habitat management, are major challenges today [4]. Managing the food web's dynamics and nutritional balances, controlling carbon flux, and functioning as active connections between ecosystems are just a few of the ecological services that fish populations perform that are essential to the well-being and resilience of ecosystems in freshwater. Fish provides an extensive variety of services as a result of their daily, seasonal, and annual migrations in rivers, lakes, estuaries, and oceans. Fish consumption also connects distinct ecosystems by transporting nutrients across borders.

West Bengal is the only state in India that runs from the Himalayas to the Bay of Bengal [5]. Locals eat, and many sell fish every day in different marketplaces in order to make a

livelihood. Numerous researches on freshwater fish have been conducted in the Purba Medinipur area of West Bengal. The diversity of freshwater fish in West Bengal's eastern Purba Medinipur region was studied [6]. The Negua Diversion Canal in the Purba Medinipur District is home to a variety of ichthyofauna [7]. The seasonal shifts in plankton and their role on the productivity of fish in the brackish water-fed canal in the Purba Medinipur area also looked [8]. The distribution and seasonal availability of crabs along the Digha beach is looked in the Purba Medinipur district [9]. According to a 2008 research, freshwater perennial water bodies in the East Midnapore District of West Bengal, India, are home to 45 distinct fish species [10]. Nine *Puntius* species classified from the Paschim Medinipur, Purba Medinipur, and Jhargram districts as ornamental fish [11]. In addition, 44 native ornamental fish species recognized from the Purba Medinipur District of India's West Bengal region [12].

The goal of the current study is to add to the information on the distribution of species of freshwater fish in the western half of West Bengal's Purba Medinipur district and to report on the diversity of freshwater fish there. The current study's goals are to establish a fundamental tool for aquatic environment conservation planning and to report the diversity of freshwater fish in the western Purba Medinipur area.

MATERIALS AND METHODS

Description of the study sites

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Purba Medinipur district is located between 22°57'10" and 21°36'33"N and 88°21'40" and 86°33'50"E. After the division of Midnapore into Purba Medinipur and Paschim Medinipur, it was established on January 1, 2002. This area's natural water supply is extremely abundant and diverse, consisting of rivers, estuaries, backwaters, impoundments, floodplain wetlands, reservoirs, and ponds. The study has been conducted in four blocks named Ramnagar-1, Ramnagar-2, Egra-1, and Egra-2, situated westwards of Purba Medinipur district, West Bengal, India. The selected fish markets are Fatepur bazar, Ramnagar market of Ramnagar-1 block, Balisai market, Depal bazar of Ramnagar-2 block, and Egra supermarket. Mirjapur bazar of Egra-1 block, Balighai bazar, and Dhobadhi bazar of Egra-2 block were taken for the survey (Fig 1).

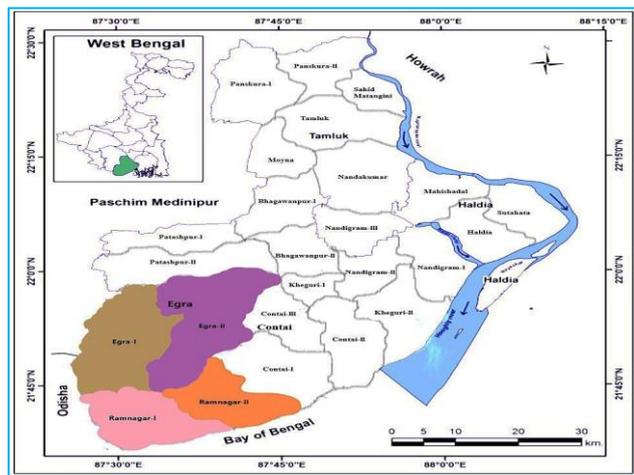


Fig 1 Location map of the study area

Study and data collection

The study period was from June 2022 to November 2022 (six months). The present research was carried out to assess the

freshwater fish and shellfish diversity and factors affecting the biodiversity in the western part of Purba Medinipur district, West Bengal, India. During the collection of data, primary sources have been considered. Primary data were collected from fishermen through focus group discussions (FGD), key informant interviews (KII), and questionnaire interviews (QI). These fish have been identified and then taxonomically categorized using different sources [13-14].

