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Cover: Nilgiri Large Burrowing Spider *Haploclastus nilgirinus*. Acrylic on canvas. © Aakanksha Komanduri.

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ARTICLE

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Diversity and distribution of fish in rivers Chinnar and Thenar and their tributary, southern Western Ghats, Tamil Nadu, India

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Abstract: The diversity and distribution of fishes were studied in the Chinnar and Thenar rivers of the Cauvery River basin of Anamalai Hills. A total of 14 sampling sites were randomly selected in this region, and fish sampling was carried out from April 2017 to May 2018. The high species diversity was recorded in downstream site 11, Thenar River (H' = 3.14), and low diversity was observed in upstream site 3, Chinnar River (H' = 1.64). Thirty-seven species of primary freshwater fishes belonging to four orders, 11 families, and 21 genera were recorded. The order Cypriniformes, with 26 species, dominate the fish assemblages (70.27%), followed by Perciformes with six species (16.21%), Siluriformes with four species (10.81%), and Synbranchiformes with one species (2.70%), respectively. Among the Cyprinids, *Devario aequipinnatus, Barilius getensis*, and *Garra mullya* had the highest local dominance (32% each) in this river's cape. The only one exotic species, *Oreochromis mossambicus,* was recorded at downstream sites of Amaravathi River. Among the recorded species, about 43% of fish species are endemic to the Western Ghats, seven species are listed as threatened, five as endangered, and two are vulnerable, according to the IUCN Red List.

Keywords: Anamalai Hills, Cypriniformes, conservation, freshwater fish diversity, habitat diversity, hill stream fishes, riverine ecosystem, River Amaravathi.

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Ethical approval: The handling and testing of individual animals were carried out as per the guidelines of the Committee for Control and Supervision of Experiments on Animals (CPCSEA) and the Tamil Nadu Forest Department. No additional ethical approval was necessary because no invasive technique was used.

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Author contributions: KMK—conceptualization, methodology, data curation, writing – original draft, validation, supervision, review & editing. TAK—methodology, sample collection, validation, review & editing. KA—methodology, sample collection, validation, review & editing.

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INTRODUCTION

Freshwater habitats and species are one of the most endangered ecosystems in the world due to the growing demand for freshwater supply (Vörösmarty et al. 2010; Shukla & Bhat 2017; Tickner et al. 2020). Freshwater species are declining at a faster rate than terrestrial or marine counterparts, and native fishes are the worst affected among the aquatic organisms (Miqueleiz et al. 2022). Fish diversity is important to any aquatic environment as they deliver essential fish resources for human survival and long-term development (Gordon et al. 2018; Cheng et al. 2019). More than 1,000 species of fish are reported from the inland water bodies (Chandran et al. 2019), and 340 freshwater fish species have been reported from the Western Ghats (Thampy et al. 2021). Many freshwater habitats are under extensive human disturbance, leading to habitat loss and degraded aquatic habitats. Several freshwater fish species are now critically endangered in India (Kunda et al. 2022). Thus, understanding the fish diversity, distribution and ecological significance of the species of a particular area is essential for its conservation. The present study aims to document fish diversity in the Chinnar and Thenar rivers in the Anamalai Tiger Reserve. Historical documentation of fish species from this region is available from the 1950's. Silas (1951) recorded fish species from Anamalai and Nelliyampathy Hills. Later, Thomas et al. (1999) reported Chinnar and Pambar River fishes, followed by Rema Devi et al. (2005) with fishes of Anamalai Hill. The river habitats of Chinnar and Thenar have been highly modified since then due to activities of residing local communities. As a result, the status of many species residing in the rivers Chinnar and Thenar is not known.

MATERIALS AND METHODS

Study Area

The study area is located between 10.333–10.142 ^{0}N and 77.058–77.256 ^{0}E in the perennial rivers, Chinar, Thenar and their tributaries, in Anamalai Hills of southern Western Ghats. A good riparian vegetation cover, including herbs, shrubs, and trees, is usually found along the study streams. There are seven tribal settlements located along the Chinnar and Thenar rivers, which directly and indirectly depend on these rivers. The rivers, Chinnar and Thenar, flow eastwardly and form the Amaravathi River of the Cauvery River basin.

Sample Collection

Fish samples were collected from 14 sites using a cast net, gill net, and dragnet depending on the habitat from the Chinnar, Thenar, and Amaravathi rivers (Figure 1, Table 1). The samples were collected in both the pre- and post-rainy seasons at daytime (0700–1700) seasonally from April 2017 to May 2018. Each fish specimen was collected and preserved in 10% formalin to identify the species. Before preservation, each species was photographed with its original colour. The species were appropriately identified based on the keys provided in various taxonomic literature (Talwar & Jhingran 1991; Jayaram 2010). Most of the fish were measured in the field, individuals were counted and released back to the river. They were measured to the nearest millimetre to identify and study the taxonomical characters correctly.

Statistical Analysis

Fish species recorded from each site were subjected to different diversity analyses (Shannon index, Simpson's evenness index, Margalef species richness index, Berger Parker dominance index, and equitability index) (Chandran et al. 2019). Further, the fish abundance data were used to create a dendrogram based on the Bray-Curtis similarity index. All statistical analyses were performed using PAST (PAleontological Statistics) software, version 4.13 (Hammer et al. 2001; Chandran et al. 2019).

