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Ichthyofaunal composition, Commercial importance and Conservation status of Recorded species from Daroji Lake, Karnataka, India

Shireen Banu Kurdi[1] and Shashikanth H. Majagi[2]*

[1]Department of Studies in Zoology, Vijayanagara Sri Krishnadevaraya University, Ballari - 583105 (India)
[2]Department of PG Studies and Research in Zoology, Gulbarga University, Kalaburagi - 585106 (India)
*Corresponding Author: Shashikanth Majagi, Email: majagish78@gmail.com

Abstract

Daroji lake in Karnataka is an important freshwater system in a semi-arid environment, with limited studies of its ichthyofaunal characteristics. This study establishes baseline data on fish diversity, commercial value, and conservation status through periodic field observations and structured interactions with the local fishing community. A total of 15 fish species belonging to different taxonomic groups were recorded, with the order Cypriniformes and family Cyprinidae emerging as the dominant taxonomic groups.The fish assemblage includes native and exotic species, with Indian Major Carps, Grass carp, and Common carp sustaining the local economy. Most species were categorized as Least Concern under IUCN criteria, whereas the presence of the "Near Threatened" *Ompok bimaculatus* highlights the reservoir's conservation significance despite anthropogenic pressures such as industrial pollution and fluctuating water levels. The study highlights that sustainable management must balance fishery production with biodiversity preservation by prioritizing indigenous species stocking, protecting habitats for vulnerable fish, and implementing consistent water quality monitoring.

Key words : Fish diversity, Exotic species, Conservation status, Cyprinidae, Commercial species, Daroji Lake

Freshwater ecosystems are one of the most complex and important parts of nature's diversity, and fish diversity is one of the best indicators of an aquatic ecosystem's condition and services. Fresh water fish species are a significant component of the aquatic eco-system, and are essential for the global bio diversity[27]. They are important ecological players, facilitating nutrient cycling, trophic regulation and ecosystem stability in aquatic ecosystems[42]. They are a food chain at both its top and bottom, keeping the populations of other species from becoming too numerous and maintaining a healthy food web. In addition to their ecological functions, freshwater fish are also a major source of animal protein for billions of people and a key livelihood for rural populations in developing nations through catch fisheries and aquaculture activities[15,51]. However, fish are a vital source of micronutrients and good quality protein in many developing regions, where they are the most affordable and available food, playing a critical role in food security[15].

Globally, Asia is recognized as a hotspot for freshwater biodiversity; specifically, India ranks among the top 25 countries for endemism and third in Asia for overall freshwater fish diversity[18,26]. This biological wealth flows throughout an extensive network of rivers, streams and lakes. India has an estimated 1,000 species of freshwater fishes and accounts for around 7.7% of the total fish biodiversity in the world[25,34]. The rich ichthyofauna highlights the importance of freshwater ecosystems in the country's biological legacy and economic structure, offering livelihood opportunities to millions of fishers and sustaining centuries-old traditional practices[34].

Lakes and natural lentic systems are important areas of ichthyofauna support, and have an important role in regional fisheries (including fisheries resource management) and regional biodiversity conservation, especially where natural flowing rivers have been altered[24,43]. In India, such inland water bodies (natural lakes or large-scale man-made impoundments) represent a sizable proportion of fisheries resources[41,54]. The country has an extensive lentic water body which consists of about 19,000 small, 180 medium and 56 large reservoirs and lakes, having a great potential to increase national fish production[6,41].

Freshwater ecosystems face intense anthropogenic pressure, making fish a highly threatened group despite their ecological importance[35]. A primary threat is the introduction of exotic species like common carp (*Cyprinus carpio*) and tilapia, which outcompete native fish for food and nesting sites, leading to long-term population alterations[7,45]. In Karnataka, approximately 13.6% of fish diversity is exotic, often displacing indigenous species and causing the homogenization of aquatic food webs[7]. Furthermore, industrial pollution, agricultural runoff, and climate change severely impair the recruitment, growth, and survival of sensitive native species[11,46]. These issues are critical in endemic-rich areas like the Krishna River basin, which hosts at least 28 endemic and 8 threatened species[2,15]. Addressing these cumulative risks requires systematic regional assessments to implement targeted conservation measures and prevent local extinctions[31,32].

