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Checklist and conservation status of freshwater finfishes of Kole Wetlands a Ramsar Site in Kerala, India

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ABSTRACT: Checklist of fishes of Kole wetlands, a Ramsar site in Kerala is presented along with their scientific names, IUCN Red List status and endemism. Fifty three freshwater fish species were recorded from the Kole wetlands of Kerala comprising of twelve orders and nineteen families. Majority of the fishes were from order Cypriniformes and family Cyprinidae. As per IUCN Red list category, five fishes are vulnerable and one is in near threatened category list. Among the fifty three fishes, seven species of Kerala region and ten species of Western Ghats region are endemic to the respective places. Two endemic species of Kerala and two from Western Ghats are in threatened category.

Key words: Freshwater fishes, IUCN, Kole Wetlands, Ramsar Site

Wetlands are critical habitats for many plants and animals including numerous threatened species. They provide vital and valuable ecosystem services such as flood control and the maintenance of water quality (Van der Valk, 2006). Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They mainly occurs where the water table is at or near the surface of the land or where the land is covered by water. Some of the wetlands are among the most productive systems in the planet (Leith, 1975). Wetlands have been described both as the kidneys of the landscape and biological supermarkets. This is because of the functions they perform in the hydrological and chemical cycles and because of the extensive food webs and the rich biodiversity that they support (Mitsch and Gosselink, 1993).

According to Ramsar convention, Kole wetlands of Kerala come under Vembanad-Kol wetland, the largest brackish and humid tropical wetland ecosystem on the southwest coast of India, fed by ten rivers. It is renowned for clams and its the third largest waterfowl population in India during the winter (RCS, 2013). Over ninety species of resident birds and fifty species of migratory birds from different regions comes for nesting and feed (Nameer, 2002).

The Kole lands remains submerged for about six months under flood water in a year and the ecosystem structure and process are determined by both terrestrial and water related properties influenced by the seasonal alteration which in turn give rise to various provisioning services. The Kole lands contains about 233.74 mm³ of water, which is in fact more than Chimmony and Peechi dams which is providing the water for the irrigation of its summer crop. The Kole lands are mainly fed by the flood waters of two rivers Kechery and Karuvannur which finally drains into the sea as the lands lies parallel to the sea.

The major threats to this pristine wetlands are agricultural intensification due to the double cropping, various types of engineering interventions, infrastructural developments, conversion of Kole lands for non-agricultural uses and facilitated mining and other activities (Srinivasan, 2010). Kole wetlands are also facing many other problems like over exploitation, water pollution, flow modification, habitat degradation and invasion by exotic species.

Present study had provided a comprehensive account of finfish of Kole wetland. Information on diversity resources will serve as pre requisite information for conservation and management of this bio-diverse area.

MATERIALS AND METHODS

Kole wetlands are vast area of freshwater region spread in both Thrissur and Malappuram districts of Kerala (Fig.1). This Ramsar site includes mainly paddy fields, associated rivers and canals. Kole lands in Thrissur and Malappuram districts cover an area of about 13,632 hectares (ha) within the Vembanad-Kol wetland ecosystem. 'Kole' is a particular type of rice cultivation in the low lying water logged paddy fields. Kole lands extend from the northern bank of Chalakudy River to the southern bank of Bharatapuzha River in the north. They are low lying tracts located 0.5 to 1 m below mean sea level located between 10° 20' and 10°40' N Latitude and between 75°58' and 76°11' E Longitude.

Collection and preservation of sample

To understand the diversity and distribution of finfishes of Kole wetlands, fish specimens were collected from the selected sites namely Nedupuzha, Konthipulam, Choondal and Uppungalkadavu on weekly basis. Specimens of finfishes were collected during active hours of fish auction. Study was carried out for a period of 12 months from August 2016 to July 2017. Specimens were collected from all the fishing gears operated in the sites. Cast net, gill net of different mesh sizes from 16 to 32 cm, traditional gears like *ottal* and *koodu* are the major fishing gears operated in the area. Fishermen used to bring all the fishes and shellfishes to the landing centers. Most of the time they sort their fish catch at shore. This practice makes the fishery a discard free fishery and ensure recording of all fishes caught during fishing operation. After sorting out the catch on group/genus/species wise, specimens were numbered and weighed to nearest gram. Number and weight of each group/ genus/ species were recorded. Area, date, time and fishing gear used for catching the fish were also recorded to calculate the effort spend for each fishing operation. Photograph of each specimen were taken immediately after collection. The specimens collected from the sampling sites were brought to the laboratory. Various parameters for taxonomic studies of finfish and shell fish were recorded. Specimens collected from the field station were