RESULTS

The Thenar and Chinnar rivers are perennial and converge to form the Amaravathi river, enabling fish to migrate through both rivers. Consequently, 14 sites were randomly selected across these rivers for the study. Thirty-seven species of freshwater fishes belonging to four orders, 11 families, and 21 genera were recorded from the 14 sampling locations in Chinnar and Thenar rivers. The fish species recorded from the study area are presented in Table 2. Image 1 shows the photographs of the fish species recorded at the study sites. Among the recorded fish species of Cypriniformes, 26 species have demonstrated the highest dominance among the order (70.27%), followed by Perciformes with six species (16.21%) and the catfish order Siluriformes accounting for four species (10.81%) (Figure 2). The Cyprinidae family of fish species has 12 species that have shown the most dominance, followed by the Danionidae eight species, Nemacheilidae with four species and the Bagridae with three species. Among the families, Cyprinidae (32.43%),

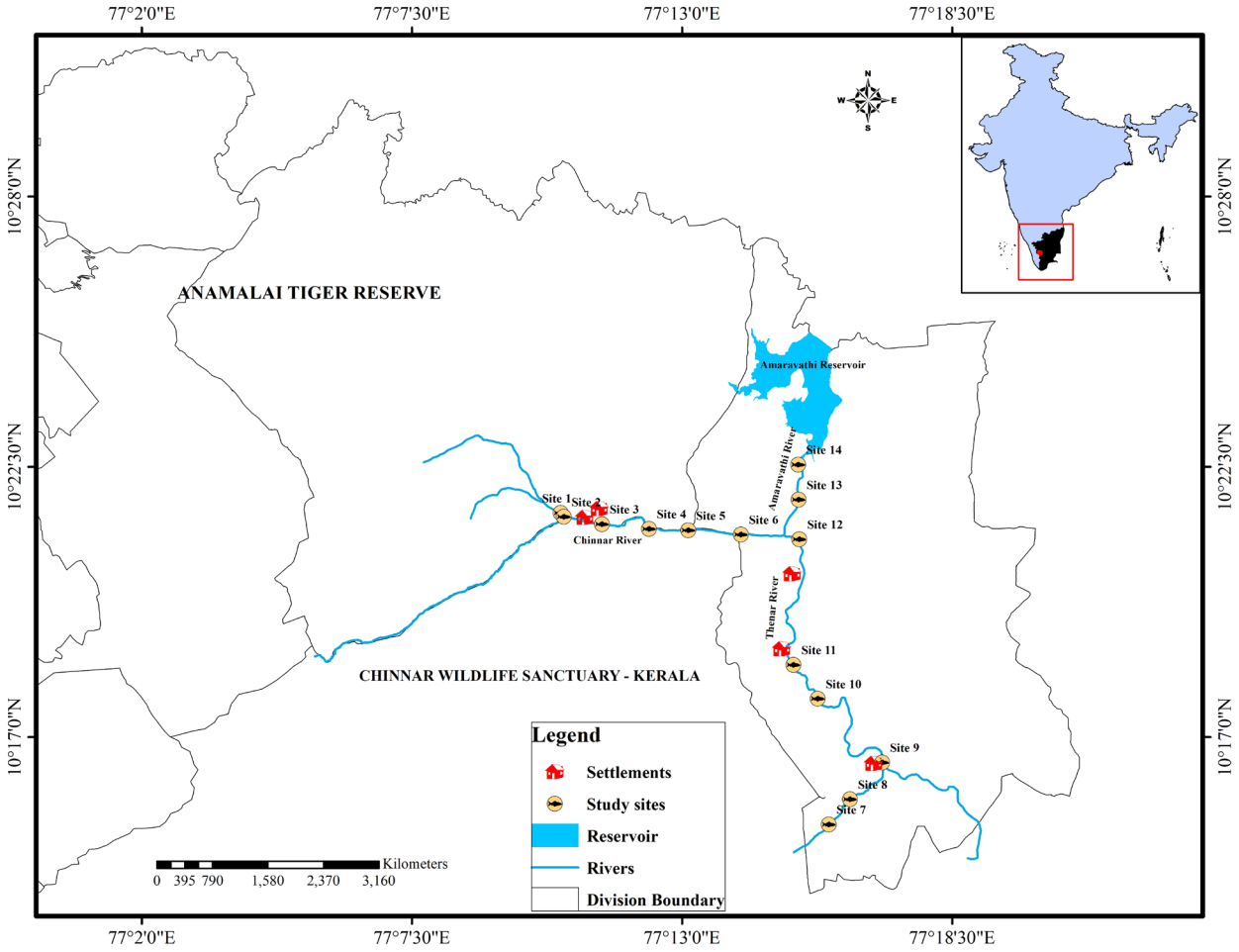

Figure 1. Study area and fish sampling site map.

Danionidae (21.62%), Nemacheilidae (10.81%), Bagridae (8.11%), Ambassidae (5.41%), Channidae (5.41%), and Balitoridae (2.70%) were the most species-rich (Figure 2). Furthermore, among the 14 study sites of the Chinnar and Thenar river systems, the maximum Shannon-Wiener index, and Margalef index of species diversity and richness was recorded in site 11 (H' = 3.139; S = 32), and low diversity and richness was recorded in site 3 (H' = 1.639; S = 6). The maximum species abundance of 820 was recorded at site 5, and minimum abundance of 106 was recorded at site 13. The maximum dominance (D = 0.262) was recorded at site 4, while the dominance was low in site 11 (D = 0.053). The maximum evenness (E = 0.937) was recorded at site 7, and the minimum evenness (E = 0.528) at site 4 (Table 3). A summary of fish assemblage structure in the Chinnar and Thenar Rivers is presented in Table 4. During this study, the following endemic and threatened fish species were recorded from the study area: *Haludaria fasciata*, *Haludaria melanampyx*, *Hypselobarbus dubius, Tor khudree, Tor*

Table 1. Stream type and altitude of the different sampling sites in the study area.

