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A Systematic Literature Review on Ichthyofaunal Diversity in Fresh Water Ecosystem, with Special Reference to Maharashtra

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Abstract:- The study highlights a review of ichthyofaunal diversity across major rivers in Maharashtra such as the Godavari, Krishna, Tapti, Bhima, and Wainganga etc. Secondary data from various sources, research publications, were analysed. River Godavari had the most studied River. The scope of fish and fisheries in Maharashtra holds significant economic importance, particularly for local livelihoods and food security. Freshwater fish diversity in the state, as studied between 2009 and 2024, The current study deals with the freshwater ichthyofauna recorded and confirmed by different author shows a rich variety with 160 species recorded, spanning 9 orders, 25 families, and 80 genera. The most dominant order was Cypriniform followed by Siluridae. This diversity not only supports the fishing communities but also plays a critical role in meeting the demand for fish, which is a key source of protein for consumers. The review of this data provides valuable insights for fishermen. It also aids the fish industry by offering guidance on sustainable practices, as overfishing and habitat destruction can threaten these species.

Keywords:- *Ichthyofaunal, Diversity, Habitat, Genera.*

I. INTRODUCTION

Freshwater resources are vital for life on Earth. In recent years, the number of dams, reservoirs, tanks, and other water bodies has sufficiently increased. Aquatic ecosystems are crucial, hosting many economically important animals, mainly fish, which are a key source of food for humanbeing.[1] To advance fisheries development in these freshwater resources, scientific approaches must be adopted. However, anthropogenic activities have severely impacted natural habitats.[2] Freshwater resources serve various purposes, including agriculture, industry, household use, recreation, and environmental management. Despite these uses, including industrial developments, agriculture, fisheries, mining, navigation, power generation, sand excavation, and waste disposal.[3] some natural breeding grounds still exist. Identifying and conserving these natural breeding sites is essential for effective conservation of natural breeds.

Water is essential for life, being a critical component found abundantly in nature. It is indispensable for all living forms, including humans, who rely on it for drinking and other purposes. Groundwater sources such as rivers, lakes, ponds, and dams are typically used for drinking water. However, these sources are increasingly being contaminated by various pollutants, necessitating the quantitative analysis of these contaminants to ensure water quality.[2] Aquatic pollution is one of the world's most common environmental issues, posing lots of threats to public health and the quality of life. According to the Ministry of Jal Shakti, approximately 70% of industrial waste is dumped untreated into local water bodies, severely polluting usable water resources.[4]

Maharashtra is very rich in freshwater resources, such as rivers, ponds, irrigation canals, dams, and lakes, which support diverse fish species. The state is crucial for fish production and natural water resource management, with considerable potential for developing its fisheries. However, fish diversity is rapidly declining due to ongoing some common anthropogenic activities. This loss not only affects the ecological wealth but also has serious impact on fishes. Therefore, it is a necessary the documentation of fish diversity and comprehensive investigation. So we have to develop a freshwater fish diversity information system which includes both bioinformatics and georeferenced databases of fish and their habitats is essential. This review focuses on documenting the fish fauna of freshwater reservoirs in Maharashtra from 2010 to 2024.

From the perspective of changes in fish diversity over time and space, it is crucial to consider biodiversity and its distribution to develop effective protection strategies. Natural waterways generally provide more stable conditions for fish evolution compared to man-made reservoirs. However, aside from water utility management, many freshwater reservoirs are underutilised. These reservoirs and lakes are key resources for inland fisheries. To ensure their sustainable and economical management, it is essential to recognise the diversity of fish species present.[5] Maharashtra has seen significant benefits from the introduction of freshwater fish species Fish represent over half of all vertebrates on Earth and inhabit nearly every type of aquatic environment. They exhibit a vast range of sizes and ecological roles, highlighting their importance in maintaining aquatic biodiversity and ecosystem health.[6]

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II. REVIEW ON FISH DIVERSITY IN MAHARASHTRA

Maharashtra is one of the megadiverse states in the India enriched with varied taxonomic, genetic and ecosystem diversity. It is provided with different riverine system; with tributaries, streams, canals, lakes, ponds, and reservoirs etc. that are rich in ichthyofauna. In the21st century, noteworthy Ichthyofaunal studies were carried out in lentic and lotic fresh water ecosystem of Maharashtra (Table 1).