brought to the Fishery Biology laboratory of Department of Fisheries Resource Management. Specimens were labeled and preserved in 10% formalin for future use. Experimental fishing using cast net were carried out in all locations to ensure the recording of all fish fauna of the wetlands. Data collected through experimental fishing were supplemented to the data collected from the landing centres. The collected specimens were then identified up to species level using standard references (Day, 1878; Munro, 1955; FAO, 1984; Jayram, K.C., 1999; Fricke *et al.*, 2022) and arranged systematically following Nelson (2016). International Union for Conservation of Nature (IUCN) status of the species was checked with IUCN (2021). Endemic nature of the species was checked following Bijukumar *et al.* (2015) and presented (Table 1).

RESULTS AND DISCUSSION

Present study on diversity of finfishes carried out during 2016-17 identified fifty-three finfish species from Kole wetlands of Kerala (Table 1). As showed in Table 1 finfishes belonging to twelve Orders, nineteen Families, from thirty-seven genera with fifty three species were recorded. Majority of the fishes are from order Cypriniformes and family Cyprinidae. As per IUCN, five fishes are vulnerable and one is in near threatened category (IUCN, 2021). Among the fifty-three fishes recorded, seven species are endemic to Kerala and ten species endemic to Western Ghats region. From Kole wetlands two fishes endemic to Kerala and two endemic to Western Ghats region are in threatened category. This emphasise the importance of conservation of the freshwater fishes and their habitats. Presence of exotic species like *Ctenopharyngodon idella*, *Cyprinus carpio*, *Oreochromis niloticus* in the Kole wetlands is an indication of the vulnerability of the ecosystem to the intruder species.

Results of the present study was compared with the results of earlier workers and presented in Table 2. Kadhar (1993) reported occurrence of thirty-six species from Kole wetlands of Trichur. John Thomas *et al.* (2003) reported twenty-five species of fishes from Muriyad wetlands. Johny *et al.* (2012) studied

Table 1: Checklist of fishes of Kole wetlands

	IUCN STATUS	COMMON NAME	ENDEMISM
I. ORDER: ANGUILLIFORMES			
I.a. FAMILY: ANGUILLIDAE			
1. <i>Anguilla bicolor</i>	NT	Shortfin Eel	–
II. ORDER: CLUPEIFORMES			
II. a. FAMILY: CLUPEIDAE			
2. <i>Dayella malabarica</i>	LC	Day's Round Herring	Kerala
3. <i>Ehirava fluviatilis</i>	DD	Malabar sprat	–
III. ORDER: CYPRINIFORMES			
III. FAMILY: CYPRINIDAE			
4. <i>Puntius mahecola</i>	DD	Mahecola barb	Kerala
5. <i>Puntius chola</i>	LC	Chola Barb	–
6. <i>Puntius parrah</i>	LC	Parrah Barb	Kerala
7. <i>Puntius vittatus</i>	LC	Green stripe barb	–
8. <i>Dawkinsia filamentosa</i>	LC	Filament Barb	Western ghats
9. <i>Systomus sarana</i>	LC	Olive barb	Western ghats
10. <i>Amblypharyngodon microlepis</i>	LC	Indian Carplet	–
11. <i>Amblypharyngodon melettinus</i>	LC	Silver Carplet	–
12. <i>Neochela dadiburjori</i>	LC	Burjor's Brilliance (Dadio)	Kerala
13. <i>Pethia punctata</i>	LC	Dotted sawfin Barb	Western ghats
14. <i>Horadandia brittani</i>	NE	Glass Carplet	–
15. <i>Rasbora dandia</i>	NE	Blacklinerasbora	–
16. <i>Devario malabaricus</i>	LC	Giant Danio	Western ghats
17. <i>Ctenopharyngodon idella</i>	EXO	Grass carp	–
18. <i>Cyprinus carpio</i>	EXO	Common Carp	–
19. <i>Labeo catla</i>	LC	Catla	–
20. <i>Labeo rohita</i>	LC	Rohu	–
21. <i>Labeo dussumieri</i>	LC	Malabar Labeo	–
22. <i>Cirrihinus mrigala</i>	LC	Mrigal	–
IV. ORDER: CYPRINODONTIFORMES			
IV. a. FAMILY: APLOCHEILIDAE			
23. <i>Aplochelys lineatus</i>	NE	Striped panchax	–
24. <i>Aplochelys blockii</i>	NE	Green panchax	–
IV. b. FAMILY: COBITIDAE			
25. <i>Lepidocephalichthys thermalis</i>	LC	Common spiny loach	–
V. ORDER: SILURIFORMES			
V. a. FAMILY: SILURIDAE			
26. <i>Wallago attu</i>	VU	Helicopter catfish	–
27. <i>Ompok malabaricus</i>	LC	Butter Catfish	Western ghats
V. b. FAMILY: PANGASIIDAE			
28. <i>Pangasius pangasius</i>	LC	Pangas catfish	–
V. c. FAMILY: HORABAGRIDAE			
29. <i>Horabagrus brachysoma</i>	VU	Günther's Catfish	Western ghats
V. d. FAMILY: BAGRIDAE			
30. <i>Mystus oculatus</i>	LC	Malabar Mystus	Western ghats
31. <i>Mystus vittatus</i>	LC	Striped Mystus	–
32. <i>Mystus gulio</i>	LC	Long whiskered catfish	–
33. <i>Mystus armatus</i>	LC	Kerala mystus	–
V. e. FAMILY: HETEROPNEUSTIDAE			
34. <i>Heteropneustes fossilis</i>	LC	Stinging catfish	–
VI. ORDER: GOBIIFORMES			
VI. a. FAMILY: GOBIIDAE			
35. <i>Glossogobius giuris</i>	LC	Bareye Goby	–
VI. b. FAMILY: AMBASSIDAE			
36. <i>Parambassis dayi</i>	LC	Day's glassy perchlet	–

