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Fish diversity in aquatic ecosystems with emphasis on freshwater habitats: A review

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Abstract
Freshwater ecosystem is one of the most diverse ecosystem on the earth. Fishes constitute a valuable component of biological wealth in natural water bodies. Fish provide high nutritional value as it contains protein, vitamins, minerals and oil. Objective of these review work to understanding the structure and composition of aquatic ecosystem, they provide valuable information on fish species richness, distribution and ecological balance, and also support the development of effective conservation and management strategies.

Keywords: Fish diversity, cypriniformes, conservation

Introduction

Biodiversity assessment is an important tool for making well-informed decision related to environmental conservation and management (Lalitha, 2024) [21]. In both term number of species and individual fishes is the most abundant class of vertebrates. Fish diversity is essential for sustaining ecosystem resilience and productivity, as diverse fish population contribute to trophic structure, nutrient dynamics, and ecological equilibrium (Yeole, 2024) [43]. Fishes play a vital role in freshwater ecosystems because of there ecological significance. Understanding fish diversity is important from scientific, ecological, and economic perspective (Gurchal, *et al.,* 2024) [14]. Fishes from both freshwater and marine environments are a rich source of protein, carbohydrates, essencial nutrients, and medicinal value (Madkwaade & Vairale 2024). Provide high quality dietary components required for growth and development.A significant portion of the economically backward population in the country depend on fish for their livelihood (NarasimhaRamulu, *et al.,* 2015) [27].

Study on fish diversity help in effective sustainable development of fisheries resource, understanding the composition, dominance and distribution of fish species helps in developing suitable management practices, conserving native species, and improving fish productivity in freshwater bodies.

Review of Literature

Golubtsov, *et al.,*(2003) [13] discussed the fish diversity in the major drainage system of Ethiopia. Analyzed species composition across different regions and highlighted the distribution of indigenous and endemic fish species.

Ayoola, (2009) [4] conducted a study to evaluate the physicochemical parameter and fish distribution in wetland areas of Oyo state of Nigeria. During the study, a total of 16988 fish individuals were recorded comprising 11 species belonging to 7 families from 11 sampling locations. Among them Oreochromis niloticus (30.6%) and Clarias gariepinus were dominant species in the catches. At Ajinapa location agricultural runoff containing agrochemicals was identified as one of the mojar factors contributing to biodiversity loss.

Venkateshwarlu, *et al.,* (2009) [39] reported that 17 fish species belonging to 4 orders, 11 families and 14 genera were recorded from the Sogane and Santhekadur tanks, Shimoga, Karnataka. Were the Cyprinidae family as dominant in both the tanks.

Nawaz *et al*.,(2010) documented at Naf river Estuary, where 161 species which belong to 98 fin fishes, 23 shrimps and prawns, 13 crabs, 11 molluscs, 3 echinoderms, 4 other crustaceans; while 9 species could not be identified. Physicochemical parameter influence fish diversity and distribution.

William, (2010) [42] highlights the growth of knowledge on marine fish biodiversity over the past 250 years, also importance fishes database, improved technology, and exploration of deep marine habitats in discovering new species and understanding fish diversity.

A study conducted by Hossain (2012) [16] on fish diversity and habitat relationship with environmental variables at the Meghna river estuary recorded 53 fish species with 21,650 individuals from eight sampling stations, and reported that environmental factors such as water temperature and rainfall significantly influences fish distribution and diversity.

According to Sharma *et al*., (2012) [33] in river Ravi, in Samba district, Jammu (J&K) supports 35 fish species under 5 orders, 10 families and 25 genera. Earlier study recorded 59 species, showing a reduction in fish diversity caused by environmental changes human activities.

Galib, (2013) [12] studied the ichthyofauna of the Chatto Jamuna river revealed the presence of 63 fish species, categorized under 41 genera, 23 families, and 9 orders. The order Cypriniformes was found to be the most diversified group in the river. The conservation analysis showed that 41.27% of the recorded fish species are threatened in Bangladesh, including vulnerable, endangered and critically endangered categories. Therefore, the study recommended the development of fish sanctuaries to ensure the conservation of fish biodiversity.

Kumar, *et al.,*(2013) [20] studied the fish diversity of the Mahanadi River and reported that the river contains a rich variety of fish species, some of which have ornamental importance. The author also highlighted the threats to fish

biodiversity and stressed the need for conservation measures.

Ataguba, *et al.,* (2014) [3] conducted study on Gubi Dam, Bauchi State of Nigeria where 18 fish species belonging to 06 families were recorded. The family Cichlidae was the most abundant.

