VOLUME 11 ISSUE 1 2025

ISSN 2454 – 3055

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 11, No. 1, 219-224 (2025)

International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Diversity of Fishes in a Coastal Wetland of Sundarban, West Bengal, India

Mandal Krittika[1], Srinivasan M.[1], Anantharaman P.[1] and Sarkar U.K.[2]

[1]Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences,Annamalai University, Parangipettai-608 502, Tamil Nadu, India.

[2]ICAR-National Bureau of Fish Genetic Resources, Canal Ring Road, Dilkusha Marg, Lucknow 226002, Uttar Pradesh, India

**Corresponding Author*

Received: 1st August, 2024; **Accepted:** 25th October, 2024; **Published online:** 8th February, 2025

https://doi.org/10.33745/ijzi.2025.v11i01.023

Abstract: Wetlands are among the most productive ecosystems on the Earth, sustaining numerous plant and animal species through water and primary productivity. Bherua wetland is part of the Sundarban wetland situated at Namkhana block of south 24 paraganas district of West Bengal, India. In the present study water quality parameters and fish diversity of Bherua wetland was documented throughout the year (February 2021-January 2022). From the Bherua Wetland, a total of 27 fish from 10 orders and 16 families were recorded. Fishes found abundant in Monsoon season with *Puntius ticto*, *Amblypharyngodon mola*, and *Mystus tengra* being the most common species. The parameters of water quality were found to be favourable for fish culture. This wetland, along with several others nearby, was the site of several successful projects carried out by the Indian Government in the past. Fishermen and locals in the wetland area reported that poaching and chemical pollution from surrounding fish culture farms and bheries are the main drawbacks of fish culture.

Keywords: Sundarban, Coastal Wetland, Water Quality, Fish Diversity, Threats

Citation: Mandal Krittika, Srinivasan M., Anantharaman P. and Sarkar U.K.: Diversity of fishes in a coastal wetland of Sundarban, West Bengal, India. Intern. J. Zool. Invest. 11(1): 219-224, 2025.

https://doi.org/10.33745/ijzi.2025.v11i01.023

Introduction

Definition of Wetlands is a complicated concept. According to Ramsar Convention (Ramsar Convention Secretariat, 2016), wetlands are defined as -- areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. It is not a precise definition. Wetlands have been identified in the area that lies between usually dry and permanently wet conditions. They cannot be solely categorized as aquatic or terrestrial because they exhibit characteristics from both environments (Sugunan, 1997). They are essential to the survival of plant and animal life and the preservation of the earth's

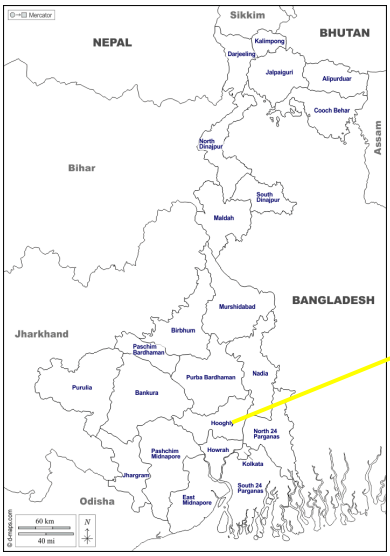

Fig. 1: Map of West Bengal.

Fig. 2: Map of Bherua Wetland.

ecology. Wetlands have a significant role in human welfare, including health, safety, food security, navigation, agriculture, post-harvest activities, fishing, and a wide range of other activities. In the case of the developing world, where many populations rely on wetlands to maintain traditional subsistence activities like farming, fishing, hunting, and animal herding, this relationship is especially important (Sugunan, 1997).