Many of the reservoirs and lakes in peninsular India are not scientifically well explored, despite their documented significance for inland fisheries. This poses a severe knowledge gap concerning their ichthyofaunal assemblages and the particular ecological dynamics that drive them[8,17]. The current study fills the void by arriving at key baseline information regarding the ichthyofaunal com-position, commercial value and conservation status of the fish species in Daroji Lake, Karnataka. Anthropogenic perturbations including high fish stocking densities and the spread of exotic species have the potential to affect native commu-nities and can only be evaluated with comprehensive data[7,27]. In addition desert and semi-desert lakes such as the Daroji are especially vulnerable to changes in the water level, which may have a profound effect on community structure[13]. This investigation sets a baseline and seeks to give a framework to guide work on developing sustainable fisheries management and regional conservation action plans. Overall, the work presented here is a step towards advancing broader national initiatives for protecting freshwater ecosystems, which ensures the use of resources in a manner that does not compromise ecological balance and biodiversity preservation[5].

Study area :

Daroji lake is situated in the Ballari district of Karnataka, India (15°13'55.76" N, 76°40'16.84" E) (Fig. 1). The water body is spread across a semi-arid landscape and is fed by inflows from the Tungabhadra dam through the Narihalla stream, with an overall length of about 3 km. The lake undergoes large amplitude seasonal oscillations in water level, especially in summer.The adjoining landscape is comprised of farmlands, rocky hillocks and is almost adjacent to a Daroji Sloth bear sanctuary. Geologically, the area is located within the old formations of the Peninsular spread and these formations contain high concentrations of iron minerals resulting in the development of the industries in the area. The lake therefore is a "natural" freshwater body under both natural hydrological control and anthropogenic influence, mainly arising from agricultural and industrial use which affects the habitat of its indigenous fish fauna.

Collection and identification of fishes :

The study was performed during 24 months (October 2023 to September 2025) to reflect the seasonal variations in the fish community structure. Fishery and economic data collections were carried out extensively from January to May, the months when fishing

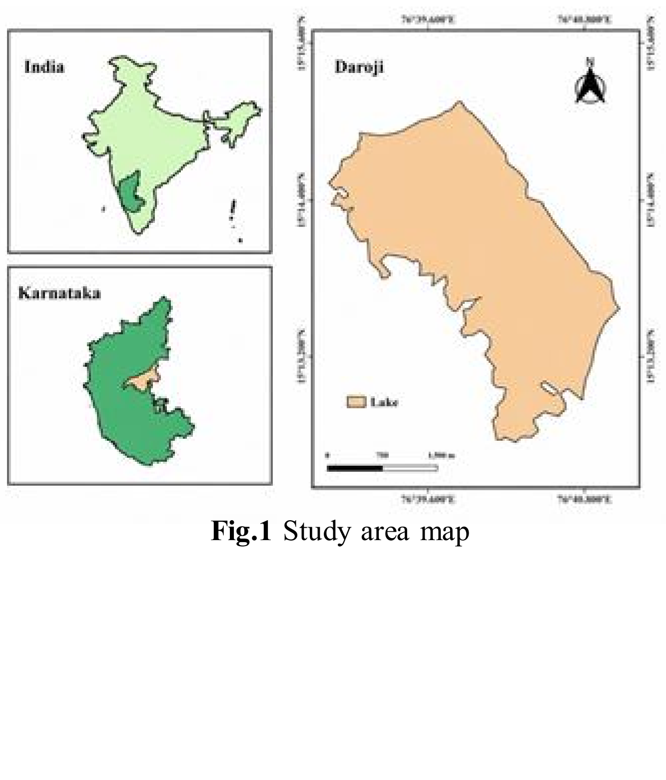

Fig.1 Study area map

activity is high. The fish were collected with the help of local fishermen, using gill nets of different mesh widths. A 10% formalin solution was used to preserve a representative sample for laboratory analysis, which were photographed in their native habitat to record their natural color and features[39]. Taxonomic identification was made by looking at the morphometric and meristic characteristics and using standard keys for both common and rare species established by Talwar and Jhingran[52] and Jayaram[14] respec- tively. The IUCN Red List criteria have been applied to assess the conservation status of recorded fish species. Every species was given a section of the list (Least Concern, Near Threatened, *etc.*). Commercial species of fish were identified through the market survey and stakeholder discussions, based on the presence of a particular fish species in commercial markets consistently, frequent catches followed by local fishers and economic value of the fish.