Basavaraja, (2014) [6] conducted Anjanpura reservoir exhibit considerable fish diversity, comprising 25 species belonging to 4 orders, nine family and 18 genera. The order Cypriniformes most dominant group, while Siluriformes(6),Perciformes (4) and Osteoglossiformes(1) species. Diversity analyzed through ecological indices such as Shannon-Wiener index, Simpson's dominance index, Pielou's evenness index and Margalef's species richness index. According to the IUCN (1994) out of total species 11 species fall under lower risk/near threatened, eight species remain not assessed, 3 vulnerable and one endangered.

Battacharya, *et al.,*(2016) documented fish community of river Kulsi (Kukurmara, Jiakur and Dorabeel confluence) three zones. Total 7 orders, 25 families and 38 genera were recorded. Diversity metrics, including the Simpson Index, Shannon-Wiener Index, and Margalef's species richness, revealed reduced fish diversity, composition and richness in areas inhabited by dolphins.

Dubey, *et al.,* (2016) [11] documented the ichthyofaunal diversity of Sarangapani lake and identified 13 species of fishes belonging to 10 genera, 5 families and 3 orders. Dominated by Cypriniformes followed by Siluriformes and Perciformes.Fish fauna approximately 4.73 mt of production.

Plamootii, (2016) investigated presence of 07 catfish species in Sasthamcottah lake under the order Siluriformes. These species belong to four families and are important food fishes for the local community. However, the study reported a decline in their population due to increasing pollution and unsustainable fishing activities.

Shelke, (2016) [34] recorded 24 fish species belonging to 05 orders, 11 families, and 18 genera in Girna Dam (Girna river), Dist. Nashik, Maharashtra, India. The family Cyprinidae was the most dominant with 13 species.

Ubarhande, *et al.,* (2016) [38] investigated the fish diversity of Khadakpurna dam, district Buldhana, Maharashtra, India, recorded 23 fish species distributed among 21 genera, 12 families, and 7 orders with the family Cyprinidae being the most dominant.

Anjum, *et al.,*(2017) [2] investigated of fish diversity and the livelihood of fisherman in the Tezu river. A total of 49 fish species belonging to 33 genera and 17 families,Cyprinidae as the dominant family. Also deal with soci-economic aspects such as income, family structure, and education of fisherman households. Showing rich biodiversity but the present status of fisheries in the area is decline.

Islam, (2018) [17] studied the fish biodiversity of the Dhaleshwari River. The study area covered about 20 km stretch of the main stream. The biodiversity status of fishes was analyzed using Simson's diversity index and Shannon-Wiener diversity index. Proper management strategies are necessary to ensure the maintenance of fish habitat health and ecological balance before irreversible damage occurs.

Chari, *et al.,* (2020) [9] suggested reservoir support the rich fish fauna reported 33 fish species belonging to 6 orders in Singaraya Reservoir, Siddipet District Telangana, Cypriniformes dominated with 8 species (46%) fellowed by Siluriformes, Osteoglossiformes, Channiformes, perciformes, and Anthrniformes.

Khatri, (2020) [19] reviewed on Nepal's freshwater system contain a rich diversity of fishes, with more than 220 species recorded. Cyprinidae is the most common fish family. The study also reviewed the conservation status of these species under the IUCN red list. Key threats like damming and pollution affecting fish diversity are mentioned. In addition, the abstract emphasized the importance of further research, including genetic and spatial studies, for better conservation planning.

Lodhi, *et al.,* (2020) [22] investigated total of 22 fish species belonging to 11 families and 6 orders were recorded from the Atal Sagar dam. Among them, Cypriniformes was the dominant order represented by 10 species followed by Siluriformes consist 5 species, Perciformes 4 species, Osteoglossiformes and Beloniformes consist 01 the study indicated that the reservoir supports rich fish biodiversity.

Lonkar, (2020) [23] documented total 21 fish species belonging to nine orders as Cypriniformes, Anguilliformes,Beloniformes,Paraformes,Singuilliformes,Clupeiforimes,Mastacembaliformes,Ophicephalliformes and synganthiformes were documented from Telangkhedi lake and Ambazari lake. Higher diversity observed in Telangkhedi lake rather than Ambazari lake. Provide productive ground for fish production.

Rahman, (2020) conducted study in Digholi beel of Kamrup district of Assam, India, documented 38 fish species under 15 families, with 14 species belonging to the Cyprinidae family. Along with fishes 26 species of phytoplankton were also recorded. According to conservation status, most fish species listed as least concern, 01 as near threatened, 03 not evaluated and two data deficient.

