

Ichthyofaunal Diversity in Selected Lakes of Kodagu District

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Received 12 April, 2024, accepted 31st may , 2024

ABSTRACT

The study was carried out to document the fish diversity in the lakes of Somwarapete taluk of Kodagu district, Karnataka. The study was carried out from June 2021- May 2022. Three Lakes namely, Tavare kere, Dodda kere and Honnamanna kere was selected for the study. The fishes were collected with the help of local fishermen and identified with the help of standard reference material and internet sources. The diversity indices such as Shannon diversity index, Simpson diversity index and Pielou's evenness index were calculated to understand the diversity and distribution of fish species. A total of 17 species, belonging to 13 genera, and 8 families were documented. On evaluating the endemism of the fishes, it was noted that 23% were endemic to Western Ghats, 59% were endemic to Indian Subcontinent, and 18% were exotic taxa. The study also showed the abundance of family Cyprinidae with 41% of taxa, followed by Channiadae and Claridae with 17 and 12% taxa respectively. Simpson diversity index varied from 0.83 (Honnamanna kere) to 0.9 (Tavare kere and Dodda kere), indicating a high diversity and Pielou's evenness with a value of 1 showed that the ecosystem is stable.

Key words: Ichthy fauna, Biodiversity, Fresh water, Simpson diversity index, Kodagu

Introduction

India is one of the megadiversity hotspots of the world which contributes 60-70% of world's biodiversity (Myers *et al.*, 2000; Lakhra and Sarkar 2009). India is reported to be home for more than 2546 fish species, belonging to 969 genera, 254 families and 40 orders, which accounts for more than 10% of global fish diversity (Talwar and Jhingram, 1991).

Western Ghat region of India extends from Gujarat to Kerala, covering a distance of 1600 km² (Dahankur *et al.*, 2011). According to a study conducted by Dahankur *et al.*, (2013), Western Ghats is home for 290 species of fresh water fishes belonging to 11 orders, 33 families and 106 genera. On further classification 189 species were endemic to Western

Ghats, belonging to 7 orders, 23 families and 69 genera (Dahankur *et al.*, 2013).

The freshwater fish diversity of India is not only significant in terms of species richness but also in terms of their adaptations to different habitats. These adaptations include physical, behavioral, and physiological characteristics that enable fish to survive in various freshwater ecosystems, such as rivers, lakes, and reservoirs (Thakur *et al.*, 2021)

Few works are reported from Western Ghats regions and Southern India pertaining to fresh water fishes. They include Rema and Indra, (2000) in Cauvery-Bhavani river complex, Acharya and Iftekhar, (2000) in Tapti river, Arunachalam (2000) in hills of Western Ghats, Dahanukar *et al.*, (2004) in Western Ghats, Heda (2009) in Godavari basin, Shah Nawaz *et al.*, (2010) in Bhadra river, Rankhamb

(2011) in Goadavari river, Mollur (2011) in Agastyamalai region, Bakawale and Kanhere (2013) in Narmada river, Arunkumar *et al.*, (2016) in Cauvery river.

Some fish families reported from Western Ghats include Notopteridae, Anguillidae, Belonidae, Anabantidae, Gobiidae, Mugilidae, Pangasidae, Heteropneustidae, Sisoridae, from Krishna river (Laxmappa *et al.* 2015). The families Anguillidae, Hemiramphidae, Balitoridae, Cobidae, Aplocheilidae, Cichlidae, Mastacembelidae were reported from Ghata Prabha region of Karnataka by Kumkar *et al.*, (2017). The families Anguillidae, Cobidae, Siluridae, Sisoridae Heteropneustidae, Belonidae, Aplocheilidae, Poecilidae, Mastecembalidae, Gobiidae, Anabantidae, were reported by Radhakrishna and Kurup (2010) in Periyar Tiger reserve.

However, only reports available on fish diversity in district include a study on Cauvery river basin by Krishna and Shreepada, (2009) and a study on Chikklihole dam by Krishna (2021). No attempts are made so far, to document the diversity of fresh water fishes in Somwarapete taluk. Hence, an attempt was made to conduct a preliminary screening for fishes in the area.