Table 1: A Succinct View of Lentic and Lotic Freshwater Fish Diversity in Maharashtra.

Study Area	Species	Genera	Family	Order	Reference
Godavari river, Parbhani dist.	26	15	7	5	S.V. Rankhamb (2009)
Nathsagar Dam	43	27	14	8	Pawar & Hiware (2005)
Dudhna river	27	15	9	7	Shaikh et. Al. (2010)
Purna river	40	29	15	9	Patole et. al. (2015)
Manar river	14			4	S.K. Pawar (2018)
Vishnupuri Dam	16		4	4	Kadam et. al. (2018)
Bindusara river	25	17	12	6	P.B. Sirsat (2022)
Ghagardara Dam	16		6	5	Pawar S.K. (2018)
Hingoli District	37	19	8	8	Salve & Sirsat (2018)
Aram river	8		3	2	Patil R.B. (2022)
Lendi river			13	8	Kale & Bathe (2022)
Wishvaganga river	28		13	7	Chaudhari & Kakde (2023)
Ashti lake	23	21	12	5	Solanke et. al. (2014)
Painganga river	36		11	6	Gawande & Patki (2023)
Krishna river	73				Patil &Gujar (2017)
Krishna river	25	21	11		Kokate et. al. (2017)
Yerala river	58	40	19	7	Bhoikamble & Kumbhar
Wainganga river	35		16	6	Paliwal et. al. (2013)
Bagh river	62	34	16	8	Karve & Dahegaonkar (2020)
Tapi river	32	24	11		Patole (2014)
Girna river	17	13	4		Nirbhavane et. al.
Girna river	35	27	17	8	Shelke (2008)
Wan river	21	22	8	5	Khade et. al. (2014)
Patalganga river	25	17	8	7	Koparkar & Kamble (2014)
Jog river	22	6	11	19	Jagtap & Jagdale (2023)
Painganga river	36		14	7	Chatap et. al. (2020)
Bhima river	27		10	5	Kawade & Pandharkar (2016)
Bori river	17		4	5	Patil et. al. (2018)
Wardha river	35	23	11	6	Jambhulkar & Kamdi (2023)

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Bhima river	26		7		Kumbhar et. al. (2018)
Bhima river	10	8	4		A.N. Dede (2024)
Chargaon lake	19		12	8	Chandgulwar & Bakre (2020)
Jivrekha reservoir	36			6	P. J. Misal
Shakti river	24			6	Farkade et.al.
Harsul Savangi dam	15	12	4	3	Shinde et. al. (2009)
Nandurbar District	32	24	11	6	Patole (2024)
Ghod reservoir	25	19	10	6	Kunjir & Kawade (2021)
Tawarja reservoir	31	19	9	5	Sutar et. al. (2023)
Osmanabad District	262		12	6	Jawale et. al. (2017)
Mahadare lake	22		18		Mohite et. al. (2020)