Throughout the study period (October 2023 to September 2025), 15 species of fish were recorded at Daroji lake through regular field visits and interactions with fishers in the area (Table-1). The recorded ichthyofauna consisted of several taxonomic groups, with Cypriniformes showing the greatest number of species (Fig. 2). *Catla catla, Labeo rohita, Cirrhinus mrigala, Labeo calbasu, Cyprinus carpio* and *Systomus sarana* were the most prominent genera of the family Cyprinidae. In India, a large number of reservoirs, lakes and riverine systems have been reported to be dominated by Cyprinidae and therefore cyprinids form a significant proportion of the inland fisheries due to their wide environmental tolerance, effectiveness in food capturing and high commercial value[10,36,56]. The dominance of Cypriniformes was also observed in the studies conducted on the ichthyofaunal diversity in Hiramandalam Reservoir, Udayasamudram Reservoir and Siddheshwar Reservoir[20,32,44]. A similar dominance of the cyprinidae was observed in the 72 fish species identified in the Gose Khurd Reservoir, Maharashtra[50]. The presence of Cyprinidae in all the freshwater bodies of India adds to their importance in the ecology and economy of the area as an aqua culture species[47,55].

Table-1. List of fish species recorded from Daroji lake with origin and IUCN status

Sl.No	Order	Family	Species	Common name	Origin	IUCN status
1	Cypriniformes	Cyprinidae	*Cirrhinus mrigala*	Mrigal	Stocked native	LC
		Xenocyprididae	*Ctenopharyngodon idella*	Grass carp	Stocked exotic	LC
		Cyprinidae	*Labeo catla*	Catla	Stocked native	LC
		Cyprinidae	*Labeo rohita*	Rohu	Stocked native	LC
		Cyprinidae	*Labeo calbasu*	Orange fin labeo	Stocked native	LC
		Cyprinidae	*Systomus sarana*	Olive barb	Natural	LC

		Cyprinidae	*Cyprinus carpio*	Common carp	native Stocked exotic	LC
2	Perciformes	Channidae	*Channa striata*	Snakehead edmurrel	Natural native	LC
		Ambassidae	*Parambassis ranga*	Indian glassy fish	Natural native	LC
		Cichlidae	*Oreochromis niloticus*	Nile tilapia	Stocked exotic	LC
3	Siluriformes	Siluridae	*Ompok bimaculatus*	Butter catfish	Natural native	NT
		Bagridae	*Mystus cavasius*	Gangetic mystus	Natural native	LC
4	Synbranchi formes	Mastacem-belidae	*Mastacembelus armatus*	Spiny eel	Natural native	LC
5	Characiformes	Serrasalmidae	*Piaractus brachypomus*	Red bellied pacu	Stocked exotic	LC
6	Beloniformes	Belonidae	*Xenentodon cancila*	Gar fish	Natural native	LC