Materials and Methods

Study area

Samples were collected in three lakes (Table 1) located in Kodagu district, Karnataka state, India (Fig 1). The sample sites were selected based on the influence of anthropogenic activity in and around the re-

gion. The geographical location of the sites was noted with GPS

Data Collection and Documentation

The fishes were collected using fish nets and hooks, with the help of local fishermen. The collected fishes were photographed (model- Canon EOS 1500D) on site. The fishes were preserved in 8% formalin for 48 hours, Followed by which they can be transferred to 5% formalin for further study and identification. Since the fishes were commonly introduced by the fishermen and procured from the fisheries department, the identification was done by taxonomic experts on fishes by referring to the standard literature (Talwar and Jhingran, 1991; Jayaram, 1999). The International Union of Conservation of nature's (IUCN) red list was followed to evaluate the conservation status of the fishes. The author citations were documented from the internet source (Froese and Poley 2020 / Fishbase.org).

Statistical Analysis

The diversity indices were calculated in PAST 4.3 software, The graphs were constructed on MS Excel -2020 version.

Results and Discussion

A total of 17 fishes taxa was documented across 3 lakes (Table 2). The fishes belonged to 8 families, 13 genera and 17 species. The common names and IUCN status of the fishes were also documented (Table 3). The endemic status of the fishes are mentioned in Table 4.

Table 1. Description of sampling sites.

Site	Latitude	Longitude	Depth (m)	Level of anthropogenic activity	Habitat description
Honnamana kere (HK)	12.6208°N	75.8806°E	5	high	The lake is adjacent to a temple, where religious activities are carried out regularly with offerings being thrown into the lakes. They have introduced fish communities.
Dodda kere (DK)	14.73901°N	76.3702°E	8	Moderate	The water body is situated amid the forest and agriculture lands. The lake is used as an water source for irrigation in summer and fishing ground for local
Tavare kere (TK)	12.4555°N	75.957°E	4	High	The lake is situated near to a industrial sewage revulet (about 200 meter). The lake is populated with and <i>Azolla</i> sp., <i>Lemna</i> sp., <i>Ceratophyllum</i> sp. and <i>Salvinia</i> sp.

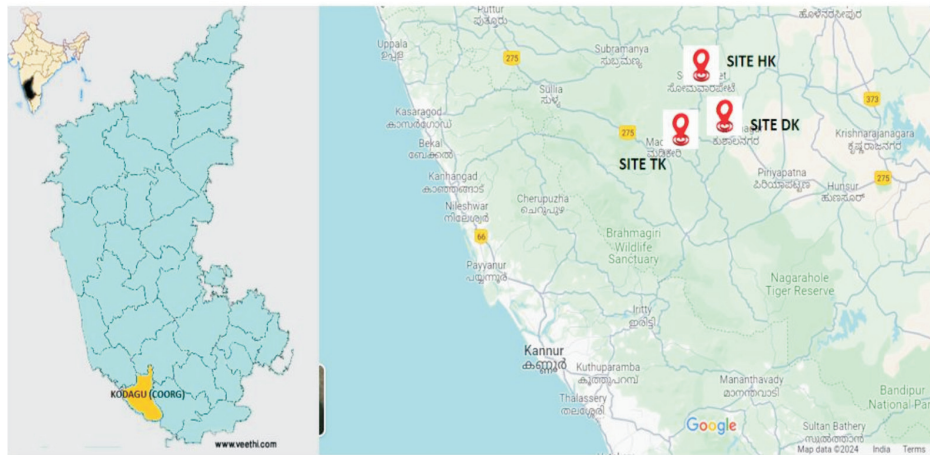


Fig. 1. Study sites (Source : Google maps)

The fishes belongs to families of Anguillidae, Channidae, Cyprinidae, Notopteridae, Cichlidae, Clupeidae, Siluridae, and Claridae. The taxa distribution is as follows, with Cyprinidae with 41% (7 taxa), Channidae 17% (3 taxa), Claridae 12% (2 taxa), followed by Anguillidae, Channidae, Notopteridae, Cichlidae, Clupeidae, and Siluridae 6 % (1 taxa) each (Graph 1).