➢ *Fish Diversity of Godavari River System*

S.V. Rankhamb [7]Ichthyofaunal diversity studies were undertaken with the lots of fresh water fishes in Godavari River at Mudgal Tq. Pathri, Dist. Parbhani. The results of the study states that the occurrence of 26 fish species belonging to 05 orders, 07 families and 15 genera. The Order Cypriniformes were dominated by 15 species followed by Siluriformes with 05 species, Channiformes 04 Species, and Mastacembaliformes 01, Perciformes 1 species. **Shaikh et.al.**[1] analysed fresh water fish diversity, their distribution abundance, and their threats of fish in river Dudhna which is tributary of Godavari river and collected 27 fish species belonging to 7 orders, 15 genera and 9 families where recorded. order Cypriniform was dominant. **Khobragade**[8] conducted a study on fish diversity in river pravara and Godavari in Ahmednagar district. The outcome of study revealed the occurrence of 21 fish species belonging to 6 orders, The order Cypriniform was dominant with 10 fish species **Patole et.al.**[9] the research was undertaken at Siddheshwar reservoir in Hingoli district the finding of study suggests that there is presence of 40 species, 29 genera, 15 families and 9 orders. order Cypriniform were dominant which and 45% in total number during the study they suggested that check physicochemical and biological parameters periodically to prevent reservoir diversity from being depleted.

Pawar S.K.[10] Some ecological investigation of predatory fishes was studied from Limboti dam in Nanded District. During the study 14 species belonging to 4 orders were recorded, they observed that generally large sized fishes found in littoral zone**. A.G. Baraskar**[11] the study was taken on Murambi reservoir on Raina River which is a tributary of the Godavari River in Beed district. The result of the investigation reported that dominance of order Cypriniform with 10 pieces belonging to it. A total of 21 species were recorded, the common species in catches wear Catla Catla, Labio Rohita, Cirrhinus mrigala, Cyprinus carpeo etc. **Kadam et. al.**[12] research was accomplished on Vishnupuri dam in Nanded district, during the study total 16 species with 4 order wear observed. They concluded that changes in fish diversity could impact directly or indirectly the physicochemical, and biological character of dam.

Shinde et. al. [13] the study was undertaken on Harsul Savangi dam of Aurangabad district during the study period they found 15 species of fish with 3 orders ,4 families and 12 genera**. R.T. Pawar and C.J. Hiware** [14] the investigation was done to study the fish diversity of Nathsagar Dam in Aurangabad district the fish diversity represents those 43 fishes belonging to 27 genera, 14 families and 8 orders. they also discussed the economic importance of fishes. **S.B. Ingole**[15]they studied fish diversity on Majalgaon dam on the river Sindaphana. Sindaphana River is the tributary of Godavari River. They identified 17 species of fishes they concluded that reservoir depending upon physical parameter and biological aspect to maintain the socio-economic status. **Sirsat P.B.**[16] the study was carried out on Bindusara River in Beed district, Maharashtra. During the study they concluded that the occurrence of 25 species belonging to 17 genera under 12 families and 6 orders. The investigation shows that Bindusara reservoir possesses rich biodiversity but proper conservation measure required to maintain sustainability.

➢ *Wainganga And Painganga Rivers*

Gavande and Patki[17] The study were conducted to access fish diversity from Sai Kheda Dam on Painganga River in Yavatmal District, during the study they concluded that total 36 species including to 6 order and 11 families were recorded they concluded that the dam accommodates the rich diversity of edible fishes. **Chatap et. al.**[18]The study was aimed to fish identification and diversity in Painganga River in Chandrapur District. the survey indicates the presence of total 36 fish species belonging to 7 major orders including 14 families**. Paliwal et. al.** [19] the study was conducted to access the fish diversity profile in Itiadoh reservoir in Gondia District. All 35 fish species of 6 orders and 16 families were recorded. they found the abundance of major carps, common carps, cat fishes and eel fishes. **Karve and Dahegaonkar** [20] the study was done on river Bagh which is tributary of Wainganga River. The conclusion of investigation states that the occurrence of 62 fish species including 8 orders, 16

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families and 34 genera**. G.P. Gadekar** [21]the study was undertaken on river Wainganga of district Bhandara. they concluded further studies will be done in future to develop fish culturing.