Wetlands are among the valuable aquatic ecosystems that humans have a close relationship with, and these have been widely and irresponsibly mistreated worldwide. In countries with high population density like India, the issue is more serious and acute (Nath, 2003). In light of this, wetland protection has been taking on a more important role in recent years (Nath, 2003). A number of issues have been shown to be the reason behind not reaching the potential, that includes lack of scientific knowledge and technology, biodiversity loss, habitat degradation, etc. (Sarkar *et al*., 2020). Raut *et al*. (2021) studied some selected wetlands in Maharastra and found that majority of the fish diversity is threatened by anthropogenic activities. These authors also suggested that Fishery Department should provide scientific training to fishermen, provide facilities to fish farmers and provide loan on subsidize basis which may help in high yield fish species. There is an urgent need to follow legislative and other measures for conservation of fishery. Previously several successful researches have been conducted in this wetland by Scientists of Indian Council of Agricultural Research (Ramteke *et al*., 2020; Sinha *et al*., 2022). In the present study water quality parameters and fish diversity of Bherua wetland was documented throughout the year (February 2021-January 2022). Present study is important in order to maintain the lake's ecological balance and to identify potential future challenge.

Materials and Methods

Study Area

The present study was carried out in Bherua wetland (21º36'19.00" N 88º15'20.45" E) (Figs. 1, 2), which is situated in Shibpur near Bakkhali. Bakkhali is a village in Namkhana Block in South 24 Paraganas district of West Bengal, India. This wetland is tidal fed and connected with River Hoogly. Bherua wetland is one of many canals, creeks and other wetlands located in the Sundarban area. The human population

surrounding the wetland is entirely dependent on water source for irrigation of agricultural crops, livestock rearing and capture fishing activity. The total length of canal is approximately 1.6 km and width ranged from 30-70 m. Depth of the wetland varies approximately between 1-2 m. Three sampling locations were chosen at an equal distance with the station 1 at near river mouth, station 2 in the middle of the canal and station 3 at the end point of the canal from river mouth.

Sampling and fish identification

Bimonthly sampling was performed from February 2021 to January 2022, representing four seasons-- Summer (Feb-April), pre-monsoon (May-June), monsoon (July-October) and post-monsoon (November-January). Water samples were collected from subsurface (0.5 m depth) at all selected locations by using water sampler and immediately transferred into pre-rinsed polyethylene sample bottles. Depth, Temperature, Salinity, pH, Electric conductivity, Transparency, TDS, DO, Free CO_2, Alkalinity, and Hardness were measured *in situ*, and water samples were brought to laboratory and preserved in cold condition for analysis of Nitrate, available Phosphate, Total Phosphate. Depth of the water body was measured with the help of a nylon rope fitted with a suitable weight at the end. Temperature, Salinity, pH, Electric Conductivity and TDS were measured using PCS Test: 35 Probe. Water Transparency was measured using Secchi Disk. Dissolved oxygen, Free CO_2, Alkalinity and Hardness were determined by following APHA Standard Methods (2012). Fin fish specimens were collected using cast net. In addition, fish samples were also collected from the local fishermen nearby in the canal. The collected fish samples were preserved in 4% formalin solution. Identification of fishes was done by standard taxonomic keys and literatures (Talwar *et al*., 1991; Jayaram *et al*., 1999; Gorai *et al*., 2003).

Results and Discussion

Physico-chemical Parameters of water of Bherua wetland

The variations in physico-chemical parameters of Bherua Wetland are depicted in Table 1. Depth of Bherua wetland was minimum 1.00±0.17 m in pre-monsoon and maximum 2.47±0.32 m in monsoon. Water surface temperature was recorded highest (30.83±0.29 ºC) in summer and lowest (22.56±0.17 ºC) in monsoon. Salinity was observed highest (4.7±0.77 ppt) in pre-monsoon and lowest (1.64±0.19 ppt) in monsoon. Water pH was highest (7.78±0.39) in summer and lowest (7.3±0.1) in monsoon. Electric Conductivity was highest (10.31±0.89 µS/cm) in monsoon and lowest (4.84±0.1 µS/cm) in summer. Water transparency recorded lowest (7.8±0.06 inch) in monsoon and highest (10.30±0.26 inch) in summer. TDS of Bherua wetland was highest (5.40±0.40) in monsoon and lowest (2.48±0.55) in pre-monsoon. Dissolved oxygen was recorded highest (6.86±0.34 ppm) in monsoon and lowest (3.87±0.14 ppm) in pre-monsoon. Free Carbon dioxide documented lowest (0.61±0.10 ppm) in monsoon and highest (1.23±0.14 ppm) in pre-monsoon. Alkalinity was lowest (171.33±12.9 ppm) in monsoon and highest (288±15.37 ppm) in pre-monsoon season. Hardness of water was maximum (426±8.08 ppm) in monsoon and minimum (332.66±19.19 ppm) in pre-monsoon. Nitrate was minimum (0.04±0.01 ppm) in pre-monsoon and maximum (0.08±0.02 ppm) in monsoon. Available phosphate recorded lowest (0.009±0.002 ppm) in monsoon and highest (0.067±0.015 ppm) in summer. Total phosphate ranged between 0.027±0.012 ppm to 0.20±0.05 ppm.