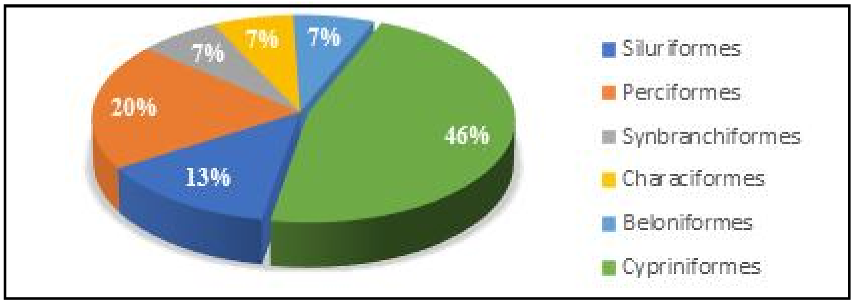

Fig. 2. Composition of fish species across different orders

The fish population of Daroji lake consisted of indigenous fish and stocked fish. *Ompok bimaculatus, Xenentodon cancila, Parambassis ranga, Channa striata, Mystus cavasius, Systomus sarana* and *Mastacembelus armatus* were the naturally occurring and indigenous fishes. Native fish species have been seen to persist in parallel with stocked ones in a few managed reservoirs where local natural colonization and reservoir habitat heterogeneity provide habitat for local fauna[34]. The presence of these species in Daroji lake suggests that, despite the management effort, the system still has ecological conditions suitable for native freshwater fishes. A few stocked species were also recorded, especially Indian major carps like *Catla catla, Labeo rohita, Labeo calbasu* and *Cirrhinusmrigala* (Fig. 3). They are commonly used in reservoir fisheries enhancement programmes in India due to their rapid growth, high consumer demand[23,30]. The frequent occurrences in the present study indicate that fish production in the lake is strongly affected by the practices of stocking, as frequently reported in many irrigation reservoirs in which capture fisheries are supported by seed release[12,36.37].

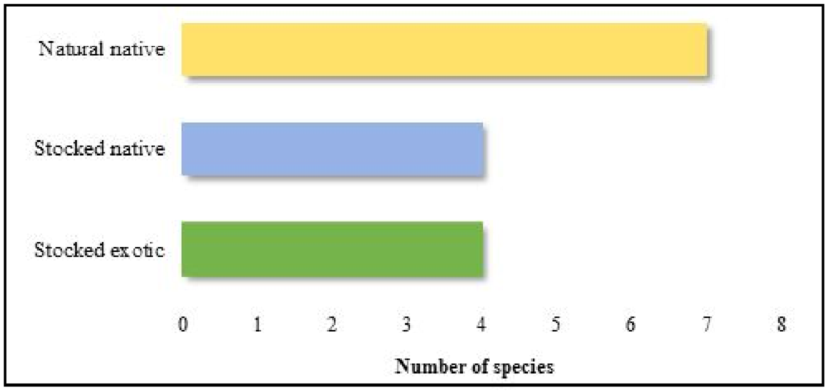

Fig. 3. Composition of fish species based on origin in Daroji lake

Catla, Rohu, Mrigal, Grass carp and Common carp are the most common fishes which are sold from the lake. This confirms the local economy is dominated by carp-based fisheries. The observation is similar in other water bodies of India, where carp species make the bulk of inland fish production because of their larger body size, higher market value and favorability of consumers[4,40,56]. The significance of these species in the commercial sector suggests that the Daroji lake also supports livelihoods as well as its ecological services. The observed species composition, including exotic species such as *Oreochromis niloticus, Cyprinus carpio, Ctenopharyngodon idella*, and *Piaractus brachypomus*, further emphasizes the potential for ecological changes in the reservoir ecosystem[48]. The establishment of these exotic species may introduce complicated interspecific interactions that involve competition with native fish for resources or predation pressure[98]. The conservation status of the species recorded was assessed and the majority of the species are recorded under the Least Concern category, suggesting that there are no apparent declines in the global population of these species (Fig. 4). However, *Ompok bimaculatus* was classified as Near Threatened[27,49]. The presence of a Near Threatened species adds to the conservation significance of the lake and indicates that management of the fishery should not be based solely on production species[21]. Similar investigations from other inland waters have focused on the fact that lakes are frequent refuge habitat for native fishes, even in the presence of commercially stocked species[53]. Their protection is thus crucial for the preservation of regional biodiversity. The reproductive success and population dynamics of *Ompok bimaculatus* in the lake of Daroji should be further studied to develop effective conservation measures for this vulnerable species.