On evaluating the IUCN status, 18% of total taxa (3) is found to be Vulnerable, 12% of total taxa (2) is Critically Endangered, and 70% (12) is under the Least Concern category (Table 3, Graph 2). On evaluating the endemism of the 17 fishes, 18% of total taxa (3) is found to be Exotic, 23% of total taxa (4) is Endemic to Western Ghats, and 59% (10) is En-

dem to Indian Subcontinent (Table 4, Graph 3).

On analyzing the diversity indices of the three study sites, The dominance index value varied from 0.1 in Tavare kere and Dodda kere, to 0.16 in Honnammana kare. The shanon diversity index varied from 0.9 in Tavare kere and Dodda kere to 0.83 in Honnammana kare. The Simpson diversity index varied from 2.303 in Tavare kere and Dodda kere, to 1.793 in Honnammana kare. The Pielou's evenness index, value was 1 in all sites (Table 5)

Some fishes were exclusive to particular study sites, in Tavare kere we documented, *Channa punctata* (Bloch, 1793), *Channa striata* (Bloch, 1795) *Notopterus notopterus* (Pallas, 1769), *Oreochromis niloticus* (Linnaeus, 1758), *Rutilus rutilus* (Linnaeus,

Table 2. List of fishes in three study sites and their distribution

Sl. No	Scientific name	Tavare kere	Dodda kere	Honnammana kere
01	<i>Anguila anguila</i> (Linnaeus, 1758)	-	+	+
02	<i>Channa punctata</i> (Bloch, 1793)	+	-	-
03	<i>Channa striata</i> (Bloch, 1795)	+	-	-
04	<i>Channa orientalis</i> (Bloch & Scheidner, 1801)	+	+	-
05	<i>Clarias batrachus</i> (Linnaeus, 1758)	-	+	-
06	<i>Clarias gariepinus</i> (Burchell, 1822)	-	+	-
07	<i>Cirrhinus cirrhossus</i> (Bloch, 1795)	-	+	+
08	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	-	+	+
09	<i>Cyprinus carpio</i> (Linnaeus, 1758)	+	-	-
10	<i>Labeo catla</i> (Hamilton, 1822)	+	+	+
11	<i>Labeo rohita</i> (Hamilton, 1822)	+	+	+
12	<i>Mylopharyngodon piceus</i> (Richardson, 1846)	+	+	-
13	<i>Notopterus notopterus</i> (Pallas, 1769)	+	-	-
14	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	+	-	-
15	<i>Rutilus rutilus</i> (Linnaeus, 1758)	+	-	-
16	<i>Tenualosa ilisha</i> (Hamilton, 1822)	-	-	+
17	<i>Wallogo attu</i> (Bloch and Schneider, 1801)	-	+	-

Table 3. List of fishes with common name, family and IUCN status.