Location	Rivers	Stream type	Altitude (m)
Site 1	Chinnar	Upstream	644.95
Site 2	Chinnar	Upstream	623.92
Site 3	Chinnar	Upstream	549.85
Site 4	Chinnar	Upstream	488.89
Site 5	Chinnar	Upstream	474.87
Site 6	Chinnar	Downstream	455.98
Site 7	Thenar	Upstream	799.79
Site 8	Thenar	Upstream	723.90
Site 9	Thenar	Upstream	669.95
Site 10	Thenar	Midstream	583.99
Site 11	Thenar	Downstream	574.85
Site 12	Thenar	Downstream	449.88
Site 13	Amaravathi	Downstream	430.98
Site 14	Amaravathi	Downstream	381.00

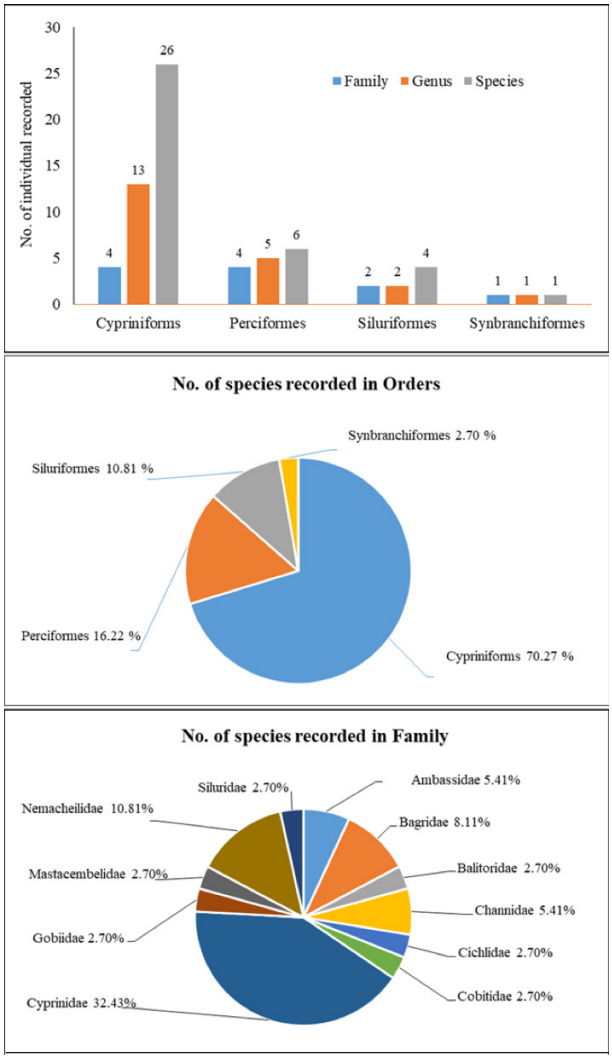

Figure 2. The bar chart diagram: a—representation of fishes in different orders, families and species among the Figure | b—total number of species richly order of total species in the 14 sites | c—percentage of species number of the most species-rich families to the total species in the 14 sites.

remadevii, *Barilius gatensis*, *Devario aequipinnatus*, *Garra mullya*, *Bhavania australis*, and *Nemacheilus rueppelli*. In addition, *Oreochromis mossambicus*, an exotic species, was also recorded. Almost 43% of fish species recorded within the research area are endemic to the Western Ghats, and only one introduced species was recorded during the period Table 4.

DISCUSSION

Fish are crucial to the continued life of aquatic habitats. They serve as a reliable gauge of ecological health. Additionally, they act like keystone species that significantly influence both their environment and other species (Whitfield & Elliott 2022). The Amaravathi river basin (river Chinnar and Thenar and their tributaries), being a perennial water source, supports a high diversity of fish species, but, in some parts of the sampled area, the diversity is very low because the area is prone to disturbance and contamination by the local people and introduced exotic fish species (Gibson et al. 1996; Sarkar et al. 2010; Joshi et al. 2021). Maximum species richness was recorded at site 11, followed by site 6 of midstream and downstream habitat. *Haludaria fasciata, Haludaria melanampyx, Barilius gatensis, Devario aequipinnatus, Garra mullya,* and *Nemacheilus rueppelli* were recorded in all study locations. Earlier work on the river Pambar of Chinnar Wildlife Sanctuary recorded 15 species in and around protected areas; among the species, eight are endemic to the Western Ghats (Thomas et al. 1999).

Along with the global problem of climatic changes, many species, especially endemic species, are also currently threatened by a number of human activities (Giannetto & Innal 2021). Sixteen species, such as *Haludaria fasciata, Haludaria melanampyx, Barbodes carnaticus, Salmostoma boopis, Tor malabaricus, Hypselobarbus mussullah, Hypselobarbus dubius, Barilius gatensis, Garra mcclellandi, Garra hughi, Garra stenorhynchus, Bhavania australis, Nemacheilus monilus, Nemacheilus rueppelli, Nemacheilus semiarmatus,* and *Nemacheilus guentheri* are endemic out of 37 species recorded in the survey (Dayal et al. 2014; https://www.iucnredlist.org 2024). It was reported that 59 species belong to Anamalai Hills region (Rema Devi et al. 2005), of which 30 are new additions to the Indira Gandhi Wildlife Sanctuary and 20 to the Nelliampathi Hill, including one new species. Fish diversity was recorded at around 69 species compared to the previous study. Biju et al. (1999) recorded 41 species in Kerala's Palakkad District, in a valley between the Anamalai and Nelliampathi Hill ranges of the Parambikulam Wildlife Sanctuary and the Chalakudy River system. Silas (1951) listed 10 species of fish from Neliampathi Hills and 25 species of fish from Anamalai Hills and their research expanded the range of several species that were previously restricted to the southern Western Ghats beyond the Palghat Gap.

Big barbs and mahseers, such as *Labeo calbasu*, *Puntius sarana*, *Hypselobarbus dobsoni*, *H. curmuca*, *H. dubius*, *H. dobsoni*, *Tor khudree*, and *Tor malabaricus*, were only permitted in large, deep pools (Arunachalam 2000). Furthermore, threatened and endemic species viz., *Barbodes carnaticus, Hypselobarbus mussullah, Hypselobarbus dubius, Tor khudree,* and *Tor malabaricus* were reported in the deep pools in the study area at sites