Focus group discussions (FGD)

Focus group discussions (FGD) were arranged at different markets of each block with the fisherman and fish seller. The places were Fatepur bazar, Ramnagar market, Balisai market, Depal bazaar, Egra super market, Mirjapur bazaar, Balighai bazar, and Dhobadhi bazar.

Questionnaire interviews (QI)

In the study, all fish sellers from the different markets within the four blocks were selected for questionnaire interviews. The questionnaire interviews were done at marketplaces, depending on the presence of fishermen and fish sellers.

Statistical analysis

Using Microsoft Office Excel 2007, data were analyzed by information gathered by the questionnaire. The data was presented using tables and pie charts.

RESULTS AND DISCUSSION

According to the availability of fish species, they were categorized into 3 groups: commonly available (CA), moderately available (MA), and rarely available (RA) species. A total of 63 fish species from 18 families were found during the period of investigation. These include carp, catfish, barb, minnows, snakeheads, eels, perches, featherbacks, and prawns, which are discussed below:

Table 1 A list of carp species was recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Cyprinidae	<i>Labeo rohita</i>	Rui	Indian major carp	CA	LC
2	Cyprinidae	<i>Catla catla</i>	Catla	Indian major carp	CA	LC
3	Cyprinidae	<i>Cirrhinus mrigala</i>	Mrigal	Indian major carp	CA	LC
4	Cyprinidae	<i>Labeo calbasu</i>	Kalbose	Black rohu	MA	LC
5	Cyprinidae	<i>Labeo bata</i>	Bata	Minor carp	CA	LC
6	Cyprinidae	<i>Labeo boga</i>	Bata	Boga Labeo	MA	LC
7	Cyprinidae	<i>Cirrhinus reba</i>	Bata	Minor carp	CA	LC
8	Cyprinidae	<i>Hypophthalmichthys molitrix</i>	Silver carp	Silver carp	CA	NT
9	Cyprinidae	<i>Hypophthalmichthys nobilis</i>	Silver carp	Silver carp	CA	DD
10	Cyprinidae	<i>Cyprinus carpio</i>	Cyprinus	Common carp	CA	VU
11	Cyprinidae	<i>Ctenopharyngodon idella</i>	Grass carp	Grass carp	CA	NE
12	Cyprinidae	<i>Carassius auratus</i>	Golden carp	Golden carp	CA	LC

Table 2 A list of catfishes as recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Bagridae	<i>Mystus vittatus</i>	Tangra	Striped dwarf catfish	CA	LC
2	Bagridae	<i>Mystus cavasius</i>	Tangra	Gangetic mystus	MA	LC
3	Bagridae	<i>Mystus aor</i>	Aar	Indian shovelnose	MA	LC
4	Siluridae	<i>Wallago attu</i>	Boal	Freshwater shark	MA	VU
5	Siluridae	<i>Ompok pabda</i>	Pabda	Two-stripe gulper catfish	CA	NT
6	Siluridae	<i>Ompok bimaculatus</i>	Pabda	Indian butter catfish	MA	NT
7	Siluridae	<i>Ompok pabo</i>	Pabda	Pabo catfish	MA	NT
8	Heteropneustidae	<i>Heteropneustes fossilis</i>	Singhi	Stinging catfish	CA	LC
9	Clariidae	<i>Clarias batrachus</i>	Desi magur	Walking catfish	MA	LC
10	Clariidae	<i>Clarias gariepinus</i>	Hybrid magur	African catfish	CA	LC
11	Clariidae	<i>Clarias dussumieri</i>	Magur	Valenciennes clariid	MA	NT

Table 3 A list of barbs and minnows as recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Cyprinidae	<i>Puntius sophore</i>	Punti	Pool barb	MA	LC
2	Cyprinidae	<i>Puntius sarana</i>	Sarpunti	Olive barb	RA	LC
3	Cyprinidae	<i>Puntius chola</i>	Chelapunti	Chola barb	MA	LC
4	Cyprinidae	<i>Puntius ticto</i>	Titpunti	Ticto barb	RA	LC
5	Cyprinidae	<i>Chagunius chagunio</i>	Lalpunti	Lal puti	RA	LC
6	Cyprinidae	<i>Puntius conchoniis</i>	Kanchanpunti	Red barb	MA	LC
7	Cyprinidae	<i>Puntius javanicus</i>	Japani punti	Java barb	MA	LC
8	Cyprinidae	<i>Amblypharyngodon mola</i>	Morala	Mola carplet	RA	LC
9	Cyprinidae	<i>Esomus danricus</i>	Darke	Flying barb	RA	LC

