



Ichthyofaunal Diversity of Kavvayi Backwaters, Malabar Coast of India: A Preliminary Study

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Authors' contributions

This work was carried out in collaboration among all authors. Authors KAJ and TMVM designed the study, performed the collection, wrote the protocol and wrote the first draft of the manuscript. Authors TV and TG managed the identification of the specimens and the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJFAR/2022/v19i230470

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/90704>

Original Research Article

**Received 08 June 2022
Accepted 17 August 2022
Published 23 August 2022**

ABSTRACT

Fish faunal diversity studies are of great importance for the effective utilization of valuable natural resources and to plan different conservation strategies. Studies on the diversity and richness of fish in Kavvayi backwaters are very rare. Hence, this study is aimed at exploring the fish resources, diversity and species richness of the fish fauna of Kavvayi backwaters of the Kerala coast, which has received very little attention hitherto. Monthly sample collections were made from four stations regularly for a period of one year, and the collection was done by netting with cast net and gill net. A total of 65 species under 51 genera, comprising 36 families belonging to 17 orders of fin fish fauna, were recorded from the Kavvayi backwater. Further studies are required to identify other fish species also and to ascertain the reasons for variations in fish faunal diversity in the Kavvayi backwater ecosystem.

Keywords: *Kavvayi backwater; fish fauna; back water fishery; diversity.*

1. INTRODUCTION

Water resources, including lakes, rivers, canals, reservoirs, ponds, streams, springs, cave waters, floodplains, wetlands, estuaries, coastal lagoons, mangrove creeks, marshes, and swamps, provide habitat for fish, water birds, semi-aquatic animals, and plants, the majority of which are highly endemic and endangered taxa. These dynamic ecosystems are responsible for maintaining a variety of functions, including flood mitigation, nutrient recycling, water purification, and waste management. Furthermore, they are essential for the survival and sustenance of millions of people worldwide [1]. Proper understandings of these habitats and their fauna, especially of ichthyofaunal diversity are of great importance for the effective utilization of the valuable ecosystems and to plan out developmental and successive management programs for their conservation [2]. Fisheries and aquaculture is one of the fastest growing food-producing sector in the world and has played an important part in economic development. As a result, the fisheries industry is crucial to a nation's socioeconomic development. [3]. India ranks third in the world for both captive and aquaculture fisheries, contributing 9.7% of the world's total fish production. Around 14 million people work in the fishing and related industries [4].

Kerala's coastline is notably surrounded by a network of backwaters, which often follow the shoreline parallel. These large bodies of water, called as kayals locally, cover a large region [5]. The Kavvayi backwaters is a long water body of 21 KM in length formed by drainages from four rivers namely Karingote, Nileswaram, Kavvayi, and Peruvamba. This backwater system includes the islets Edayilakad, Madackal, Vadakkekad, Chembantemedu, Oari, Thekkekad, Purathal, and Kockal [6]. The ichthyofaunal diversity is a good indicator of health of aquatic ecosystem and a good piscine diversity represents the balanced ecosystem [7]. Proper understandings of the fish fauna and their habitats are of great importance for the effective utilization of the valuable ecosystem and to plan out developmental and successive management programs for their conservation. Studies on the diversity and richness of ichthyofauna of Kavvayi backwaters are rare. Likewise, fishery resource of Kavvayi back water, Malabar region of Kerala coast has received only little attention hither to. This study aims to explore the fish faunal diversity of Kavvayi back water.

2. MATERIALS AND METHODS

2.1 Study Area

The Kavvayi backwater (12.0929° N and 75.1677° E) is situated in the northern part of Kerala, in Kannur and Kasargod districts and has a permanent connection with the Arabian Sea on both in northern and southern side. At the northern side, it is joined to Arabian Sea with the river mouth at Azhithala, Nileswaram and in the south to the mouth of Palakkode River. There are seven islands in the Kavvayi backwaters, five (Kavvayi, Madakkal, Edayilekkad, Thekkekad and Vadakkekad) having human settlements and two (Kocha Thuruthi and Kurippad Thuruthi) are not inhabited. Study locations are listed in the Table 1 and indicated in the Fig. 1.