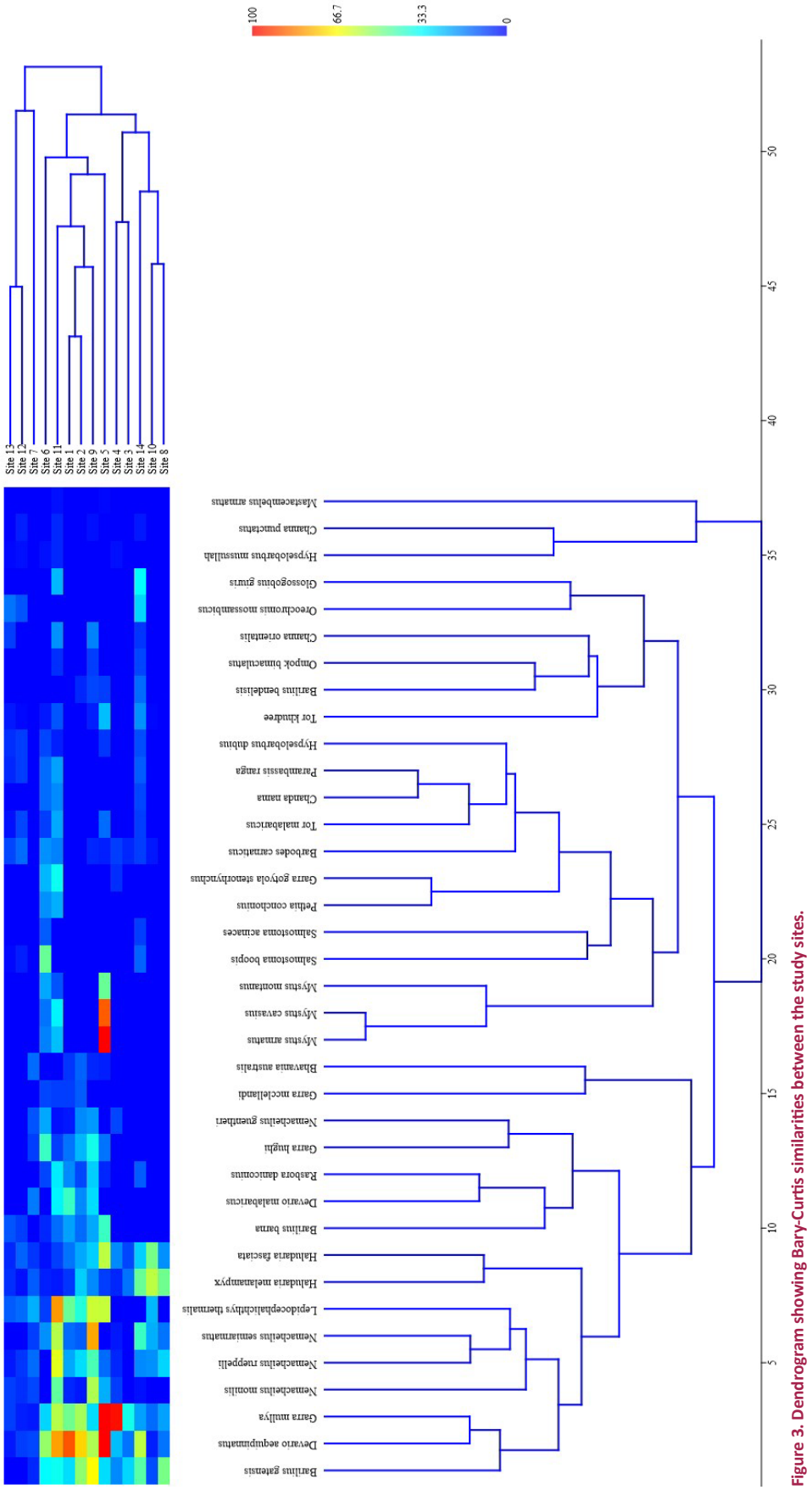

Figure 3. Dendrogram showing Bary-Curtis similarities between the study sites.

Table 2. Status of the fish species recorded from river Chinnar, Thenar, and Amaravathi.

	Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14
1	*Haludaria fasciata*	15	22	9	18	58	2	7	19	27	49	8	13	5	27
2	*Haludaria melanampyx*	7	27	15	5	8	4	12	48	18	58	3	2	6	47
3	*Pethia conchonius*	0	0	0	0	0	19	0	0	0	0	23	0	0	0
4	*Barbodes carnaticus*	0	0	5	8	4	19	0	0	5	3	17	14	9	8
5	*Salmostoma boopis*	0	0	0	0	0	47	0	0	0	0	0	4	1	13
6	*Salmostoma acinaces*	0	0	0	0	0	12	0	0	0	0	0	0	0	8
7	*Tor malabaricus*	0	0	0	0	14	8	0	0	0	0	22	9	2	8
8	*Tor khudree*	0	0	0	0	25	3	0	0	4	1	11	1	3	19
9	*Hypselobarbus mussullah*	0	0	0	2	0	2	0	0	0	0	5	2	1	0
10	*Hypselobarbus dubius*	0	0	0	0	7	9	0	0	0	0	4	8	6	10
11	*Barilius bendelisis*	0	5	0	0	8	0	0	0	9	0	0	0	0	14
12	*Barilius gatensis*	29	52	28	18	29	33	5	49	67	10	35	0	0	45
13	*Barilius barna*	21	14	0	0	41	5	0	0	22	0	14	8	11	0
14	*Devario malabaricus*	41	18	0	0	0	0	16	0	29	0	32	0	0	0
15	*Devario aequipinnatus*	89	72	15	25	109	53	9	15	56	4	79	8	3	58
16	*Rasbora daniconius*	18	9	0	0	5	9	0	0	27	0	31	0	0	12
17	*Garra mullya*	48	55	36	98	159	28	3	21	29	14	57	4	8	21
18	*Garra mcclellandi*	8	12	0	0	0	9	0	0	0	0	8	0	0	0
19	*Garra hughi*	15	24	0	0	15	41	8	0	36	0	8	0	0	0
20	*Garra gotyola stenorhynchus*	0	0	0	6	0	24	0	0	0	0	35	0	0	0
21	*Bhavania australis*	7	13	0	0	4	0	14	0	5	0	0	0	0	0
22	*Nemacheilus monilis*	5	3	0	8	23	0	9	0	56	0	46	6	8	2
23	*Nemacheilus rueppelli*	22	29	0	5	14	0	14	28	43	19	63	7	3	18
24	*Nemacheilus semiarmatus*	14	12	0	3	0	19	8	15	78	23	57	0	0	41
25	*Nemacheilus guentheri*	3	18	0	9	0	22	11	0	20	0	2	0	0	0
26	*Lepidocephalichthys thermalis*	47	38	0	0	59	8	23	0	60	24	80	14	12	0
27	*Mystus armatus*	0	0	0	0	102	17	0	0	0	0	25	0	0	0
28	*Mystus cavasius*	0	0	0	0	88	15	0	0	0	0	32	0	0	0
29	*Mystus montanus*	0	0	0	0	47	22	0	0	0	0	11	0	0	0
30	*Chanda nama*	0	0	0	0	0	14	0	0	0	0	18	0	0	9
31	*Parambassis ranga*	0	0	0	0	0	14	0	0	0	0	21	8	5	12
32	*Oreochromis mossambicus*	0	0	0	0	0	0	0	0	0	0	0	11	15	28
33	*Glossogobius giuris*	0	0	0	0	0	0	0	0	0	0	24	0	0	33
34	*Channa orientalis*	0	0	0	0	0	0	0	0	17	0	19	0	8	7
35	*Channa punctatus*	0	0	0	0	0	0	0	0	2	0	5	4	0	3
36	*Ompok bimaculatus*	0	0	0	0	0	0	0	0	8	0	6	0	0	9
37	*Mastacembelus armatus*	0	0	0	0	1	0	0	0	0	0	2	0	0	0