Table 4 A list of snakeheads was recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Channidae	<i>Channa punctatus</i>	Lata	Spotted snakehead	MA	LC
2	Channidae	<i>Channa orientalis</i>	Cheng	Asiatic snakehead	RA	VU
3	Channidae	<i>Channa striatus</i>	Shol	Snakehead murrel	RA	LC
4	Channidae	<i>Channa marulius</i>	Shal	Giant snakehead	RA	LC
5	Channidae	<i>Channa gachua</i>	Cheng	Dwarf snakehead	RA	LC

Table 5 A list of eels as recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Mastacembelidae	<i>Macrognathus pancalus</i>	Pankal	Indian spiny eel	MA	LC
2	Mastacembelidae	<i>Macrognathus aral</i>	Pankal	One-stripe eel	MA	LC
3	Mastacembelidae	<i>Macrognathus aculeatus</i>	Baam	Lesser spiny eel	RA	LC
4	Mastacembelidae	<i>Mastacembelus armatus</i>	Baam	Leopard spiny eel	RA	LC
5	Anguillidae	<i>Anguilla bengalensis</i>	Baam	Indian longfin eel	RA	VU
6	Synbranchidae	<i>Monopterusuchia</i>	Cuchia	Gangetic mud eel	RA	VU

Table 6 A list of perches as recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Anabantidae	<i>Anabas testudineus</i>	Koi	Climbing perch	CA	LC
2	Nandidae	<i>Nandus nandus</i>	Bheda	Gangetic leaffish	RA	EN
3	Mugilidae	<i>Rhinomugil corsula</i>	Khorshula	Corsula mullet	MA	VU
4	Latidae	<i>Lates calcarifer</i>	Bhakti	Giant Sea perch	MA	LC
5	Gobiidae	<i>Apocryptes bato</i>	Gule	Goby	RA	LC
6	Gobiidae	<i>Pseudapocryptes elongatus</i>	Chewa	Elongate mudskipper	RA	LC
7	Mugilidae	<i>Planiliza parsia</i>	Parshy	Goldspot mullet	CA	NE
8	Ambassidae	<i>Chanda nama</i>	Chanda	Elongated Glass Perchlet	RA	VU
9	Ambassidae	<i>Parambassis ranga</i>	Chanda	Indian Glass Fish	RA	VU
10	Cichlidae	<i>Oreochromis mossambicus</i>	Tilapia	Mozambique Tilapia	CA	VU
11	Cichlidae	<i>Oreochromis niloticus</i>	Nilontica	Nile Tilapia	CA	LC
12	Anabantidae	<i>Trichogaster fasciata</i>	Kholshe	Striped Gourami	CA	LC
13	Anabantidae	<i>Trichogaster lalius</i>	Kholshe	Dwarf Gourami	MA	LC
14	Gobiidae	<i>Glossogobius giuris</i>	Bele	Bar eyed goby	RA	LC
15	Gobiidae	<i>Glossogobius aureus</i>	Bele	Golden tank goby	RA	LC

Table 7 A list of featherbacks as recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Notopteriidae	<i>Notopterus chitala</i>	Chital	Humped Featherback	RA	EN
2	Notopteriidae	<i>Notopterus notopterus</i>	Falui	Bronze Featherback	MA	VU

Table 8 A list of prawns as recorded during the period of the present study

S. No.	Family	Scientific name	Local name	Common name	Remark	IUCN status
1	Palaemonidae	<i>Macrobrachium rosenbergii</i>	Golda chingri	Giant freshwater prawn	CA	LC
2	Palaemonidae	<i>Macrobrachium malcolmsonii</i>	Chamne chingri	Monsoon River Prawn	CA	LC
3	Palaemonidae	<i>Macrobrachium villosimanus</i>	Chingri	Dimua river prawn	RA	LC

CA: Commonly available species, MA: Moderately available species, RA: Rarely available species.