Fish species recorded from Bherua Wetland

During the present study, total 27 numbers of fish species under10 orders and 16 families were documented from Bherua Wetland. Order-wise and family-wise fish composition of Bherua Wetland is shown in Figures 3 and 4, respectively. The most dominant species were under family Cyprinidae (26%), Channidae (11%), Siluridae (7%), Bagridae (7%) and Mastacembelidae (7%). The most common fishes were – *Puntius ticto, Amblypharyngodon mola*, *Mystus tengra*, *Chanda*

Table 1: Physico-chemical parameters of Bherua wetland

	Summer	Pre-monsoon	Monsoon	Post-monsoon
Depth (m)	1.43±0.23	1.00±0.173	2.467±0.318	1.447±0.226
Water Temperature (°C)	30.83±0.29	27.93±0.43	22.56±0.17	25±0.26
Salinity (ppt)	4.01±1.57	4.7±0.77	1.64±0.19	2.97±0.69
pH	7.78±0.39	7.64±0.14	7.3±0.1	7.54±0.05
E Conductivity (µS cm^{-1})	4.84±0.1	4.59±0.17	10.31±0.89	5.27±0.15
Transparency (inch)	10.30±0.26	10.13±0.14	7.8±0.06	8.47±0.23
TDS	4.43±0.07	2.48±0.55	5.40±0.40	4.63±0.14
D.O. (mg l^{-1})	4.13±0.06	3.87±0.14	6.86±0.34	4.9±0.17
Free CO_2 (mg l^{-1})	1.15±0.03	1.23±0.14	0.61±0.10	0.70±0.17
Alkalinity (mg l^{-1})	263.6±5.89	288±15.37	171.33±12.9	255.67±8.25
Hardness (mg l^{-1})	364.3±9.9	332.66±19.19	426.0±8.08	379.33±19.05
Nitrate (mg l^{-1})	0.06±0.01	0.04±0.01	0.08±0.02	0.04±0.02
Available Phosphate (ppm)	0.067±0.015	0.03±0.01	0.009±0.002	0.013±0.002
Total Phosphate (ppm)	0.20±0.05	0.15±0.05	0.027±0.012	0.11±0.01

Values are mean±standard error

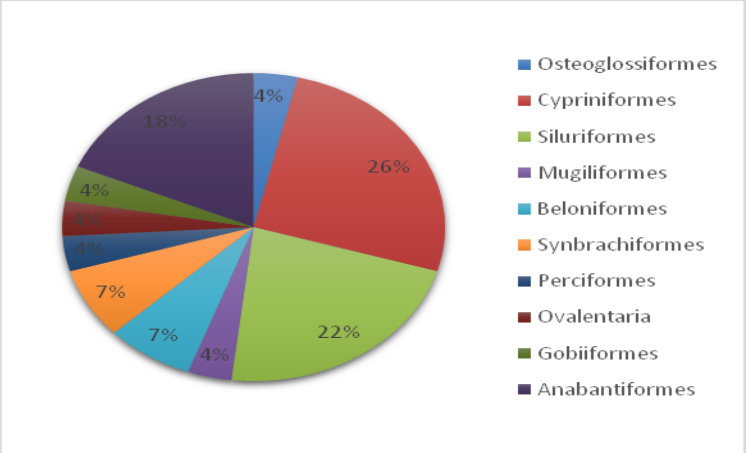

Fig. 3: Order-wise fish composition of Bherua wetland.