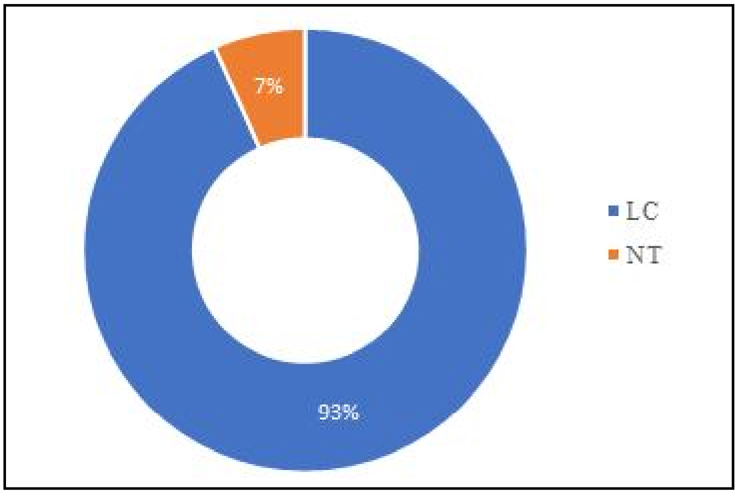

Fig. 4. Conservation status of fish species based on IUCN categories

The presence of exotic fishes such as *Oreochromis niloticus, Cyprinus carpio*, *Ctenopharyngodon idella*, and *Piaractus brachypomus* represents an important manage- ment concern. Exotic species are frequently introduced with the aim of improving the fish yield; however, the introduction of an exotic species could affect native species through competition, habitat changes and trophic changes[7,28]. The same ecological issues of tilapia, common carp, and introduced fishes have been reported in great detail in Indian reservoirs wherein such species often take over the niche of the indigenous fishes and drive native fishes out[16]. The introduction of invasive alien fishes, like *Oreochromis mossambicus* and *Cyprinus carpio*, has caused a marked reduction in indigenous fish stocks and homogenization of aquatic food web in Karnataka[3,7,24]. Hence, unassessed stocking could gradually shift the Daroji lake's native fish community.

Many tropical water bodies are subject to seasonal water reductions that can affect fish diversity and impact habitat area, crowding and environmental stresses[22,29]. The small pelagic native fish species may be more sensitive to such fluctuations than hardy stocked fishes such as tilapia and common carp, which are more tolerant of adverse limnological conditions and hypoxic environments[7,10,33]. However, with increasingly frequent periods of water stress, longterm shifts in species composition can arise, as, for example, the survival of certain trophic guilds in a large number of reported seasonal reservoirs and semi-arid freshwater systems is influenced by water stress in combination with other environmental factors, such as dissolved oxygen, transparency, and other factors[9].

Pollution pressure due to industrial activities in the vicinity was also noted in the study. In the present investigation detailed water quality parameters were not analysed however the pollution sources were well visible and if water quality is degraded it has a negative impact on the growth, reproduction and recruitment of the fish. Other freshwater systems have found similar patterns of anthropogenic disturbance and loss of fish diversity; and fish species are known to be sensitive to environmental factors like dissolved oxygen, transparency, and total dissolved solids, which in turn affect their spatio-temporal distribution[1,9]. Therefore, along with stocking management, the quality of habitat management is crucial for maintaining the fisheries of lakes, and anthropogenic pressures can cause the replacement of native fish species with more resilient exotic species[29].

In general, the present study gives an idea about the baseline information of the ichthyofaunal composition, commercial importance and conservation status of fishes of Daroji lake. Occurrence of native species, stocked carps and exotic fishes emphasize the multi-functional nature of managed lakes in India. But future community structure may be affected by ongoing pressures of exotic introductions, seasonal water reduction, and pollution. To ensure fisheries benefits without compromising long-term ecological conservation, sustainable management practices like periodic biodiversity monitoring, protection of native species like *Ompok bimaculatus*, regulation of stocking practices and maintaining habitat quality are supported.

The present study gives the baseline information on the composition of ichthyofauna of Daroji lake with 15 fish species including native and stocked species. The dominance of carp species reflects the importance of culture-based fisheries in supporting local livelihoods, while the presence of native species indicates the reservoir's ecological value. The majority of species were classified as Least Concern, however, the presence of *Ompok bimaculatus* (Near Threatened) warrants conservation interest. Low water levels and pollution have been observed and exotic species may affect long-term community structure. Thus, sustainable manage- ment such as controlled stocking operations, managing habitats and protection of native species are crucial in order to ensure fisheries productivity and the ecological integrity of the lake.