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

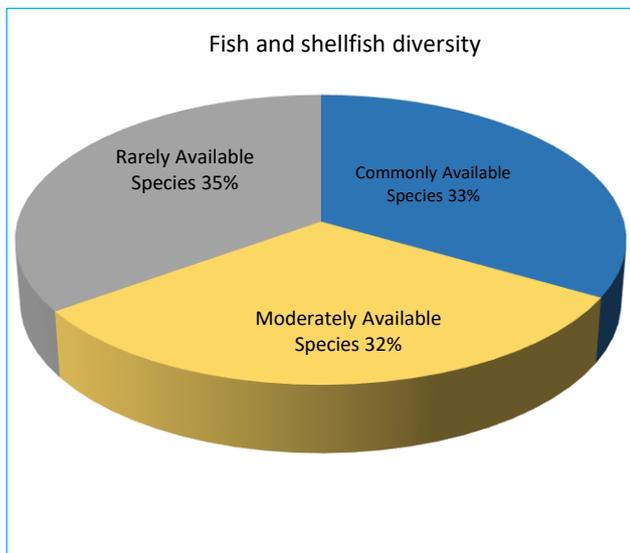


Fig 2 Present status of freshwater fish diversity in the western part of Purba Medinipur district

Actinopterygii fishes

During the period of the present investigation, 12 species of carp were recorded, of which 10 species were commonly

available and 2 species were moderately available (Table 1). Eleven species of catfish were recorded whereas 4 species were commonly available species and 7 species were moderately available species (Table 2). In the present investigation, 9 species of barbs and minnows were listed in the study area, where 4 species were moderately available and 5 species were rarely available in the study area (Table 3). Different 5 species of snakeheads were present in the study area, where lata was moderately available, and Cheng, Shol, and shal were rarely available species during the study (Table 4). During the study period, 6 species of eel were identified where Pankal was a moderately available species and Baam and Cuchia were rarely available species (Table 5). There were 15 species of perches recorded from the western part of Purba Medinipur district, where 5 species were commonly available, 3 species were moderately available, and the other 7 species were rarely available (Table 6). During the present investigation, two featherback species were recorded. Among them, Chital was a rarely available species, and Falui was a moderately available species (Table 7).

Prawns

A few species of prawns were found. Among the 3 identified species, Golda and Chamne chingri were commonly available, and 1 species was rarely available (Table 8).