Table 1. Study locations

Collection sites	Descriptions
Madakka	12.10434 N, 75.16363 E
Kavvayi	12.10087 N, 75.17528 E
Kavvayi Island	12.09105 N, 75.17148 E
Valiyaparamba	12.08185 N, 75.17608 E

2.2 Collection and Identification of Fishes

Fish were collected from four locations in the Kavvayi backwater (Figs. 2a, 2b, 2c, and 2d) by using gill nets, cast nets, and dragnets, with the help of local fishermen. Monthly collections were taken on a regular basis from all four stations (2020-21). After being cleaned, the fish were preserved in 10% formalin and were examined in detail. Characters were measured and fishes were identified up to the species level, with the help of standard keys given by Day [18], Munro [19], Talwar and Jhingran [10], Jayaram [11], and Fischer and Bianchi [12].

3. RESULTS AND DISCUSSION

In the present study 65 species of fishes belonging to 36 families were collected from the study area. The common name, scientific name, family and the IUCN status of the collected fishes are given in the Table 2. Among them Engraulidae (six species) was the most dominant family followed by Lutjanidae (5), Platycephalidae (4), Leiognathidae (4). Family Cichlidae, Clupeidae, Ophichthidae and Mugilidae having three species, and Ambassidae, Bagridae, Cynoglossidae, Gerreidae, Gobiidae, and Scatophagidae with two species each (Table 3). Out of the 65 species listed 25 species belongs