References :

1. Alam, A., J. Kumar, U. K. Sarkar, D. N. Jha, B.K. Das, S.K.Srivastava, V. Kumar, and B.K. Das (2021). *Aquatic Ecosystem Health & Management*, *24*(4): 46–53. https://doi.org/10.14321/aehm.024.04.07
2. Arunkumar, A. A., and A. Manimekalan, (2018). *Earth System Science Data*, *10*(3): 1735–1752. https://doi.org/10.5194/essd-10-1735-2018
3. Bagra, K., K. Kadu, K. Nebeshwar-Sharma, B. A. Laskar, U.K. Sarkar, and D.N. Das, (2009). *Check List*, *5*(2): 330–330. https://doi.org/10.15560/5.2.330
4. Bairwa, M. K., S. K. Swain, B. R. Pillai, B. Prakash, S. K. Ail, and S. Ferosekhan, (2023). *J. Inland fish. Soc. India*, *55*(1): 43-54.
5. Bhakta, S., and S. Saxena, (2024). *International Journal of Fisheries and Aquatic Studies*, *12*(4): 42–48. AkiNik Publications. https://doi.org/10.22271/fish.2024.v12.i4a.2942
6. Bhargavi, K., P. Krishnan, A. Anand, G. Kantharajan, A. T. Landge, and B. B Nayak, (2022). *Indian Journal of Fisheries*,

69(4). https://doi.org/10.21077/ijf.2022.69.4.123322-02

7. Chakma, A., M. Pappuswamy, and A. Chaudhary, (2023). *Ecology Economy and Society –the INSEE Journal*, *7*(1): https://doi.org/10.37773/ees.v7i1.902
8. Dalavi, S. D., and B. A. Pawar, (2023). *International Journal of Zoological Investigations*, *9*(1): 120–125. https://doi.org/10.33745/ijzi.2023.v09i01.012
9. Das, S. K., T.S. Nagesh, N. Sarang, S.K. Das, T. J. Abraham, C. Johnson,K. Panda, J. Canciyal and K. Panda, (2023). *Ecohydrology*, *16*(8): https://doi.org/10.1002/eco.2599
10. Devi, M. (2025). *International Journal of Scientific Research in Science and Technology*, *12*(4): 1033–1039. https://doi.org/10.32628/ijsrst251389
11. Dudgeon, D., and J. H. Liew, (2026). *Philosophical Transactions of the Royal Society B Biological Sciences, 381*(1942): https://doi.org/10.1098/rstb.2024.0424
12. Gowsalya, T., V. Kanaga, and M. M. Faizullah, (2019). *Indian Journal of Animal Research*, *54*(9): 1159–1164. https://doi.org/10.18805/ijar.b-3875
13. Jarupala, L.S., G. Ganesh,Pon. Subhashini, G. Suhashini and P. Raju (2025). *International Journal of Bio-Resource and Stress Management*, *19*: 1–8. https://doi.org/10.23910/1.2025.6302
14. Jayaram, K.C. (2010). The Freshwater Fishes of the Indian Region (Revised second edition).
15. Jinturkar, Anita. S., S. V. Rankhamb, and M. Shaikh, (2024). *International Journal of Innovative Science and Research Technology (IJISRT)*, 1889–1895. https://doi.org/10.38124/ijisrt/ijisrt24oct1174
16. Joshi, K.D., V.S. Basheer, A. Kumar, S.M. Srivastava, V. Sahu, and K.K. Lal, (2021). *The Indian Journal of Animal Sciences*, *91*(3): https://doi.org/10.56093/ijans .v91i3.114139
17. Kamble, P., S.Q. Fatima, and K. Vijaykumar, (2025). *International Journal of Science and Research (IJSR)*, 284–287. https://doi.org/10.21275/sr251105090300
18. Kottelat, M., and T. Whitten (1996). Fresh water Biodiversity in Asia, with Special Reference to Fish. In *World Bank eBooks*. https://doi.org/10.1596/978-0-8213-3808-7
19. Kumbar, S. M., S. Jadhav, S. B. Lad,A. Ghadage, S.S. Patil and S. Shankar (2021). *Journal of Threatened Taxa*, *13*(8): 19093–19101. https://doi.org/10.11609/jott. 6281.13.8.19093-19101
20. Laxminarayana, G., K. R. Rao, and M. Ratnakala, (2024). *Uttar Pradesh Journal Of Zoology*, *45*(9): 177–187. https://doi.org/10.56557/upjoz/2024/v45i94036
21. Lee, D.-H. (2024). *Pakistan Journal of Zoology*. https://doi.org/10.17582/journal.pjz/20240117094114
22. Leela, R. V., S. M. Salim, J. Parakkandi, P. Panikkar, K. Mani, V. M. Eregowda, U. K.Sarkar, and B. K. Das, (2021). *Aquatic Ecosystem Health & Management*, *24*(3): 111–120. https://doi.org/10.14321/aehm.024.03.13
23. Manam, V.K., and M.A. Quraishi, (2024). *International Journal of Fisheries and Aquatic Studies*, *12*(1). https://doi.org/10.22271/fish.2024.v12.i1.a
24. Markad, G., R. More, V. Kakade, & J. Sarwade, (2025). *Journal of Threatened Taxa*, *17*(10): 27705–27719. https://doi.org/10.11609/jott.9673.17.10.27705-27719
25. Mishra, R. (2024). *Uttar Pradesh Journal of Zoology*, *45*(17): 200–203. https://doi.org/10.56557/upjoz/2024/v45i174362