Varma, *et al.,* (2020) conducted study on Tara Tal at Saugahana Village, District Bahraich (UP). The study identified 33 fish species belong to 25 genera, 15 families and 7 orders. Among these the family Cyprinidae was the most dominant, whereas the family Nandidae was less common, the species Labeo rohita was reported as the most abundant in the water body.

Adhikari, *et al.,*(2021) [1] documented Mechi River, Jhapa, Province No. 1, Nepal. A total of 33 fish species belonging to 04 orders 08 families and 16 genera with 1772 individual were recorded. The study also examined dissolved oxygen, water velocity and pH, which influence the fish assemblage structure of the river.

Barman, (2021) [5] conducted the study in the kura river, Bangladesh. Fish were collected using a set net and identified using standard literature of Jhingran and Talwar (1991), Rahman (2005). A total 59 fish species belonging to 22 families were recorded, with about 27% of the species found to be threatened.

Dessy, (2021) [10] observed the fish community in the Mangrove Ecotourism area in Pantai Indah Kapuk, a total 29 individual fishes were recorded, representing 8 species across 6 families. Among them, the goldfish (Cyprinus carpio) was obtained. The fish species diversity index in these area low, with value 1.9.

Medda, (2021) [26] conducted the investigation of fish diversity in the Ganga stretch of Malda district (West Bengal) revealed the presence of 69 freshwater fish species under 9 orders and 24 families.

Patil, & Patil, (2021) [29] studied of fish faunal diversity of Ujani reservoir, near Bhigwan, dist. Pune reported fish diversity from the Ujani reservoir. The study recorded 17 fish species belonging to 8 families and 5 orders. The

Cyprinidae family was dominant, and the authors emphasized the need to conserve indigenous fish species in the reservoir.

Tumbahangfe, *et al.,* (2021) research conducted in the Tamor river assessed fish diversity in relation to environmental variables. A total 6,373 individuals representing 28 fish species under 03 orders, 07 families and 16 genera were recorded. Seasonal variation significantly influenced fish diversity, while environmental factors such as pH, temperature hardness played an important role in shaping the fish community structure.

Watkar, (2021) [41] studied the ichthyofaunal diversity of the Kolar River and recorded 24 fish species belonging to Cypriniformes (10 species), Perciformes(7 species), Siluriformes(5 species), Osteoglossiformes and Synbranchiformes each having one species.the study reported that the order Cypriniformes was dominant un the river ecosystem.

Sanapala, *et al.,* (2022) [32] investigated Madduvalasa reservoir Vangara Mandalam in Srikakulam District, Andhra Pradesh possesses significant potential for sustaining rich fish diversity. Reported 31 fish species distributed across 5 orders, 21 genera and 13 families. Cypriniformes with 14 species most dominant order, whereas Siluriformes, perciformes, and Characiformes were represent by 07,06 and 03 species.

Cao, *et al.,* (2023) [8] reported the freshwater fish biodiversity and its conservation status in China. There are 355 species at risk, including 69 classified as critically endangered, 97 as endangered, and 189 as vulnerable.Suggesting measures for improving conservation and protection efforts.

Shrestha, *et al.,* (2023) [35] studied conducted in the Dudhkoshi River, Nepal documented 21 fish species under 03 orders, 06 families and 12 genera. The resukt show that Cypriniformes was the dominant order, also evaluated various water quality parameters and found a strong relationship between environmental factors and fish assemblage structure.

Shukla, *et al.,* (2023) documented Aami river, Gorakhpur, India, reporting 18 fish species belonging to 6 orders, 11 families, and 17 genera, with Cypriniformes being the most dominant.

Jana, (2024) [18] reported a rich diversity of fish species has been from the Sundarbans.The study indicate that 322 fish species belonging to 217 genera, 19 families and 22 orders are present in this region. This diverse fish fauna includes several vulnerable and endangered species, highlighting the need for conservation measures to maintain ecological balance. Approaches in fish biochemistry and biotechnology are also useful for understanding fish nutrition and health status.

Gutiérrez-Aguirre, *et al.,* (2024) [15] conducted study om fish and crustacean diversity in the Yucatan Peninsula using records. Documented total 329 species were recorded, including 117 fish 212 crustaceans. Results emphasize the ecological importance of the region and the need for future biodiversity conservation.

Madkwade, & Vairale, (2025) investigated in Dagadparwa dam Barshitakli, Akola (M.S). identifying six species of fishes belong to orders Channiformes, Siluriformes, Cypriniformes, Cichliformes and families Channidae, Siluridae, Cyprinidae, Cichlidae.