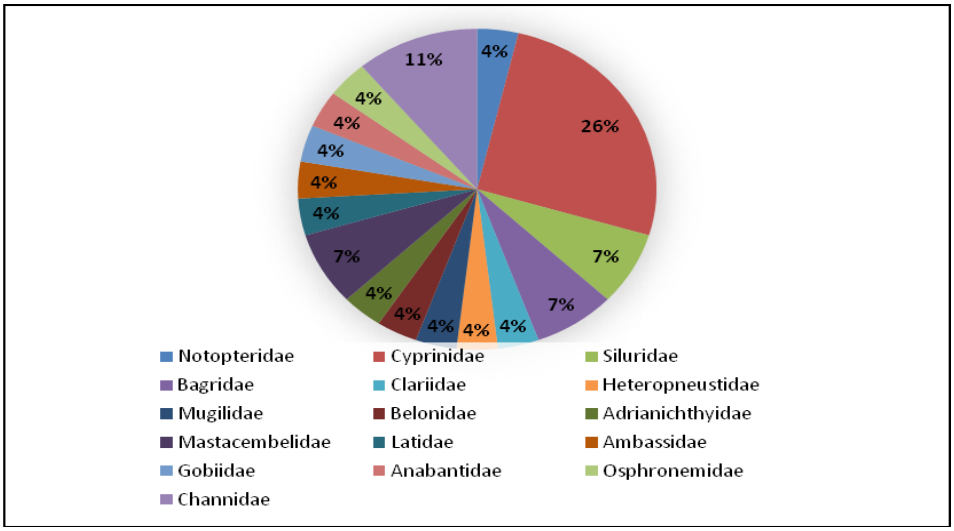

Fig. 4: Family-wise fish composition of Bherua wetland.

Table 2: Fish species diversity of Bherua wetland along with their IUCN status

S. No.	Order	Family	Genus	Species	IUCN Status
1	Osteoglossiformes	Notopteridae	*Notopterus*	*notopterus*	LC
2	Cypriniformes	Cyprinidae	*Amblypharyngodon*	*mola*	LC
3			*Systomus*	*sarana*	LC
4			*Puntius*	*ticto*	LC
5			*Puntius*	*sophore*	LC
6			*Salmostoma*	*bacaila*	LC
7			*Rasbora*	*daniconius*	LC
8			*Labeo*	*rohita*	LC
9	Siluriformes	Siluridae	*Ompok*	*pabda*	NT
10			*Wallago*	*attu*	VU
11		Bagridae	*Mystus*	*gulio*	LC
12			*Mystus*	*tengara*	LC
13		Clariidae	*Clarias*	*batrachus*	LC
14		Heteropneustidae	*Heteropneustes*	*fossilis*	LC
15	Mugiliformes	Mugilidae	*Mugil*	*cephalus*	LC
16	Beloniformes	Belonidae	*Xenentodon*	*cancila*	LC
17		Adrianichthyidae	*Oryzias*	*dancena*	LC
18	Synbrachiformes	Mastacembelidae	*Mastacembelus*	*armatus*	LC
19			*Macroagnathus*	*pancalus*	LC
20	Perciformes	Latidae	*Lates*	*calcarifer*	LC
21	Ovalentaria	Ambassidae	*Chanda*	*nama*	LC
22	Gobiiformes	Gobiidae	*Glossogobius*	*giuris*	LC
23	Anabantiformes	Anabantidae	*Anabas*	*testudineus*	LC
24		Osphronemidae	*Trichogaster*	*fasciata*	LC
25		Channidae	*Channa*	*marulius*	LC
26			*Channa*	*puntate*	LC
27			*Channa*	*striata*	LC

LC= Least Concern, VU= Vulnerable, NT= Near Threatened

nama, *Oryzias dancena* etc. In monsoon season fishes were found most abundant. Fish diversity is shown in Table 2.