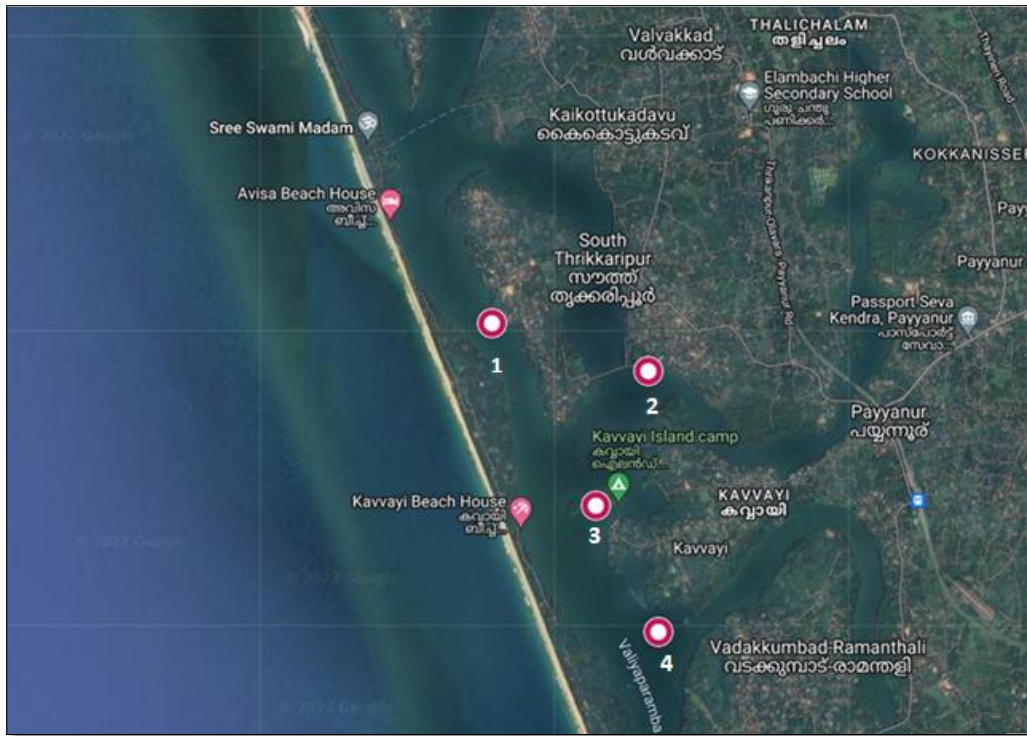


Fig. 1. Map showing study locations

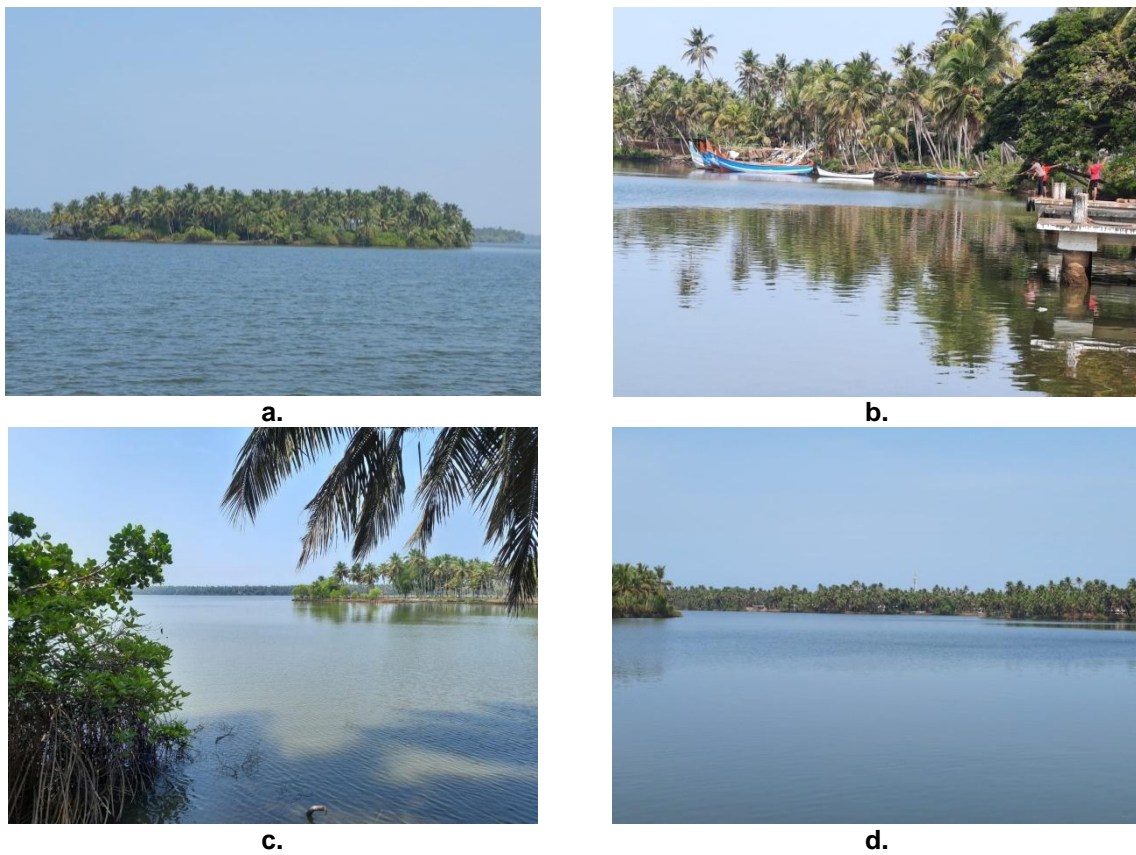


Fig. 2. Collection sites a (Madakka), b (Kavvayi), c (Kavvayi Island) and d (Valiyaparamba)

to the order Perciformes, followed by Clupeiformes (10), Siluriformes (4) and Pleuronectiformes (4). Order Acanthuriformes, Anguilliformes, Cichliformes and Mugiliform having three species each, Beloniformes, Carangiformes, Centrarchiformes, Elopiformes, Gobiiformes, Gonorynchiformes and Mulliformes with one species each. Percentage composition of various fish orders is presented in Fig. 3. The data gathered in this study is anticipated to serve as a baseline for subsequent research on the effects of various factors on the aquatic environment As per the KFRI research report 2014 (16) 68 species of fishes were reported from entire Kavvayi river basin belongs to the order Perciformes with 27 species, followed by Cypriniformes (9), Tetraodontiformes (6) and Siluriformes (4) and Clupeiformes, other orders: Beloniformes, Mugiliformes, Synbranchiformes and Pleuronectiformes having three species, and Cyprinodontiformes and Anguilliformes having

two species each. Order Batrachoidiformes, Scorpaeniformes, Atheriniformes and Lophiformes are with one species each.