➢ *Fish Diversity in Krishna River System*

Kokate et. al. [22] the study was conducted on Krishna River in Sangli district during the investigation total 25 fin fish species were recorded which are belonging to 11 families 21 genera most of species belonging to family Cypriniform, Bagridae. **Patil and Gurjar** [23] ichthyofaunal diversity in Krishna River from Satara District were studied during the period of 2 years. Total 73 fish species wear observed out of this species 5 were endangered 7 were near threatened 47 were list concern three were vulnerable and 9 were not evaluated. **Bhoikamble and kumbhar**[24] the freshwater fish fauna of Yerla River in Sangli district was studied. Yerla river is tributary of Krishna River. The study aimed to find real anthropogenic threat to fish fauna of Yerla River. Total number of 58 species belonging to 7 orders 19 families and 40 genera were recorded, as per IUCN rad list of threatened species 41 species are list concern, 3 wear near threatened ,2 species were vulnerable, 4 species were endangered and 4 were data deficient. therefore, Yerla River will be most suitable habitat for conservation of endangered and threatened spsecies. **S. B. Kengar** [25]study was carried out on Shivaji Nagar reservoir of Mutha River in Sangli district Maharashtra during the study total 22 species of fishes belonging to 21 genera ,12 families and 5 orders where identified. the study reveals that reach diversity present in the reservoir

➢ *Bhima River*

Kawade and pandharkar[26] the investigation was carried out to study the ichthyofauna of Kalu Dam on Bhima River of Ahmednagar district, during the study all together 27 fish species belonging to 10 families and 5 orders were recorded. they concluded that dam possesses rich fish diversity but proper conservation major was required to maintain sustainability and species diversity. **Kumbhar et.al.**[27] the study was done with a weekly visit at Bhima River in Ahmednagar district, in the investigation 26 species belonging to 9 families wear reported. The family Cypriniform was dominant with 12 species followed by Siluridae with 6 species. **A. N. Dede**[28] assessment of ichthyofaunal diversity of the Bhima River in Solapur district was done in the year 2017 the investigation revealed total 10 species of fish belonging to 8 genera and 4 families. The Shannon diversity index value range in 22.59 therefore population status was moderate. **Patil et.al.** [29] the study was done on Bori River which is tributary of Bhima River in all 3 different seasons during the study period all together 17 belonging to four families and five orders were recorded.

➢ *Tapi River System*

S.S. Patole[30] Ichthyofaunal diversity was carried out in the rivers, streams, reservoir and ponds of Nandurbar District of River Tapi and its principal tributaries that is Gomai, Vir, Rangavali, Daheli, and Shivan River etc. In the study 32 species belonging to 6 orders ,11 families and 24 genera were observed. Conclusion was made that site based the conservation action needed for conservation of rear and threatened fish species in the area**. A.D. Shelke** [31] the study was undertaken in Girna River which is tributary of Tapi River of Jalgaon District. Total 35 fish species belonging to 8 orders 27 genera and 17 families were recorded. **Nirbhavane et. al**. [32] the study was taken in Chankapur dam of Nashik District, in the study 17 species were recorded with 13 genera and 4 families. The family Cyprinedae was dominant along with Siluridae and Percidae. **Khade et. al.**[33] the study was conducted on Wan River which is a tributary of Tapi river. During the study 21 species of fish along with 22 Texas, 18 families and five orders were identified.