37. <i>Parambassis thomassi</i>	LC	W. Ghatglassy perchlet	Western ghats
VII. ORDER: CICHLIFORMES			
VII. a. FAMILY: CICHLIDAE			
38. <i>Etroplus suratensis</i>	LC	Green Chromide	–
39. <i>Pseudotroplus maculatus</i>	LC	Orange chromide	–
40. <i>Oreochromis niloticus</i>	EXO	Tilapia	–
VIII. ORDER: BELONIFORMES			
VIII. a. FAMILY: HEMIRAMPHIDAE			
41. <i>Hyporhamphus xanthopterus</i>	VU	Red tipped half beak	Kerala
42. <i>Xenentodon cancila</i>	LC	Freshwater garfish	–
IX. ORDER: SYBRACHIFORMES			
IX. a. FAMILY: MASTACEMBELIDAE			
43. <i>Macrogathus guentheri</i>	LC	Malabar spiny eel	Western ghats
44. <i>Mastacembelus armatus</i>	LC	Spiny eel	Kerala
X. ORDER: ANABANTIFORMES			
X.a. FAMILY: ANABANTIDAE			
45. <i>Anabas testudineus</i>	DD	Climbing perch	–
XI. ORDER: OSPHRONEMIDAE			
XI. a. FAMILY: OSPHRONEMIDAE			
46. <i>Pseudosphromenus cupanus</i>	LC	Spiketail Paradise Fish	–
47. <i>Pseudosphromenus dayi</i>	VU	Day's Paradise Fish	Kerala
XII. ORDER: ANABANTIFORMES			
XII. a. FAMILY: CHANNIDAE			
48. <i>Channa striata</i>	LC	Snakehead Murrel	–
49. <i>Channa pseudomarulius</i>	NE	Great snakehead	–
50. <i>Channa gachua</i>	LC	Dwarf Snakehead	–
51. <i>Channa punctata</i>	LC	Spotted snakehead	–
XII. b. FAMILY: NANDIDAE			
52. <i>Nandus nandus</i>	LC	Gangetic leaf fish	–
XIII. ORDER: TETRAODONTIFORMES			
XIII. a. FAMILY: TETRAODONTIDAE			
53. <i>Carinotetraodon travancoricus</i>	VU	Malabar Pufferfish	Western ghats