26. Mondal, R., and A. Bhat, (2020). *PLoS ONE*, *15*(4). https://doi.org/10.1371/journal. pone.0227354
27. Nagabhushan, C. M. (2022). *Journal of Threatened Taxa*, *14*(8): 21704–21709. https://doi.org/10.11609/jott. 7593.14.8. 21704-21709
28. Panikkar, P., M. F. Khan, U. K. Sarkar, and B. K. Das, (2021). *Aquatic Ecosystem Health & Management*, *24*(2): 24–32. https://doi.org/10.14321/aehm.024.02.06
29. Parida, P. K., L. Lianthuamluaia,T. Kayal, B. K. Das, U. K. Sarkar,S. K. Koushlesh, and B.K. Behera (2021). *Research Square (Research Square)*. https://doi.org/10. 21203/rs.3.rs-885951/v1
30. Paswan, V. K., K. Rawat, P. P. Srivast, C.Prakash, M. Aklakur, R, S. S. L., S. Sangavi, M. Kumar, and N. Poojari, (2022). *Research Square (Research Square)*. https://doi.org/10.21203/rs.3.rs-1827294/v1
31. Patode, P. S., B.S. Salve, and R.T. Pawar, (2021). *International Journal of Zoology and Applied Biosciences*, *6*(6): 293–298. https://doi.org/10.55126/ijzab.2021. v06. i06.031
32. Pawar, R.T. (2021). *Zenodo (CERN European Organization for Nuclear Research)*.https://doi.org/10.5281/zenodo. 748 9265
33. Piet, G. J. (1998). *Canadian Journal of Fisheries and Aquatic Sciences*, *55*(8): 1842–1853. https://doi.org/10.1139/cjfas-55-8-1842
34. Prasad, K.K., M. Younus, and C. Srinivasulu, (2020). *Journal of Threatened Taxa*, *12* (10): 16357–16367. https://doi.org/10.11609/jott.5408.12.10.16357-16367
35. Pratap, G. V., T. B. Rao, Y. S. Prabha, B. Keerthana, and P. L. N. Lakshman, (2025). *Evaluation of Fish Diversity and Water Quality in a Tropical Freshwater Ecosystem: A Case Study from Lakshmipuram Lake, Andhra Pradesh, India* (pp. 96–114). https://doi.org/10.9734/bpi/rpbs/v3/5380
36. Puthiyottil, M., U. K. Sarkar, G. Karnatak, L.Lianthuamluaia, A. K. Das, S. K. Koushlesh, S. Kumari, and B. K. Das, (2021). *International Review of Hydrobiology*, *106*: 259–276. https://doi.org/10.1002/iroh .202102093
37. Ramya, V. L., P. Panikkar, P. K. Jesna, A.Saha, G. Janarthanan, and B. N. Das, (2026). *Aquatic Living Resources*, *39*: 1–1. https://doi.org/10.1051/alr/2025025
38. Rao, B. R. S., and D. R. Rao, (2026). *International Journal on Science and Technology*, *17*(1): https://doi.org/10.71097/ijsat.alsdahw-2025.106
39. Roshith, C. M., R. K. Manna, S. Samanta, V. R. Suresh, L. Kumar, S. Sibinamol, and B. K. Das, (2022). *Aquatic Ecosystem Health & Management*, *25*(2): 53-61.
40. Sahoo, G., M. K. Sinha, and Y. Nayak, (2020). *Int. J. Fish. Aquat. Stud.*, *8*: 633-638.
41. Sarkar, U. K., K. Sandhya, M. Puthiyottil, G. Karnatak, S. Kumari, P. Panikkar,R. Palaniswamy, M. Karthikeyan, S. S. Mol, T. T. Paul, V. L. Ramya, D. S. Rao,M. F. Khan, D. Panda, and B. K. Das, (2017). *Reviews in Fisheries Science & Aquaculture*, *26*(2): 155–175. https://doi.org/10.1080/23308249.2017.1373744
42. Shaikh, A. S., and S. Bansode, (2024). *International Journal of Fisheries and Aquatic Studies*, *12*(5): 142–149. https://doi.org/10.22271/fish.2024.v12.i5b.2977
43. Sharma, S., H. Wala, and R. Sharma, (2020). *International Journal of Fisheries and Aquatic Studies*, *8*(5): 375–379.