According to IUCN status, of the 65 species identified in the present study, 43 species are classified as Least Concern (LC), 4 are vulnerable, 12 have not been evaluated, and 6 are classified as data deficient. Generally, invasive fishes may change the aquatic environment by altering the water quality and may drive native fish to extinction through predation and resource competition [13]. During the present study, one invasive species, *Oreochromis mossambicus*, was collected. Fish life may suffer as a result of environmental changes caused by human activities in backwaters. Chemical pollution, river diversion, and sand mining all have a significant impact on backwater fish species [14-17].

Table 2. Listed common name, scientific name, family of collected fish species during study period and their IUCN status

Sl. No.	Common name	Scientific name	Family	IUCN status
1	Asiatic glassfish.	<i>Ambassis ambassis</i> (Lacepède, 1802)	Ambassidae	LC
2	Bald glassy	<i>Ambassis gymnocephalus</i> (Lacepède 1802)	Ambassidae	LC
3	Thread fin sea catfish	<i>Arius arius</i> (Hamilton 1822)	Ariidae	LC
4	Kerala mystus	<i>Mystus armatus</i> (Day 1865)	Bagridae	LC
5	Long whiskered mystus	<i>Mystus seengtee</i> (Sykes 1839)	Bagridae	LC
6	Coastal trevally	<i>Carangoides coeruleopinnatus</i> (Rüppell 1830)	Carangidae	LC
7	Milkfish	<i>Chanos chanos</i> (Forsskål 1775)	Chanidae	
8	Orange chromide	<i>Pseudotroplus maculatus</i> (Bloch 1795)	Cichlidae	
9	Mozambique tilapia	<i>Oreochromis mossambicus</i> (Peters 1852)	Cichlidae	VU
10	Pearlspot	<i>Etroplus suratensis</i> (Bloch 1790)	Cichlidae	LC
11	Toli shad	<i>Tenuulosa toli</i> (Valenciennes 1847)	Clupeidae	VU
12	Arabian gizzard shad	<i>Nematalosa arabica</i> Regan 1917	Clupeidae	DD
13	White sardine	<i>Escualosa thoracata</i> (Valenciennes 1847)	Clupeidae	LC
14	Malabar tonguesole	<i>Cynoglossus macrostomus</i> Norman 1928	Cynoglossidae	VU
15	Bengal tongue sole	<i>Cynoglossus cynoglossus</i> (Hamilton 1822)	Cynoglossidae	LC
16	Surf perch	<i>Amphistichus</i> sp.	Embiotocidae	LC
17	Moustached thryssa	<i>Thryssa mystax</i> (Bloch & Schneider 1801)	Engraulidae	LC
18	Indian anchovy	<i>Stolephorus indicus</i> (van Hasselt 1823)	Engraulidae	LC
19	Malabar thryssa	<i>Thryssa malabarica</i> (Bloch 1795)	Engraulidae	DD
20	Hamilton's thryssa	<i>Thryssa hamiltonii</i> Gray 1835	Engraulidae	LC
21	Orangemouth anchovy	<i>Thryssa vitrirostris</i> (Gilchrist & Thompson 1908)	Engraulidae	LC