Table 2: Comparison of this study with the later studies in Kole wetlands

Sl.No.	Species	Khadar, 1993	Thomas <i>et al.</i> , 2003	Johny <i>et al.</i> , 2012	Present study
1	<i>Anguilla bicolor</i>	+	+	-	+
2	<i>Dayella malabarica</i>	-	-	+	+
3	<i>Ehirava fluviatilis</i>	-	-	-	+
4	<i>Puntius mahecola</i>	-	-	-	+
5	<i>Puntius chola</i>	+	+	+	+
6	<i>Puntius parrah</i>	-	+	+	+
7	<i>Puntius vittatus</i>	+	+	+	+
8	<i>Dawkinsia filamentosa</i>	+	+	+	+
9	<i>Systomus sarana</i>	+	-	+	+
10	<i>Amblypharyngodon microlepis</i>	+	-	-	+
11	<i>Amblypharyngodon melettinus</i>	+	-	+	+
12	<i>Neochela dadiburjori</i>	-	-	-	+
13	<i>Pethia punctata</i>	-	-	-	+
14	<i>Horadandia brittani</i>	-	-	-	+
15	<i>Rasbora dandia</i>	+	+	+	+
16	<i>Devario malabaricus</i>	-	-	+	+
17	<i>Ctenopharyngodon idella</i>	-	-	-	+
18	<i>Cyprinus carpio</i>	-	-	-	+
19	<i>Labeo catla</i>	-	-	+	+

20	<i>Labeo rohita</i>	-	-	+	+
21	<i>Labeo dussumieri</i>	-	-	-	+
22	<i>Cirrihinus mrigala</i>	-	-	-	+
23	<i>Aplocheilichthys lineatus</i>	+	-	+	+
24	<i>Aplocheilichthys blockii</i>	-	-	-	+
25	<i>Lepidocephalichthys thermalis</i>	+	-	+	+
26	<i>Wallago attu</i>	+	-	-	+
27	<i>Ompok malabaricus</i>	+	-	-	+
28	<i>Pangasius pangasius</i>	-	-	-	+
29	<i>Horabagrus brachysoma</i>	+	+	-	+
30	<i>Mystus oculatus</i>	+	+	+	+
31	<i>Mystus vittatus</i>	+	-	-	+
32	<i>Mystus gulio</i>	-	-	-	+
33	<i>Mystus armatus</i>	-	-	-	+
34	<i>Heteropneustes fossilis</i>	+	-	+	+
35	<i>Glossogobius giuris</i>	+	+	+	+
36	<i>Parambassis dayi</i>	-	-	+	+
37	<i>Parambassis thomassi</i>	+	+	+	+
38	<i>Etroplus suratensis</i>	+	+	+	+
39	<i>Pseudotropheus maculatus</i>	+	+	+	+
40	<i>Oreochromis niloticus</i>	-	-	-	+
41	<i>Hyporhamphus xanthopterus</i>	-	-	-	+
42	<i>Xenentodon cancila</i>	+	+	+	+
43	<i>Macrogynathus guentheri</i>	+	+	+	+
44	<i>Mastacembelus armatus</i>	-	+	-	+
45	<i>Anabas testudineus</i>	+	+	+	+
46	<i>Pseudosphromenus cupanus</i>	+	-	+	+
47	<i>Pseudosphromenus dayi</i>	-	-	-	+
48	<i>Channa striata</i>	+	+	-	+
49	<i>Channa pseudomarulius</i>	-	+	-	+
50	<i>Channa gachua</i>	+	-	-	+
51	<i>Channa punctata</i>	-	-	-	+
52	<i>Nandus nandus</i>	+	+	+	+
53	<i>Carinotetraodon travancoricus</i>	-	+	+	+
54	<i>Oreochromis mossambicus</i>	+	-	-	-
55	<i>Mastacembelus malabaricus</i>	-	-	-	-
56	<i>Hyporhamphus limbatus</i>	+	-	+	-
57	<i>Puntius amphibius</i>	+	-	+	-
58	<i>Puntius ticto</i>	+	-	+	-
59	<i>Puntius melanostigma</i>	+	-	-	-
60	<i>Danio aequipinnatus</i>	+	+	-	-
61	<i>Esomus danricus</i>	+	+	-	-
62	<i>Chela labuca</i>	+	-	-	-
63	<i>Mystus malabaricus</i>	-	-	-	-
64	<i>Aplocheilichthys dayi</i>	-	+	-	-
65	<i>Aplocheilichthys rubrostigma</i>	+	-	-	-
66	<i>Mystus montanus</i>	-	-	+	-
67	<i>Awaous gutum</i>	-	-	+	-
68	<i>Sicyopterus griseus</i>	-	-	+	-
69	<i>Liza parsia*</i>	-	-	+	-
70	<i>Mugil cephalus*</i>	-	-	+	-
71	<i>Caranx carangus*</i>	-	+	-	-
72	<i>Lutjanus argentimaculatus*</i>	-	+	-	-
	TOTAL	36,	25	34	53