Sl.No	Scientific name	Common name	Family	IUCN Status
01	<i>Anguila anguila</i> (Linnaeus, 1758)	European eel	Anguillidae	Critically Endangered
02	<i>Channa punctata</i> (Bloch, 1793)	Spotted snake head	Channidae	Least Concern
03	<i>Channa striata</i> (Bloch, 1795)	Snake head	Channidae	Least Concern
04	<i>Channa orientalis</i> (Bloch and Scheidner, 1801)	Chela	Channidae	Critically Endangered
05	<i>Clarias batrachus</i> (Linnaeus, 1758)	Walking catfish	Clariidae	Least Concern
06	<i>Clarias gariepinus</i> (Burchell, 1822)	Catfish	Clariidae	Least Concern
07	<i>Cirrhinus cirrhossus</i> (Bloch, 1795)	Mrigal carp	Cyprinidae	Vulnerable
08	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	Grass carp	Cyprinidae	Least Concern
09	<i>Cyprinus carpio</i> (Linnaeus, 1758)	Common carp	Cyprinidae	Vulnerable
10	<i>Labeo catla</i> (Hamilton, 1822)	Katla	Cyprinidae	Least Concern
11	<i>Labeo rohita</i> (Hamilton, 1822)	Roho	Cyprinidae	Least Concern
12	<i>Mylopharyngodon piceus</i> (Richardson, 1846)	Black carp	Cyprinidae	Least Concern
13	<i>Notopterus notopterus</i> (Pallas, 1769)	Bronze featherback	Notopteridae	Least Concern
14	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	Nile Tilapia	Cichlidae	Least Concern
15	<i>Rutilus rutilus</i> (Linnaeus, 1758)	Roach fish	Cyprinidae	Least Concern
16	<i>Tenualosa ilisha</i> (Hamilton, 1822)	Hilsa	Clupeidae	Least Concern
17	<i>Wallogo attu</i> (Bloch and Schneider, 1801)	Walaga	Siluridae	Vulnerable

Table 4. List of fishes with their Endemicity

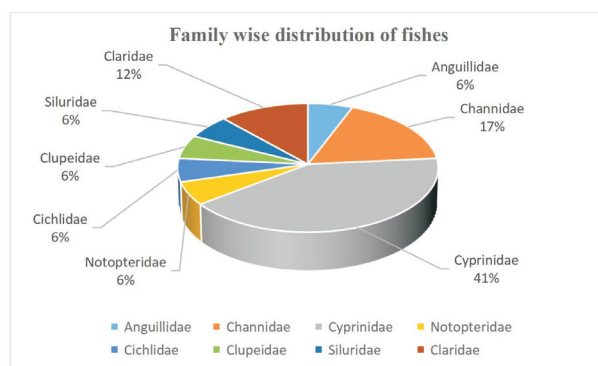
Family	Scientific name	Endemicity
Anguillidae	<i>Anguila anguila</i> (Linnaeus, 1758)	ENWG
Channidae	<i>Channa punctata</i> (Bloch, 1793)	ENIS
	<i>Channa striata</i> (Bloch, 1795)	ENIS
	<i>Channa orientalis</i> (Bloch and Scheidner, 1801)	ENIS
Cyprinidae	<i>Cirrhinus cirrhossus</i> (Bloch, 1795)	ENWG
	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	ENIS
	<i>Rutilus rutilus</i> (Linnaeus, 1758)	EX
	<i>Cyprinus carpio</i> (Linnaeus, 1758)	EX
	<i>Labeo catla</i> (Hamilton, 1822)	ENIS
	<i>Labeo rohita</i> (Hamilton, 1822)	ENIS
	<i>Mylopharyngodon piceus</i> (Richardson, 1846)	ENIS
Notopteridae	<i>Notopterus notopterus</i> (Pallas, 1769)	ENWG
Cichlidae	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	EX
Clupeidae	<i>Tenualosa ilisha</i> (Hamilton, 1822)	ENIS
Siluridae	<i>Wallogo attu</i> (Bloch and Schneider, 1801)	ENWG
Clariidae	<i>Clarias batrachus</i> (Linnaeus, 1758)	ENIS
	<i>Clarias gariepinus</i> (Burchell, 1822)	ENIS

ENWG - Endemic to Western Ghats, ENIS- Endemic to Indian Subcontinent, EX -Exotic.

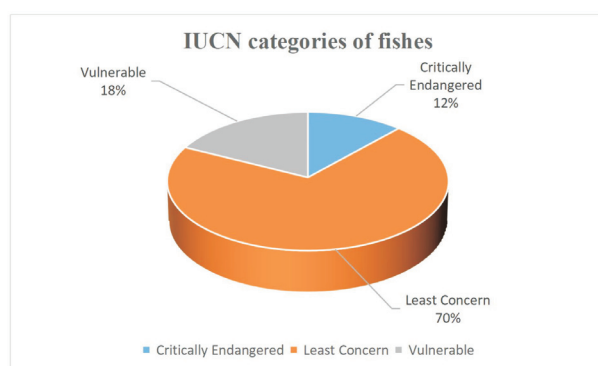
Table 5. Diversity indices of three Lakes