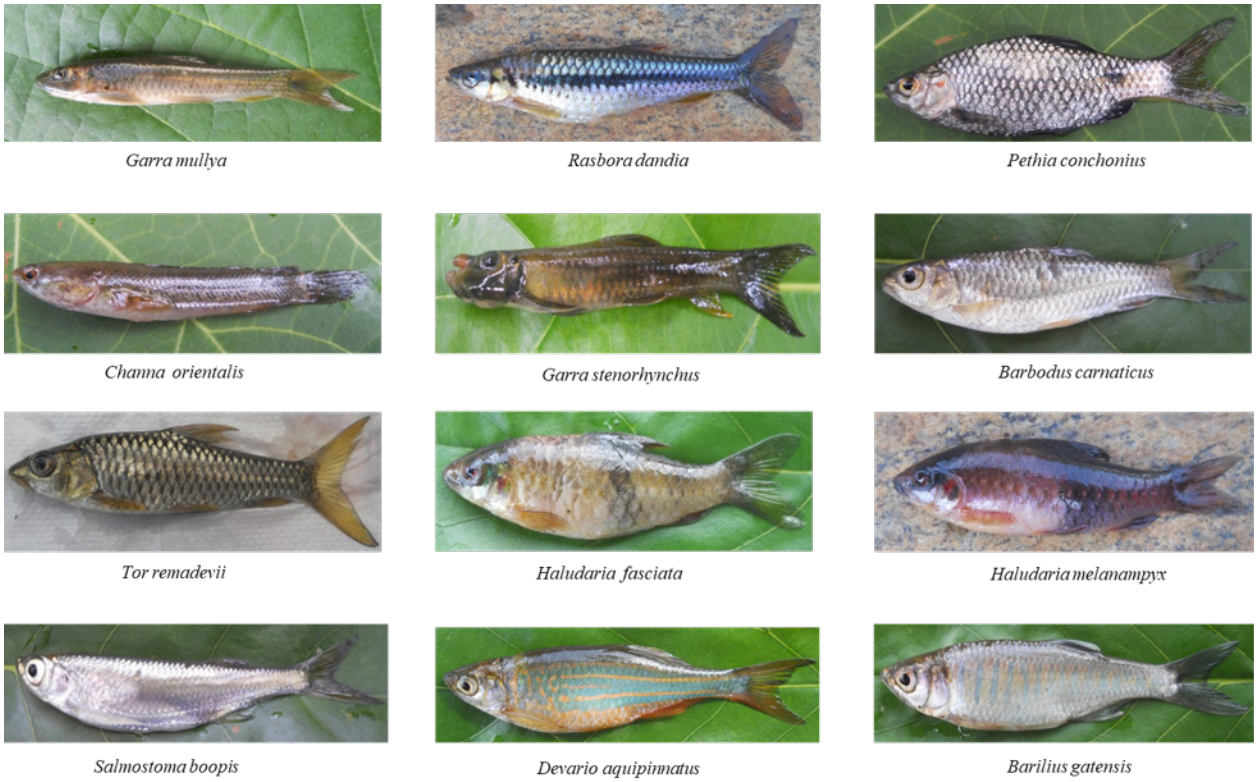

Image 1. Some fish species recorded from the Chinnar and Thenar rivers. © K. Mahesh Kumar.

5, 6, 10, 11, 12, 13, and 14, respectively. The richness of fish species in hill streams at higher elevations varies with altitude. As a result, species diversity decreases with increasing altitude, due to the fact that altitude has a considerable impact on species diversity (Johnson & Arunachalam 2009; Zhang et al. 2016). According to the Bary-Curtis similarity cluster analysis, there were two distinct clusters in the species composition of the research site basin. Whereas the remaining sites made up a different cluster, sites 12, and 13 downstream areas were divided into one cluster. Based on the cluster analysis sites 6 and 11, which were found to be the most species-rich sites. These sites 6 and 11, with richness 26 and 32, respectively, are located downstream, which is the main reason for their species richness. The frequently recorded species at these sites were *Devario aequipinnatus*, *Garra mullya*, *Barilius gatensis*, *Haludaria fasciata*, *Nemacheilus rueppelli*, *Nemacheilus semiarmatus*, *Haludaria fasciata*, *Haludaria melanampyx*, and *Lepidocephalichthys thermalis* (Table 3, Figure 3).