*Visitors from estuary + Present - Absent

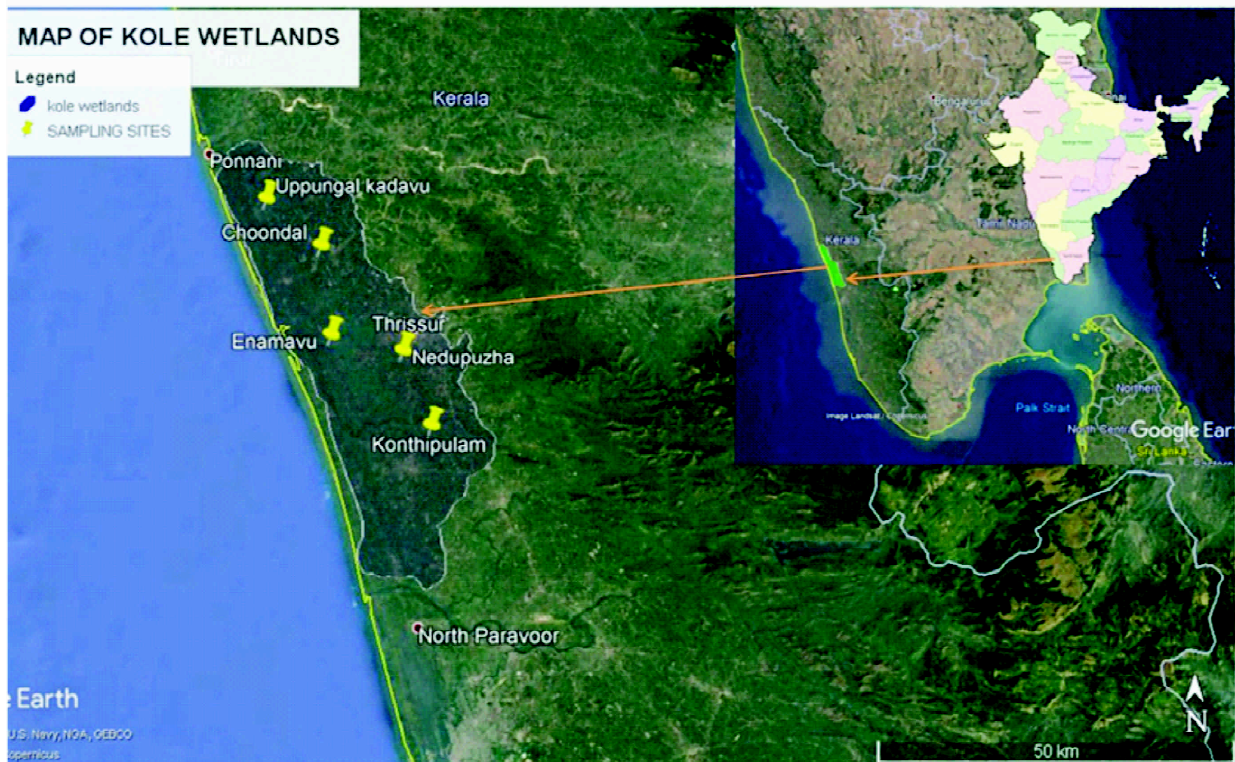


Fig. 1: Map of Kole Wetlands

*Source:Google earth

fish bio-diversity and hydrographical parameters of Kole wetlands reported thirty-four species of fishes. Present study recorded the presence of seventy two species of finfishes (fifty-three recorded during present study and nineteen by earlier workers). Present study is carried out in the sites where the water body is purely freshwater throughout the year. However, when comparing to earlier workers, present study recorded more number of finfishes from Kole wetland.

CONCLUSION

Wetlands are providing shelter to more fauna and flora hence conservation of this ecologically fragile ecosystem is the need of hour. The central and state governments should take necessary steps for the conservation of wetlands. Government and other agencies need to take initiatives to protect the Kole wetlands and preserve the biodiversity of this fragile ecosystem. Conservative measures like banning the ootha fishing a monsoon fishing practice when the

brooders migrate to Kole lands for breeding purpose (Shaji and Laladhas, 2013), check on over fishing and unregulated fishing in the freshwater ecosystems. Major steps are to be taken against the pollution and land filling in the Kole wetlands by the authorities.

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