Threats

This wetland and the other nearby water bodies have been the sites of a few of successful aquaculture projects. These projects also involved local people. They reported, poaching was a major concern while running the projects. They also mentioned that some of aquaculture farms in that area raise hybrid Maagur, a fish species that is prohibited in India and that potentially hamper the Bherua wetland's ecology. Hazardous chemicals and pesticides are also used on nearby aquaculture and agricultural fields; their runoff during monsoon season mixes with the water in the Bherua Wetland.

Conclusion

The Bherua Wetland has been offering several services such as flood protection, shelter and nursery ground to numerous species. Most significantly, this wetland has been supplying food and water to local community, additionally aiding with irrigation to agricultural fields. This wetland has the ability to support various aquaculture projects that could improve the financial situation and motivate the local population. However, the local administration's assistance is needed in order to prevent poaching and reckless use of chemicals in the surrounding farm and agricultural area. Here, proper management is required to conserve the ecosystem and provide an environment that is favourable to the survival and reproduction of its native species.

Acknowledgements

Authors are thankful to administration of Annamalai University, Tamil Nadu and ICAR-CIFRI, West Bengal for support and encouragement.

Conflict of Interest

The authors declare no conflicts of interest.

References

Gorai BK, Sugunan VV and Jha BC. (2006) Raising of stocking materials of Indian major carps in pen enclosures in selected floodplain wetlands of Assam, India. Asian Fisheries Sci. 19: 185-197.

Jayaram KC. (1999) The freshwater fishes of the Indian region. Narendra Publishing House, New Delhi, pp. 551.

Nath D. (2003) Introducing wetlands. Fisheries management of floodplain wetlands in India. ICAR-CIFRI, Barrackpore, pp. 1-5.

Ramsar Convention Secretariat (2016) An Introduction to the Convention on Wetlands (previously The Ramsar Convention Manual). Ramsar Convention Secretariat, Gland, Switzerland.

Ramteke MH, Tayung T, Sinha A, Gogoi P, Roy A, Mitra A, Mondal S and Das BK. (2020) Effect of feeding on growth performance, survival and production of carp in net partition system in canal of Sundarbans, India. J Entomol Zool Stud. 8(4): 2184-2188.

Raut MB, Khune CJ and Nagpurkar LP. (2021) Ichthyofaunal diversity and conservation perspective of some selected wetlands in Nagzira-Navegaon (NN) Corridor, Gondia District of Maharastra State, India. Int J Innov Sci Engineer Technol. 8(5): 84-94.

Sarkar UK, Mishal P, Borah S, Karnatak G, Chandra G, Kumari S, Meena DK, Debnath D, Yengkokpam S, Das P, Deb Roy P, Yadav AK, Aftabuddin M, Gogoi P, Pandit A, Bhattacharjya BK, Tayung T, Lianthuamluaia L and Das BK. (2020) Status, potential, prospects, and issues of floodplain wetland fisheries in India: Synthesis and review for sustainable management. Rev Fisheries Sci Aquacult. 29(1): 1-32.

Sinha A, Roy A, Gogoi P, Tayung T, Ramteke MH, Mitra A, Mondal S and Das BK. (2022) Exploration of canal resources as a potential source for fish production in the Indian Sundarbans. Aquaculture 26(1): 3-8.

Sugunan VV. (1997) Floodplain wetlands, small water bodies, culture-based fisheries and enhancement-conceptual framework and definitions. In: Fisheries enhancement of small reservoirs and floodplain lakes in India, (eds.) Sugunan V.V. and Sinha M., ICAR-Central Inland Capture Fisheries Research Institute, Barrackpore, 75: 13-21.

Talwar PK and Jhingran AG. (1991) Inland fishes of India and adjacent countries. Oxford-IBH Publishing Co. Pvt. Ltd., New Delhi, pp.1158.