Midstream and downstream areas contained records of *Chanda nama*, *Parambassis ranga*, and *Glossogobius giuris*. Only in the middle of the Thenar River basin species like *Channa orientalis* and *Channa punctatus*, *Ompok bimaculatus* found frequently close to dam sites of downstream. *Mastacembelus armatus* was sampled near the middle and downstream of rocky habitats (Sokheng et al. 1999), while *Mystus* sp. was only discovered in a few locations of the hill stream (Rahman 1989). The three species *Pethia conchonius*, *Salmostoma boopis*, and *Salmostoma acinaces* are most prevalent at site 6, where the rivers Pambar and Chinnar join. In slow-moving sand and gravel habitats like mid and downstream areas, loaches such as *Nemacheilus* sp., *Bhavania australis*, and *Lepidocephalichthys thermalis* (Pethiyagoda 1991) were observed during the study. Around the world, exotic fish have been purposefully introduced for biological control, ornamental uses, and competitive fishing (Valero 2010). Introduced species such as *Cyprinus carpio communis* were reported in the previous study (Thomas et al. 1999) but not recorded during the survey, and *Oreochromis mossambicus* has been sighted in the downstream lowland areas in the present study. *Oreochromis mossambicus* was first introduced as an aquaculture object at the same time as commercial consumption. The extraordinary extinction of native species suggests that these invasive fish now make up the majority of the fish population (Xie et al. 2005).

Overfishing is increasingly believed to be the cause

of the decline in freshwater biodiversity (Raghavan et al. 2011). Many such issues affecting the riparian forest, which directly influence the fish population are also a concern and threat in the region under study. In the Western Ghats, it was found that fish was the primary and most convenient source of animal food for indigenous people (Prajith et al. 2016). Fishing is usually a part-time activity for tribal women. Most people depend on fishing for their livelihood throughout the year. Fishing by poisoning the water with vegetable matter (*Curcuma augustifolia*) is being practised regularly and must be restricted (Kamalkishor & Kulkarni 2006). If indigenous species are not given considerable attention, they are more susceptible to environmental change, and threats to their habitat can result in their extinction (Giannetto & Innal 2021). In the very near future, indiscriminate fishing may result in the complete extinction of some freshwater fish species, particularly endangered species like *Tor khudree* and *Hypselobarbus dubius* (Radhakrishnan & Roshni 2024). A quantitative sustainable management and development programme should be carried out to ensure the availability of species, which are essential and on which the entire local communities depend socially and economically.

CONCLUSION

Protecting and maintaining the riparian habitats in these regions, especially by preventing forest fires, is essential. Raising awareness among forest-dwelling communities about the ecological significance of these valuable species is crucial, with a focus on discouraging harmful practices such as poisoning. Additionally, creating educational freshwater fish aquariums can foster greater awareness among schools and the public. The study identified 37 fish species in the Chinnar and Thenar rivers and their tributaries, with 43% being endemic to the Western Ghats. These ecologically and economically valuable species underscore the importance of continued conservation efforts in the region.

Table 3. Variation in diversity factors along the different sites of rivers Chinnar and Thenar.

Site / Factor	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14
Richness	16	17	6	12	21	26	13	7	21	10	32	17	17	23
Abundance	389	423	108	205	820	458	139	195	618	205	803	123	106	452
Dominance index	0.1104	0.08952	0.2188	0.2626	0.1014	0.05838	0.08737	0.173	0.07297	0.1757	0.0532	0.06917	0.07296	0.06732
Shannon-Weiner diversity index	2.452	2.596	1.637	1.845	2.547	3.016	2.5	1.848	2.77	1.933	3.139	2.733	2.707	2.885
Simpson Evenness index	0.7256	0.7886	0.8566	0.5275	0.608	0.7851	0.9374	0.9064	0.7601	0.6914	0.721	0.9048	0.8816	0.7785
Margalef richness index	2.515	2.646	1.068	2.066	2.981	4.08	2.432	1.138	3.112	1.691	4.635	3.325	3.431	3.598
Equitability index	0.8843	0.9162	0.9136	0.7426	0.8366	0.9258	0.9748	0.9495	0.9099	0.8397	0.9056	0.9647	0.9555	0.9201

REFERENCES

Arunachalam, M. (2000). Assemblage structure of stream fishes in the Western Ghats (India). *Hydrobiologia* 430: 1–31. https://doi.org/10.1023/A:1004080829388

Biju, C.R., K.R. Thomas & C.R. Ajithkumar (1999). Ecology of hill streams of Western Ghats with special reference to fish communities. Final Report. Bombay Natural History Society, Mumbai, India, 203 pp.

Chandran, R., L.K. Tyagi, A.K. Jaiswar, S. Raizada, S. Mandal, T.S. Mayekar, A.S. Bisht, S.K. Singh & W.S. Lakra (2019). Diversity and distribution of fish fauna in the Ib River, a tributary of Mahanadi, India.

Table 4. Fish species recorded from river Chinnar, Thenar, and Amaravathi indicating the status.