Sl. No.	Common name	Scientific name	Family	IUCN status
22	Short anchovy	<i>Anchoa curta</i> (Jordan & Gilbert 1882)	Engraulidae	LC
23	long-rayed silver biddy	<i>Gerres filamentosus</i> (Cuvier, 1829)	Gerreidae	LC
24	Deep-bodied mojarra	<i>Gerres erythrourus</i> (Bloch 1791)	Gerreidae	LC
25	Racer goby	<i>Babka gymnotrachelus</i> (Kessler, 1857)	Gobiidae	LC
26	Yellowfin goby	<i>Acanthogobius flavimanus</i> (Temminck & Schlegel 1845)	Gobiidae	LC
27	Lutke's halfbeak	<i>Hemiramphus lutkei</i> (Valenciennes, 1847)	Hemiramphidae	NE
28	Günther's catfish	<i>Horabagrus brachysoma</i> (Günther 1864)	Horabagridae	VU
29	False trevally	<i>Lactarius lactarius</i> (Bloch & Schneider 1801)	Lactaridae	NE
30	Barramundi	<i>Lates calcarifer</i> (Bloch 1790)	Latidae	LC
31	Deep pugnose ponyfish	<i>Secutor ruconius</i> (Hamilton, 1822)	Leiognathidae	NE
32	Common Ponyfish	<i>Leiognathus equulus</i> (Forsskal, 1775)	Leiognathidae	LC
33	Twoblotch ponyfish	<i>Nuchequula blochii</i> (Valenciennes 1835)	Leiognathidae	NE
34	Shortnose ponyfish	<i>Leiognathus brevirostris</i> (Valenciennes 1835)	Leiognathidae	NE
35	Mangrove red snapper	<i>Lutjanus argentimaculatus</i> (Forsskål 1775)	Lutjanidae	LC
36	John's snapper	<i>Lutjanus johnii</i> (Bloch 1792)	Lutjanidae	LC
37	Blacktail snapper	<i>Lutjanus fulvus</i> (Forster 1801)	Lutjanidae	LC
38	Mangrove red snapper	<i>Lutjanus argentiventris</i> (Peters 1869)	Lutjanidae	LC
39	Onespot Snapper	<i>Lutjanus monostigma</i> (Cuvier 1828)	Lutjanidae	LC
40	Indo-Pacific tarpon	<i>Megalops cyprinoides</i> (Broussonet, 1782)	Megalopidae	DD
41	Flat-tail mullet	<i>Gracilimugil argenteus</i> (Quoy & Gaimard, 1825)	Mugilidae	NE
42	Flat head grey mullet	<i>Mugil cephalus</i> Linnaeus 1758	Mugilidae	LC
43	Bluespot mullet	<i>Crenimugil seheli</i> (Forsskål 1775)	Mugilidae	LC
44	Sulphur goatfish	<i>Upeneus sulphureus</i> Cuvier 1829	Mullidae	LC
45	Indian pike conger	<i>Congresox talabonoides</i> (Bleeker 1853)	Muraenesocidae	NE
46	Serpent eel	<i>Ophisurus serpens</i> (Linnaeus 1758)	Ophichthidae	LC
47	Snake eel	<i>Muraenichthys gymnopterus</i> (Bleeker 1853)	Ophichthidae	NE
48	Rice-Paddy Eel	<i>Pisodonophis boro</i> (Hamilton, 1822)	Ophichthidae	LC
49	Bartail flathead	<i>Platycephalus indicus</i> (Linnaeus 1758)	Platycephalidae	DD
50	Dusky flathead	<i>Platycephalus fuscus</i> (Cuvier 1829)	Platycephalidae	NE
51	Southern bluespotted flathead	<i>Platycephalus speculator</i> (Klunzinger 1872)	Platycephalidae	NE
52	Small-eyed flathead	<i>Cymbacephalus bosschei</i> (Bleeker 1860)	Platycephalidae	NE
53	Peppered flounder	<i>Paralichthodes algoensis</i> (Gilchrist 1902)	Pleuronectidae	LC
54	Indian pellona	<i>Pellona ditchela</i> Valenciennes, 1847	Pristigasteridae	LC
55	Spotted scat	<i>Scatophagus argus</i> (Linnaeus)	Scatophagidae	LC
56	Spotbanded scat	<i>Selenotoca multifasciata</i> (Richardson 1846)	Scatophagidae	LC
57	Southern meagre	<i>Argyrosomus hololepidotus</i> (Lacepède, 1801)	Sciaenidae	DD
58	Indo-Pacific king mackerel	<i>Scomberomorus guttatus</i> (Bloch & Schneider 1801)	Scombridae	DD
59	Malabar grouper	<i>Epinephelus malabaricus</i>	Serranidae	LC

Sl. No.	Common name	Scientific name	Family	IUCN status
60	Vermiculated spinefoot	<i>Siganus vermiculatus</i> (Bloch & Schneider, 1801)	Siganidae	LC
61	Silver sillago	<i>Sillago sihama</i> (Forsskål 1775)	Sillaginidae	LC
62	Oriental sole	<i>Brachirus orientalis</i> (Bloch & Schneider 1801)	Soleidae	LC
63	TheYellowtail Barracuda	<i>Sphyraena obtusata</i> (Cuvier, 1829)	Sphyraenidae	NA
64	Jarbuga terapon	<i>Terapon jarbuga</i> (Forsskål 1775)	Terapontidae	LC
65	Largehead hairtail	<i>Trichiurus lepturus</i> (Linnaeus 1758)	Trichiuridae	LC