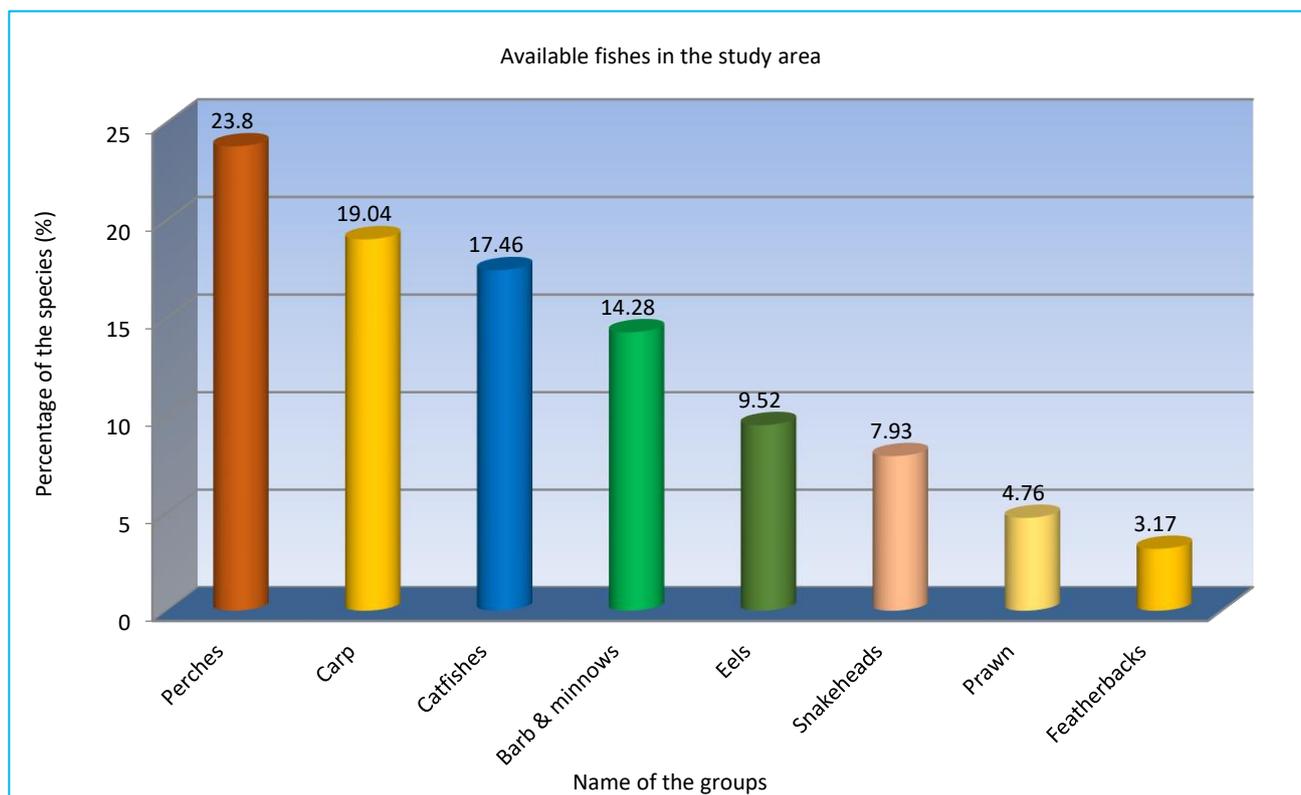


Fig 3 Different types of fish groups were recorded during the period of study

Nearly 63 fish species from the eastern portion of the Purba Medinipur district were recorded as a result of this market-based survey. According to the results of the current survey, 21 species are readily available, 20 species are only moderately available, and 22 species are only seldom available. Fish species were available in percentage terms as follows: 33% were widely accessible, 32% were moderately accessible, and 35% were hardly accessible (Fig 2). Rarely found fish were only discovered one or two times during the study, it was discovered. Perch had the highest fish proportion (23.8%) and featherback had the lowest (3.17%) among the 63 fish species

that were present. Carp (19.04%), catfish (17.46%), barbs and minnows (14.28%), snakeheads (7.93%), eels (9.52%), and prawns (4.76%) were among the other categories (Fig 3). Among all these fishes, 68% of species were least concerned, 16% of species were vulnerable, 3% of species were not evaluated, 3% of species as endangered, 8% of species were near threatened and 2% of species were data deficient category (Fig 4). The distribution of fish species into categories such as carp, catfish, barbs and minnows, snakeheads, eels, and prawns demonstrated the diverse aquatic ecosystem within the region of Purba Medinipur district.