https://doi.org/10.22271/fish.2020.v8.i5e.2346

44. Shyamsundar, R., K. K. Prasad, and C. Srinivasulu, (2017). *Journal of Threatened Taxa*, *9*(12): 11087–11087. https://doi.org/10.11609/jott.3417.9.12.11087-11094
45. Singh, A. K. (2021). *Aquatic Ecosystem Health & Management, 24*(2): 13–23. https: //doi.org/10.14321/aehm.024.02.05
46. Sreenivasan, N., N. Mahesh, & R. Raghavan, (2021). *Journal of Threatened Taxa*, *13*(1): 17470–17476. https://doi.org/10.11609/jott.6778.13.1.17470-17476
47. Subhashini, K., M. Singh, and A. Harit, (2022). *Journal Of Advanced Zoology*. https://doi.org/10.53555/jaz.v43i1.4488
48. Subhashini, K., M. Singh, and A. K. Harit, (2024). *Journal of advanced zoology*. https://doi.org/10.53555//jaz.v43i1.4488
49. Suman, K.H., M.S. Hossain, M.A. Salam, Q.S.S. Rupok, and Md. N. Haque, (2021). *Asian Fisheries Science*, *34*(2): https://doi.org/10.33997/j.afs.2021.34.2.004
50. Suryawanshi, U., H.N. Anjanayappa, S.R. Somashekara, K. N. A.S., M. Naik, P. A. Telvekar, P. Nayana, H. B. Pawar., and J. G. K. Pathan, (2025). *Uttar Pradesh Journal of Zoology*, *46*(20): 203–213. https://doi.org/10.56557/upjoz/2025/v46i205315
51. Sutar, V. B., A. S. Kulkarni, A.T. Markad, S. D. Meshre, and V. V. Bansode, (2024). *Archives of Current Research International*, *24*(4): 127–134. https://doi.org/10.9734/acri/2024/v24i4668
52. Talwar, P.K. and A.G. Jhingran (1991). Inland Fishes of India and adjacent countries, Vol. 1 and 2. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
53. Thomson Laing, G., L. Schallenberg, D. Kelly, J. D. Howarth, and S. A. Wood, (2024). *Biological Reviews*, *99*(1): 85-109.
54. Ud, V., D. AY, M. MN, and V. Ug, (2020). *Journal of Entomology and Zoology Studies*, *8*(5): 1181–1188. https://doi.org/10.22271/j.ento.2020.v8.i5q.7671
55. Vastrad, R.G., and K. G. Hiremath, (2024). *International Research Journal on Advanced Engineering and Management (IRJAEM)*, *2*(9): 2844–2846. https://doi.org/10.47392/irjaem.2024.0418
56. Yaqoob, S. (2021). *Annals of the Romanian Society for Cell Biology*, *25*(6): 34–47. http://www.annalsofrscb.ro/index.php/journal/article/view/5156