	Taxon	Name of the species	Western Ghats endemic status	IUCN status
1	Order: Cypriniformes	*Haludaria fasciata*	Endemic	LC
2	Family: Cyprinidae	*Haludaria melanampyx*	Endemic	DD
3		*Pethia conchonius*	Non-endemic	LC
4		*Barbodes carnaticus*	Endemic	LC
5		*Salmostoma boopis*	Endemic	LC
6		*Salmostoma acinaces*	Non-endemic	LC
7		*Tor khudree*	Non-endemic	EN
8		*Tor remadevii*	Endemic	EN
9		*Hypselobarbus mussullah*	Endemic	EN
10		*Hypselobarbus dubius*	Endemic	EN
11		*Barilius bendelisis*	Non-endemic	LC
12		*Barilius gatensis*	Endemic	LC
13		*Barilius barna*	Non-endemic	LC
14		*Devario malabaricus*	Non-endemic	LC
15		*Devario aequipinnatus*	Non-endemic	LC
16		*Rasbora dandia*	Non-endemic	LC
17		*Garra mullya*	Non-endemic	LC
18		*Garra mcclellandi*	Endemic	LC
19		*Garra hughi*	Endemic	EN
20		*Garra stenorhynchus*	Endemic	LC
21	Family: Balitoridae	*Bhavania australis*	Endemic	LC
22	Family: Nemacheilidae	*Nemacheilus monilis*	Endemic	LC
23		*Nemacheilus rueppelli*	Endemic	LC
24		*Nemacheilus semiarmatus*	Endemic	LC
25		*Nemacheilus guentheri*	Endemic	LC
26	Family: Cobitidae	*Lepidocephalichthys thermalis*	Non-endemic	LC
27	Order: Siluriformes	*Mystus armatus*	Non-endemic	LC
28	Family: Bagridae	*Mystus cavasius*	Non-endemic	LC
29		*Mystus montanus*	Non-endemic	LC
30	Family: Siluridae	*Ompok bimaculatus*	Non-endemic	NT
31	Order: Perciformes	*Chanda nama*	Non-endemic	LC
32	Family: Ambassidae	*Parambassis ranga*	Non-endemic	LC
33	Family: Cichlidae	*Oreochromis mossambicus*	Introduced	VU
34	Family: Gobiidae	*Glossogobius giuris*	Non-endemic	LC
35	Family: Channidae	*Channa orientalis*	Non-endemic	VU
36		*Channa punctatus*	Non-endemic	LC
37	Order: Synbranchiformes	*Mastacembelus armatus*	Non-endemic	LC
	Family: Mastacembelidae			

Based on Dayal et al. (2014) | https://www.iucnredlist.org: CR—Critically Endangered | EN—Endangered | VU—Vulnerable | NT—Near Threatened | LC—Least Concern | DD—Data Deficient and endemic status level.

Indian Journal of Fisheries 66(1): 92–98. https://doi.org/10.21077/ijf.2019.66.1.70958-12

Cheng D., X. Zhao, J. Song, H. Sun, S. Wang, H. Bai & Q. Li (2019). Quantifying the distribution and diversity of fish species along elevational gradients in the Weihe River basin, northwest China. *Sustainability* 11(21): 6177. https://doi.org/10.3390/su11216177

Dayal, R., S.P. Singh, U.K. Sarkar, A.K. Pandey, A.K. Pathak & R. Chaturvedi (2014). Fish biodiversity of Western Ghats region of India: a review. *Journal of Experimental Zoology* 17(2): 377–399.

Giannetto, D. & D. Innal (2021). Status of endemic freshwater fish fauna inhabiting major lakes of Turkey under the threats of climate change and anthropogenic disturbances: a review. *Water* 13(11): 1534. https://doi.org/10.3390/w13111534

Gibson, G.R., M.T. Barbour, M. Stribling, J. Gerritsen & J.R. Karr (1996). *Biological Criteria: Technical Guidance for Streams and Small Rivers.* Revised edition. University of Washington, WA, 162 pp.

Gordon, T.A.C., H.R. Harding, F.K. Clever, I.K. Davidson, W. Davison, D.W. Montgomery, R.C. Weatherhead, F.M. Windsor, J.D. Armstrong, A. Bardonnet, E. Bergman, J.R. Britton, I.M. Côté, D. D'agostino, L.A. Greenberg, A.R. Harborne, K.K. Kahilainen, N.B. Metcalfe, S.C. Mills, N.J. Milner, F.H. Mittermayer, L. Montorio, S.L. Nedelec, J.M. Prokkola, L.A. Rutterford, A.G.V. Salvanes, S.D. Simpson, A. Vainikka, J.K. Pinnegar & E.M. Santos (2018). Fishes in a changing world: learning from the past to promote sustainability of fish populations. *Journal of Fish Biology* 92: 804–827. https://doi.org/10.1111/jfb.13546

Hammer, O., D.A.T. Harper & P.D. Ryan (2001). PAST: Paleontological Statistic software package for education and data analysis. *Paleontol Eletron* 4(1): 1–9. http://palaeoelectronica.org/2001_1/past/issue1_01.htm

Jayaram, K.C. (1999). *The Freshwater Fishes of the Indian Region*. Narendra Publishing House, New Delhi, xxvii + 551 pp.

Jayaram, K.C. (2010). *The Freshwater Fishes of Indian Region, 2nd Edition*. Narendra Publications, New Delhi. 119 pp.

Johnson, J.A. & M. Arunachalam (2009). Diversity, distribution and assemblage structure of fishes in streams of Southern Western Ghats, India. *Journal of Threatened Taxa* 1(10): 507–513. https://doi.org/10.11609/JoTT.o2146.507-13

Joshi, K.D., V.S. Basheer, A. Kumar, S.M. Srivastava, V. Sahu & K.K. Lal (2021). Alien fish species in open waters of India: appearance, establishment and impacts. *Indian Journal of Animal Sciences* 91(3): 167–173. https://doi.org/10.56093/ijans.v91i3.114139

Kamalkishor, H.N. & K.M. Kulkarni (2009). Fish stupefying plants used by the Gond tribal of Mendha Village of central India.

Kunda, M., D. Ray, D. Pandit & A. Harun-Al-Rashid (2022). Establishment of a fish sanctuary for conserving indigenous fishes in the largest freshwater swamp forest of Bangladesh: A community-based management approach. *Heliyon* 8(e09498): 1–13. https://doi.org/10.1016/j.heliyon.2022.e09498

Margalef, R. (1958). Temporal succession and spatial heterogeneity in phytoplankton, pp. 323–347. In: Buzzati-Traverso (Ed.), *Perspectives in Marine Biology*. University of California Press, Berkeley.

Menon, A.G.K. (1992). The fauna of the adjacent countries. Pisces. Vol. IV. Teleodtei-Cobitoidae. Part 2 Cobitatidae. ZSI, Madras, 600 pp.

Miqueleiz, I., R. Miranda, A.H. Ariño & T. Cancellario (2022). Effective reassessments of freshwater fish species: a case study in a Mediterranean peninsula. *Hydrobiologia* 849: 1339–1349. https://doi.org/10.1007/s10750-021-04644-4.