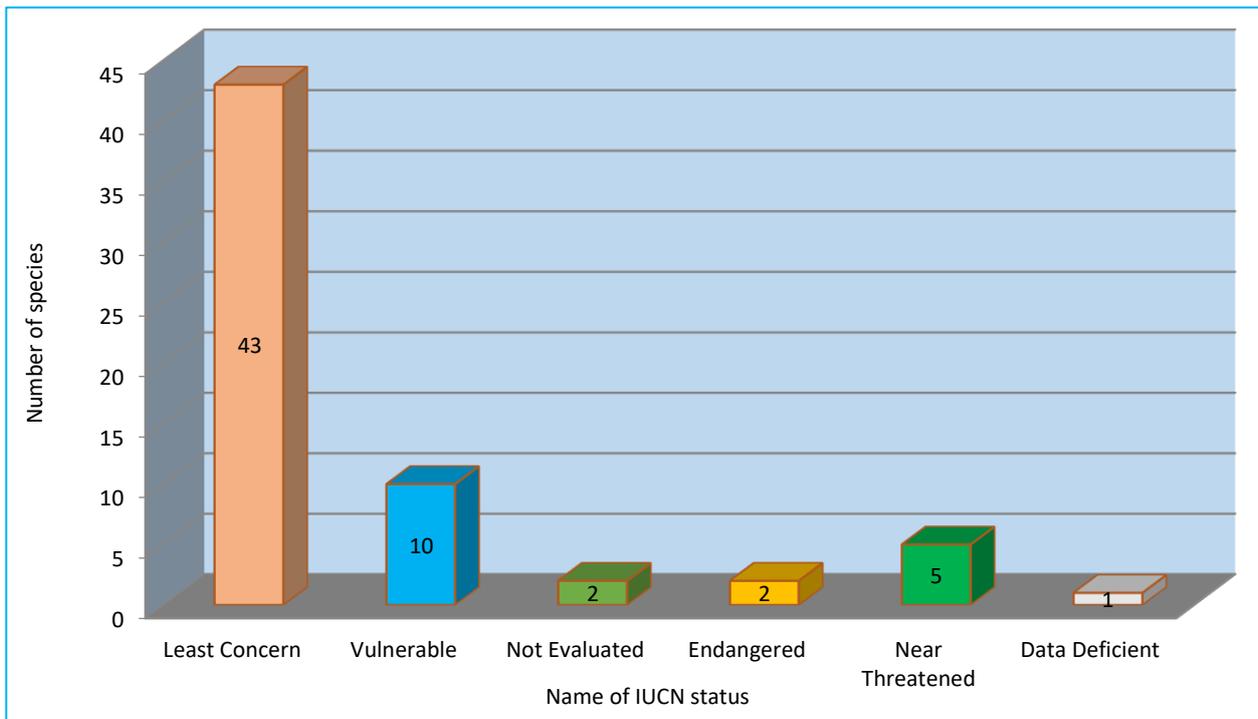


Fig 4 IUCN status of threatened fish species found during the study

Factors affecting the fish and shellfish diversity

According to fishers, both created humans and natural factors led to the lack of much vulnerable fish in the research region. Siltation and sedimentation, overfishing and random fishing, the use of illegal gear for fishing, the katha fishing method, the use of chemical fertilizers and excessive amounts of insecticides and pesticides in agriculture, the summer drought, the construction of barriers and making obstacles in fishes' natural movement, and other factors were the main causes of decreasing threatened fish diversity in the western part of Purba Medinipur. Freshwater fish and shellfish biodiversity is declining daily as a result of several environmental and man-made reasons, some of which are listed below:

Overexploitation of fishery resources and pollution

The continual expansion of fishing efforts contributes to the depletion of fishery resources. Fish variety is declining as a result of fishing practices that involve poisoning fish and applying pesticides (plant-protecting insecticides and herbicides) to modify aquatic ecosystems.

Deforestation, erosion, and sedimentation

Fish diversity may suffer from changes in water quality caused by numerous human activities, particularly the illegitimate growth of agricultural extraction (clearings and fields) and the illicit exploitation of wood.

Climate change and soaring demography

Growing populations in rural areas lead to new searches for arable land, always made at the expense of forests, which pose a constant danger to aquatic ecosystems. Because of the impact of global warming on aquatic ecosystems (such as the shrinkage or drying up of water bodies), aquatic biodiversity is impacted. In comparison to terrestrial groups (birds 1.8% and mammals 3.4%), freshwater fishes (22%), amphibians (30%), and Odonata (13%), some of which are facing severe threats of extinction, have high percentages of threatened species [15]. In practically every part of the world, human activities such as building dams, water extraction, lake and pollution of rivers, the

arrival of alien species, excessive fishing, and aquaculture have had a major impact on the condition of freshwater ecosystems. As a result, many fish populations are rapidly declining and there have been numerous recent extinctions [16-21]. Aquatic environments are losing biodiversity at a rate that is far greater than that of terrestrial and marine ecosystems [22]. To boost the rate of fish production and determine the environment that supports fish life in this area, site selection is a crucial factor. The distribution of potential and most suitable sites for fish farming was examined and measured using the Site Suitability for Fish Farming (SSFF) and Site Suitability for Commercial Fish Farming (SSCFF) models using water availability (water body density, proximity to river, precipitations), water quality (pH, DO, temperature, and TDS), slope-soil (slope of the land, soil pH, and soil texture), land use types, proximity to industries, and density distribution.

CONCLUSION

This study is a first attempt to assess the diversity of fish and shellfish and the factors contributing to their reduction at specific locations in the western Purba Medinipur district, West Bengal, India. To preserve the variety of finfish and shellfish, some steps have been taken, including reducing water pollution, maintaining fishing equipment, guaranteeing water flow, raising fishermen's knowledge, putting fisheries legislation into practice, and creating fish sanctuaries. To ensure adequate management and conservation, counter and random surveys are advised to verify the fish status and decline factors. Overall, if fish conservation is taken into account, it represents another significant environmental concern at an international scale and will remain in danger unless significant government effort is made to restrict human activities. A more thorough investigation of the fish biodiversity in the Purba Medinipur district should be conducted with support from the government, non-governmental organizations (NGOs), and national and international funders. To determine the status of the diversity of fish for proper oversight and preservation of this possibly priceless natural resource, a countermeasure, and random survey are also recommended.

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