➢ *Fish Diversity of Some Lakes & Reservoirs*

Pawar S.K.[34] common ecological observation of predatory fishes was studied from Limboti dam. during the study 14 species belonging to 4 orders were recorded, they observed that generally large sized fishes found in literal zone**. Salve and Sirsat**[35] study was done in Hingoli district to make a check list of fishes the study confirms 37 fish species belonging to 19 genera,8 families and 8 orders. **Patil Rakesh** [36] the study was carried out in Kalzar dam which is in Nashik district. The aim of study was to reveal the diversity of fish species in the Dam, the result of investigation shows the occurrence of 8 fish species belonging to 2 order and 3 families. from the study they concluded that the Kelzar dam was good source of food ichthyofauna diversity. **Kale G.B. and bathe P.N.**[37]the research work was carried out to access the fish diversity and status of dam situated on Lendi river in Buldhana district. The fish diversity indicates that 13 families with 8 orders**. S.N. Chaudhary and V.R. kakade** [38] the study was carried out to detect the fish diversity of paldag reservoir constructed on Wishvaganga river in Chikhli taluka of Buldhana district during the study period 28 species of ichthyofauna group was recorded from the study area including 7 orders and 13 families**. P. Solanki et. al.**[39] fish diversity of Ashti lake in Solapur district was studied during the investigation total 23 species of fish belonging to 21 genera 12 families and 5 orders where identified**. Dalvi and Pawar** [40] they studied the fish diversity on Mondhol dam in Ahmednagar district. They confirmed all together 10 species with 9 genera ,7 families and 5 orders. They concluded that the reservoirs potential fish yield was moderate. **S.K. Pawar**[41]the study was taken in Ghagardhara dam in Nanded district about 16 species belonging to 5 orders 6 families were recorded during the study. **Kunjar & Kawade**[42]during the study ichthyofaunal diversity of Ghod reservoir and its implicit towards fish culture was studied, all together 25 fish species belonging to 9 genera, 10 families and 6 orders wear recorded. **Sutar et al.** [43] the study was carried out on the Tawarja reservoir in Latur district during the study they found that 31 species, 19 genera, 9 families and 5 orders. Regarding conservation status of fish species 25 species wear least concern, 2 were vulnerable, 3 were near threatened and 1 were endangered.

Jamburkar and kamdi [44] the study was undertaken to understand the distribution of fish diversity on Naleshwar Dam in Chandrapur district. The conclusion was made that total 35 fish spaces of 11 family ,6 orders and 23 genera were present. According to IUCN red data list no endangered

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species was found in the dam. **koparkar and Kamble**[45] the study was carried out Patalganga River in Raigad district and they found the occurrence of 25 species belonging to 17 genera 7 orders and 8 families, the orders Cypriniforms was dominant with 11 species**. Jagtap & Jagdale** [46] to find out the productivity of the river the study was undertaken on Jog River of Ratnagiri district. The study was conducted and reported 22 species of freshwater fishes belonging to 6 orders 11 families and 19 genera, from the study they concluded that jog river was good source of food fish diversity. **Chadgulwar and Bakre** [47]the study was carried out for investigating the diversity of chargaon lake in Chandrapur district. during the study 19 species of fishes belonging to 8 orders and 12 families we are found the order Cypriniform and Siluriform were found dominant among the fishes**. P.J. Misal** [48] the study deals with fish fauna of Jivrekha reservoir, basically represent the diversity and their abundance. The result recorded was total 36 species belonging to 6 orders from the study they concluded that the Jivrekha reservoir was rich in the fish diversity. **Raut et. al.** [49] the investigation deals with Nagzira corridor of Gondia district, the results reveal the occurrence of 62 species belonging to 18 families the conclusion where drone that diversity was rich in corridor lakes but majority of fish diversity was threatened by anthropogenic activities. **S.S. Patole**[50] fish diversity was carried out in the river stream and ponds of Nandurbar district they observe 32 species belonging to 6 orders 11 families and 24 genera**. Jawale et. al.**[51] they studied the freshwater fish diversity of Osmanabad district during the study they found 26 species with 12 families and 6 orders. they suggested that planning and management towards sustainable fisheries and conservation will be needed. Mahere lake Satara district. **Mohite et. al.**[52] studied the diversity of fish of Mahadare lake in Satara district, total 22 fish species belonging to 18 genera were collected.

III. CONCLUSION

According to the study and review of research publications by utilising secondary data the study states that Godavari River to be most extensively studied river in Maharashtra. We studied articles between 2009 to 2024 and identified that the ichthyofaunal diversity is rich in the Maharashtra state. we observed that 160 species across 9 orders 25 families and 80 genera are present in freshwater of Maharashtra. the order Cypriniform was most dominant followed by Siluriformes the conclusion of study state that conservation strategies are necessary to prevent overfishing and habitat destruction.

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