	Tavare kere	Dodda kere	Honnammana kere
Taxa	10	10	6
Individuals	10	10	6
Dominance (D)	0.1	0.1	0.166
Simpson (1-D)	0.9	0.9	0.83
Shannon (H)	2.303	2.303	1.792
Evenness e ^H /S	1	1	1

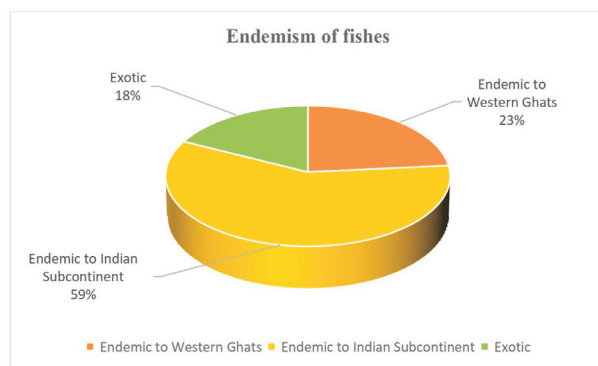
1758), and *Cyprinus carpio* (Linnaeus, 1758). In Dodda kere we documented, *Clarias batrachus* (Linnaeus, 1758), *Clarias gariepinus* (Burchell, 1822), and *Wallogo attu* (Bloch and Schneider, 1801). In Honnammana kere we documented, *Tenualosa ilisha* (Hamilton, 1822). However, some fish taxa were reported from multiple sites, like *Labeo catla* (Hamilton, 1822), and *Labeo rohita* (Hamilton, 1822) were documented in three Lakes (Table 2).



Graph 1. Distribution of fishes as per families.



Graph 2. IUCN categories of fishes.



Graph 3. Endemism status of fishes.

Aquatic diversity is a main component in maintaining the stability of an aquatic ecosystem (Gupta *et al.*, 2008). Fishes are cold blooded chordates, living in water bodies, and contributes to more than one half of vertebrates in the world (Froese and Polly 2020). The scientific studies and documentation of fishes in India started as early as 1800's by Hamilton (1882), and has been extensively studied in 21st century also.

The diversity indices value of our study, reveals information on study sites. The Shannon diversity indice value, which ranges from 1.7 to 2.3 indicates

towards a moderate diversity in study sites (Shannon and Wiener, 1962). The Simpson diversity index value of 0.8 and 0.9 indicates a higher diversity in study sites (Simpson, 1949). The Pielou's evenness value of 1 indicates towards a stable community structure in the ecosystem (Kreb, 1981).

The fishes diversity documented is similar to many works reported in Western Ghats region with Cyprinidae being the major families as reported by Krishna and Shreepadha (2009) in river Cauvery, Laxmappa *et al.*, (2015) in river Krishna, Kumakar *et al.*, (2017) in Ghataprabha, RadhaKrishnan and Kurup (2010) in Periyar Tiger reserve, Kamble and Ganesh, (2016) in Kelageri Lake, Dharwad, Srinivasan *et al.*, (2021) in Tamilnadu region of river Cauvery, Krishna (2021) in Chikklihole dam of Kodagu district, Thampi (2021) in river Kabini, Mogalekekar (2019) in Manimuthar dam.

Some other families with high diversity were Channidae and Claridae as documented in our study area. This has also been reported from workers like Thampi (2021) in Kabini, Srinivasan *et al.*, (2021) in river Cauvery basin and Krishna (2021) in Chikkli hole dam of Kodagu.

Conclusion

With an increasing population and alarmingly decreasing food security, there is an increasing pressure on fishing. Fishes not only serve as an integral part of food chain, but are also bio monitors for the quality of their habitat. This is the first scientific study of the lakes in the taluk, and results serve as a baseline data to develop science backed management plans, for conservation of aquatic biodiversity of the area.

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