References

1. Adhikari A, Limbu JH, Pathak S. Fish diversity and water quality parameters of Mechi River, Jhapa, Province No. 1, Nepal. Borneo Journal of Resource Science and Technology,2021:11(1):24-34.
2. Anjum S, Kumar R, Darshan A, Gogoi B, Das DN. Enumeration of fish and alimentation of fisherman at Tezu river in Lohit district of Arunachal Pradesh, India. Journal of Fisheries Science.com,2017:11(3):55-63.
3. Ataguba GA, Tachia MU, Aminu G. Fish species diversity and abundance of Gubi Dam,Bauchi State of Nigeria. Biological Diversity and Conservation,2014:7/2:1-9.
4. Ayoola SO, Ajani EK. Seasonal variation in fish distribution and physico-chemical parameters of wetland areas in Oyo State,Nigeria. International Journal Biology and Chemical Science,2009:3(1):107-116.
5. Barman SK, Kunda M, Mazumdar SK, Nahiduzzaman MD, Barman PP, Das SK. Fish-diversity in the Kura river of Bangladesh:Patterns and threats. Malays. Appl. Biol,2021:50(3):1–14.
6. Basavaraja D, Narayana J, Kiran RB, Puttaiah TE. Fish diversity and abundance in relation to water quality oh Anjanapura reservoir, Karnataka, India. International Journal of Current Microbiology and Applied Sciences,2014:3(3):747-757.
7. Bhattacharyya PT, Goswami MM. Ichthyofaunal diversity study in some Dolphin habitat zones of river Kulsi. International Journal of Scientific Research,2016:5(3):351-354.
8. Cao L, Shao W, Yi W, Zhang E. A review of Conservation status of freshwater fish diversity in China. Journal of Fish Biology, 2023, 1-20.
9. Chari TJ, Rajashekhar AV. The study on fish fauna of Singaraya reservoir, Siddipet district Telangana. International Journal of Innovative Studies in Aquatic Biology and Fisheries,2020:6(4):21-25.
10. Dessy F, Sukma F, Ade S. Diversity of species fish in the Mangrove beach Ecotourism area in Pantai Indah Kapuk Jakarta. Rumhius Pattimura Biological Juornal,2021:3(2):19-22.
11. Dubey M, Ujjania NC, Burrana K. Ichthyofaunal diversity in Sarangpani lake, Bhopal (India). Research in Environmental and Life Science,2016:10(9):744-746.
12. Galib SM, Abu Naser SM, Mohsin AB, Chaki F, Fahad FH. Fish diversity of the river Choto Jamuna, Bangladesh: Present status and conservation needs. International Journal of Biodiversity and Conservation,2013:5(6):389-395.
13. Golubtsov A, Mina M. Fish species diversity in the main Drainage system of Ethiopia: current state of knowledge and research perspective. Ethiopian Journal of Natural Resources,2003:5(2):282-318.
14. Gurchal SS, Bhatkulkar MM. Fish diversity of Pimpalgoan (Wakhaji) dam of Nagpur district (M.S). International Research Journal of Commerce Arts and Science,2024:15(12):117-123.
15. Gutiérrez-Aguirre MA, Cervantes-Martínez A, Suárez-Morales E. Ecological Indicators and Estimators of Fish and Crustacean Diversity in the Yucatan Peninsula. MDPI,2024:17(5):1-13.
16. Hossain MS, Das NG, Sarker S, Rahaman ZM. Fish Diversity and Habitat relationship with environmental