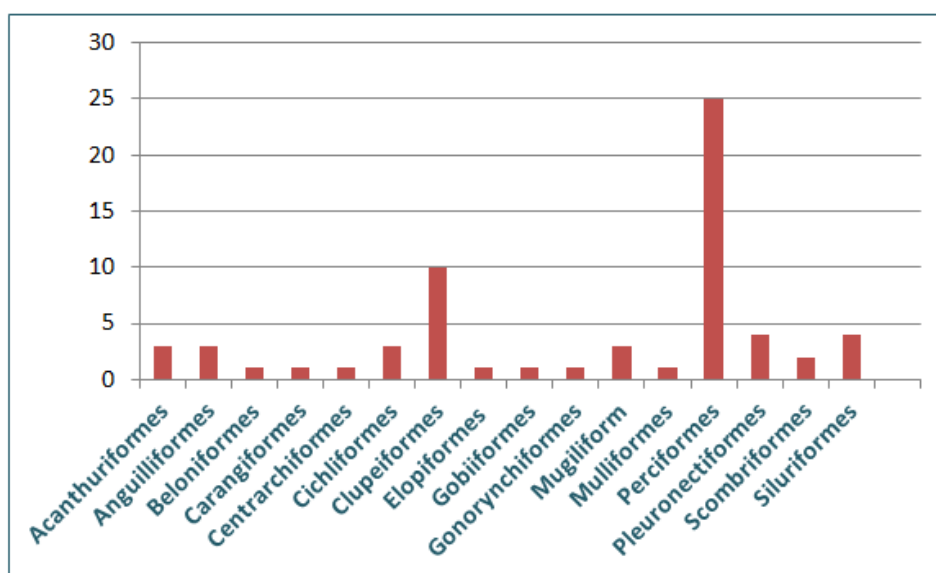


Fig. 3. Percentage composition of various orders of fishes in Kavvayi backwater

Table 3. Composition of various family of fishes in Kavvayi back water

Sl. No.	Family	Number
1	Ambassidae	2
2	Ariidae	1
3	Bagridae	2
4	Carangidae	1
5	Chanidae	1
6	Cichlidae	3
7	Clupeidae	3
8	Cynoglossidae	2
9	Embiotocidae	1
10	Engraulidae	6
11	Gerreidae	2
12	Gobiidae	2
13	Hemiramphidae	1
14	Horabagridae	1
15	Lactaridae	1
16	Latidae	1
17	Leiognathidae	4
18	Lutjanidae	5

Sl. No.	Family	Number
19	Megalopidae	1
20	Mugilidae	3
21	Mullidae	1
22	Muraenesocidae	1
23	Ophichthidae	2
24	Platycephalidae	5
25	Pleuronectidae	1
26	Pristigasteridae	1
27	Scatophagidae	2
28	Sciaenidae	1
29	Scombridae	1
30	Serranidae	1
31	Siganidae	1
32	Sillaginidae	1
33	Soleidae	1
34	Sphyrnidae	1
35	Terapontidae	1
36	Trichiuridae	1

4. CONCLUSION

The Kavvayi backwater is the third-largest water body in Kerala and are rich in religious, ecological, genetic, environmental, and economic potentials. The current study was carried out to establish an inventory of fish faunal diversity in this major ecotone location. The diversity of the ichthyofauna is a reliable measure of the health of the aquatic ecosystem. A diverse fish population indicates a healthy ecosystem. In the present study, 65 species of fishes belonging to 36 families were collected from the study area. Among them engraulidae was the most dominant family followed by Lutjanidae, Platycephalidae, Leiognathidae, Cichlidae and Clupeidae. The data gathered in this study will serve as a baseline for future research on the effects of numerous influences on the aquatic environment. The current research and development plan is insufficient for the conservation, development, and management of this complex aquatic environment. In view of the increasing strain that various human activities are putting on water resources, an effective use of the data of present study in policy development, management, research, and conservation measures on many levels, further studies would help to the much attention to this vulnerable ecosystem. Continuous monitoring is required to preserve the diversity of fish in this aquatic ecosystem.

ACKNOWLEDGEMENTS

The authors are thankful to the Head, Department of Zoology and Principal,

Government College Kasaragod, for continuous help, support and motivation during research work

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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