Pethiyagoda, R. (1991). *Freshwater Fishes of Sri Lanka*. The Wildlife Heritage Trust of Sri Lanka, Colombo, 362 pp.

Prajith, K.K., M.P. Remesan & L. Edwin (2016). Traditional wisdom of fishing techniques and rituals of Kuruman Tribe of Wayanad, Western Ghats. *Asian Agri-History* 20(2): 119–126.

Radhakrishnan, R.C. & K. Roshni (2024). Finfish harvest trends in the Chalakudy River within the Western Ghats biodiversity hotspot in the southwest of India: Finfish harvest trends in the Chalakudy River. *Sustainable Aquatic Research* 3(2): 107–126. https://doi.org/10.5281/zenodo.13341671

Raghavan R., A. Ali, N. Dahanukard & A. Rossera (2011). Is the Deccan Mahseer, *Tor khudree* (Sykes, 1839) (Pisces: Cyprinidae) fishery in the Western Ghats Hotspot sustainable? A participatory approach to stock assessment. *Fisheries Research* 110(1): 29–38. https://doi.org/10.1016/j.fishres.2011.03.008

Rahman, A.K.A (1989). *Freshwater Fishes of Bangladesh*. Zoological Society of Bangladesh. Department of Zoology, University of Dhaka, 364 pp.

Devi, K.D., T.J. Indra, M.B. Ragunathan & M.S. Ravichandran (2005). Fish fauna of Anamalai Hill ranges, Western Ghats, India. *Zoos' Print Journal* 20(3): 1809–1811. https://doi.org/10.11609/JoTT.ZPJ.1164a.1809-11

Sarkar, U.K., B.K. Gupta & W.S. Lakra (2010). Biodiversity, eco hydrology, threat status and conservation priority of freshwater fishes of river Gomti, a tributary of river Ganga (India). *Environmentalist* 30: 3–17. https://doi.org/10.1007/s10669-009-9237-1

Shannon, C.E. & W. Wiener (1963). *The Mathematical Theory of Communication*. Urbana, IL: University of Illinois Press, 127 pp.

Shukla, R. & A. Bhat (2017). Environmental drivers of α-diversity patterns in monsoonal tropical stream fish assemblages: a case study from tributaries of Narmada Basin, India. *Environmental Biology Fish* 100: 749–761. https://doi.org/10.1007/s10641-017-0601-6

Silas, A.G. (1951). On a collection of fish from the Anamalai and Nelliampathi Hill ranges (Western Ghats) with notes on its zoogeographical significance. *Journal of Bombay Natural History and Society* 49(4): 670–681.

Simpson, G.G. (1949). Measurement of diversity. *Nature* 136: 688.

Sokheng, C., C.K. Chhea, S. Viravong, K. Bouakhamvongsa, U. Suntornratana, N. Yoorong, N.T. Tung, T.Q. Bao, A.F. Poulsen & J.V. Jørgensen (1999). Fish migrations and spawning habits in the Mekong mainstream: a survey using local knowledge (basin-wide). Assessment of Mekong fisheries: Fish Migrations and Spawning and the Impact of Water Management Project (AMFC). AMFP Report 2/99. Vientiane, Lao, P.D.R.

Talwar, P.K. & A.G. Jhingran (1991). *Inland Fishes of India and Adjacent Countries, Vol. I & II*. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, 507 pp.

Tickner, D., J.J. Opperman, R. Abell, M. Acreman, A.H. Arthington, S.E. Bunn, S. J. Cooke, J. Dalton, W. Darwall, G. Edwards, I. Harrison, K. Hughes, T. Jones, D. Leclère, A.J. Lynch, P. Leonard, M.E. Mcclain, D. Muruven, J.D. Olden, S.J. Ormerod, J. Robinson, R.E. Tharme, M. Thieme, K. Tockner, M. Wright & L. Young (2020). Bending the curve of global freshwater biodiversity loss: an emergency recovery plan. *BioScience* 70(4): 330–342. https://doi.org/10.1093/biosci/biaa002

Thampy, D.R., M.R. Sethu, M.B. Paul & C.P. Shaji (2021). Ichthyofaunal diversity in the upper-catchment of Kabini River in Wayanad part of Western Ghats, India. *Journal of Threatened Taxa* 13(2): 17651–17669. https://doi.org/10.1016/j.heliyon.2022.e09498

Thomas, R.K., C.R. Biju & C.R. Ajithkumar (1999). Additions to the fish fauna of Pambar River, Kerala. *Journal of the Bombay Natural History Society* 96(2): 332–334.

Valero, A. (2010). *Mating Interference Due to Introduction of Exotic Species,* pp. 412–415. In: Breed, M.D. & J. Moore (eds.). *Encyclopedia of Animal Behavior*. Academic Press Inc.(London) Ltd., 2672 pp.

Vörösmarty, C.J., P.B. McIntyre & M.O. Gessner (2010). Global threats to human water security and river biodiversity. *Nature* 467: 555–561. https://doi.org/10.1038/nature09549

Whitfield, A.K. & M. Elliott (2022). Fishes as indicators of environmental and ecological changes within estuaries: a review of progress and some suggestions for the future. *Journal of Fish Biology* 61 (Supplement A): 229–250. https://doi.org/10.1111/j.1095-8649.2002.tb01773.x

Xie, L.Q., P. Xie, L.G. Guo, L. Li, Y. Miyabara & H.D. Park (2005). Organ distribution and bioaccumulation of microcystins in freshwater fish at different trophic levels from the eutrophic lake Chaohu, China. *Environmental Toxicology* 20(3): 293–300. https://doi.org/10.1002/tox.20120

Zhang, W., D. Huang, R. Wang, J. Liu & N. Du (2016). Altitudinal patterns of species diversity and phylogenetic diversity across temperate mountain forests of northern China. *PLOS ONE* 11(7): e0159995. https://doi.org/10.1371/journal.pone.0159995

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