variables at Meghna river estuary, Bangladesh. Egyptian Journal of Aquatic Research,2012:38:213-226.
17. Islam M, Yasmin R. Assemblage, abundance and diversity of fish species in river Dhaleshwari, Bangladesh. Asian Journal of Fisheries and Aquatic Research,2018:2(1):1-28.
18. Jana A, Kumar A, Lal J, Mandal S, Karmakar S, Battacharjee S, *et al*. Exploring the rich diverse: freshwater fish diversity and bionomics in the Sundarbans, India. Journal of Scientific Research and Reports,2024:30(6):795-808.
19. Khatri K, Jha BR, Gurung S, Khadka UR. Freshwater fish diversity and its conservation status in different water bodies of Nepal. Nep J Environ Sci,2020:8:39-52.
20. Kumar TS, Charan BC, Swain SK. Review of The Research on the fish diversity in The River Mahanadi and identifying the probable potential ornamental fishes among them with reference to threats and conservation measures. Research Journal of Animal, Veterinary and Fishery Sciences,2013:1(3):16-24.
21. Lalitha HM. A review on fish diversity of freshwater ecosystem in India. Internation Journal of Fisheries and Aquatic Studies,2024:12(6):103-106.
22. Lodhi RK, Singh Y, Gurjwar RK, Rao RJ. Fish Diversity of Atal Sagar Dam in Shivpuri district, Madhya Pradesh, India. International Journal of Fisheries and Aquatic Research,2020:5(4):46-47.
23. Lonkar SS, Tijare RV. Ichthyofaunal diversity of Telangkhedi and Ambazari lake of Nagpur, Central India. International Research Journal of Science & Engineering,2020:8(6):250-254.
24. Madkwade KJ, Vairale AB. Fish diversity og Dagadparwa dam og Barshitakli, Akola district (M.S). International Research Journal of Commerce Arts and Science,2024:15(12):111-115.
25. Madwade KJ, Virale AB. Taxonomic assessment of ichthyofaunal diversity of Dagadparwa Dam, Akola, Maharashtra. International Journal of Zoology Studies,2025:10(1):71-73.
26. Medda S, Dey SR. Status of ichthyofaunal diversity of river Ganga in Malda district of West Bengal, India. International Journal of Advancement in Life Science Research,2021:4(2):14-22.
27. NarasimhaRamulu K, Benarjee G. Fish production trends in certain reservoir- A study in the North Telangana district of Telangana state. International Journal of Science and Research,2015:4(1):2609-2612.
28. Nawaz MS, Hossain MS, Das NG, Barua P. Environmental variables and fisheries diversity of the Naaf River Estuary, Bangladesh. J Coast Conserv,2011:15:163–180.
29. Patil SS, Patil SB. study of fish faunal diversity of Ujani reservoir, near Bhigwan, dist. Pune. PLANTA Research Book series,2021:3:699-703.
30. Plamoottil M. Systematic studies on the Catfishes of Sasthamcottah lake of Kerala. Internation Journal of Research in Zoology,2016:2(2):9-16.
31. Rahman M. Ornamental fish and certain phytoplankton diversity in in Digholi beel of Kamrup district of Assam, India. Internation Journal of Applied Research,2018:6(12):323-327.
32. Sanapala C, Pedda LC, Babu K, Paidi S, K KP. The study on fish diversity of Madduvalasa reservoir Vangara Mandalam in Srikakulam District, Andhra Pradesh. International Journal of Fisheries and Aquatic Studies,2022:10(2):122-124.
33. Sharma A, Dutta SP. Present and past status of fish fauna of river Basantar, an important tributary of the river Ravi, in Samba district,Jammu(J&K). Journal of Applied and Natural Science,2012:4(1):123-126.
34. Shelke AD. Icthyofaunal Bio-diversity of Girna Dam (Girna river), Dist. Nashik, Maharashtra, India. World Journal of Fish and Marine Sciences,2016:8(3):135-141.
35. Shrestha OH, Thakuri S, Bobori D, Bhusal DR. Fish Diversity and Water Quality Parameters of Dudhkoshi River, Nepal. Egyptian Journal of Aquatic Biology & Fisheries,2023:27(4):295-309.
36. Shukla P, Singh A. Distribution and Diversity of Freshwater Fishes in Aami River, Gorakhpur, India. Advance in Biological Research,2013:7(2):26-31.
37. Tumbahangfe J, Limbu JH, Prasad A, Subba BR, Limbu DK. Ichthyofaunal divwrsity with relation to environmental variables in the snow- fed Tamor river of eastern Nepal. Journal of Threatened Texa,2013:13(14):20190-20200.
38. Ubarhande SB, Barote R, Adhale SB. Ichthyofaunal diversity from Khadakpurna dam, district Buldhana, Maharashtra, India. International Journal of Fisheries and Aquatic Studies,2016:4(3):362-366.
39. Venkateshwarlu M, Honneshappa A, Shahnawaz, Cinchana NV. Fish diversity of Sogane Santhekadur tanks, Shimoga, Karnataka. Environmental Conservation Journal,2009:10(3):35-40.
40. Verma DR, Ahmad T, Dixit VK, Bajpai S. Fish faunal diversity of historical Tara Tal at Saugahana Village, District Bahraich (UP). Journal of Global Biosciences,2020:9(9):7963-7974.
41. Watkar A. Ichthyofaunal Diversity of Kolar River, Saoner, Dist. Nagpur (M.S),India. Informational Journal of Science Technology and Management,2021:10(1):97-104.
42. William NE, Fricke R, Fong JD, Polack A. Marine fish diversity: history of knowledge and discovery (Pisces). ZOOTAXA, 2010, 2525, 19-50.
43. Yeole SM. Fish diversity as a health indicator of freshwater habitats: A review. International Journal of Research in Academic World,2024:3(2):138-140.