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Freshwater fish fauna of Peechi-Vazhani Wildlife Sanctuary, Western Ghats of Kerala, India

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ABSTRACT: Fish diversity of Peechi-Vazhani Wildlife Sanctuary in Kerala was studied during the period from January 2018 to December 2020. Fishes comprised of 53 species belonging to 11 Orders, 19 Families and 39 genera were recorded during the study. Family Cyprinidae were the most dominant group represented by 25 species belonging to 19 genera, followed by Cichlidae (4 species) and Channidae and Nemachelidae (3 species each) respectively. According to IUCN status, one species (*Mesonoemachelius herrei*) were 'critically endangered' (CR), four were 'Near Threatened' (NT), one species was 'Endangered' (EN) and one species is listed as 'Vulnerable' (VU). Further, data on one species were listed as 'Data deficient' (DD), and six species was found to be exotic species. The results of the study were represented in the form of a checklist of the freshwater fish fauna of the Peechi-Vazhani Wildlife Sanctuary together with remarks on risks and conservation requirements.

Key words: Diversity, freshwater fishes, wildlife sanctuary, Western Ghats

The Western Ghats of India has a rich freshwater fish fauna with a high level of endemism (Shaji *et al.*, 2000; Dahanukar *et al.*, 2004). However, current knowledge of the threats faced by Western Ghats fishes suggests that a major part of the fauna is threatened by human activities and invasive alien fish species (Dahanukar *et al.* 2004). Peechi-Vazhani Wildlife Sanctuary (WLS) situated in Thrissur District, Kerala (10°30'-10°42'N & 76°15'-76°27'E), is about an area of 125 km² (Fig. 1). It is bordered by the Chimmony WLS on the east and the forests of Palakkad division on the north. The terrain is undulating and the altitude varies from 100 m to 914 m above mean sea level. The reservoir of Peechi dam is located in this area. Peechi-Vazhani WLS presents a remarkable diversity in vegetation and forest types. Semi-evergreen forests are usually found at relatively lower elevations and occur as a transition zone between moist deciduous and evergreen forests (Mathew *et al.*, 2005). A considerable portion of the forest area in this region has been converted to teak and eucalyptus plantations by the forest department. The area was declared as a WLS in the year 1958. The fishery and allied activities of the reservoir was practiced/monitored by SC/ST Co-operative society, Peechi Reservoir, Thrissur. The Peechi Reservoir is located within the Peechi-Vazhani WLS and is exempt from

any fishery enhancement programmes. Not many studies have been made on the ichthyofauna of Peechi-Vazhani WLS except Thomas *et al.* (2000a). Few studies were conducted about the fish fauna of Kerala's wildlife sanctuaries and reserved forests including the Aralam WLS (Shaji *et al.*, 1995), Neyyar and Idukki WLS (Thomas *et al.*, 2000b), Parambikulam WLS (Biju *et al.*, 1999), Karimpuzha WLS (Baby *et al.*, 2010), Periyar Tiger Reserve (Radhakrishnan and Kurup, 2010) and Achankovil Reserve Forest (Baby *et al.*, 2011). Hence present study made an attempt to collect the fish specimens from the area, identify and present a checklist of the fishes inhabiting in Peechi-Vazhani WLS. Identification of the significant risks to the fish fauna and recommendation of appropriate conservation methods are the other goals of the current study.

MATERIALS AND METHODS

The sampling was carried out at twenty-eight locations based on the ecosystem's elevation and regional variations (Table 1). Fish were captured using gillnets, cast nets, and scoop nets with varying mesh sizes at all sample sites. All of the fish that gathered were identified and photographed while they alive. Samples were supplemented with the catches of fishermen and tribal community. Fish

samples were fixed in 99% ethanol for molecular studies and preserved in 5% formaldehyde for further studies. Fishes were identified after referring to Jayaram (2010) and Nelson *et al.* (2016). The valid nomenclature of species was adopted as per the Eschmeyer's Catalog of Fishes of the California Academy of Sciences (Fricke *et al.*, 2021). The voucher specimens obtained have been submitted to the Department of Fisheries Resource Management, Kerala University of Fisheries and Ocean Studies, Kochi, Kerala, India. Samples collected during pre-monsoon, monsoon, and post-monsoon seasons of the study period were grouped to understand seasonal variability. IUCN Red List status of the species and population trend were categorised following IUCN (2020). Personal interviews and discussions with a focus group of Kerala State Forest and Wildlife Department field staff and fishermen were conducted to understand changes occurred in the habitat and effect of these changes on the ichthyofaunal biodiversity.

RESULTS AND DISCUSSION

A total of 53 fish species belonging to 11 Orders, 19 Families (Fig 3) and 39 genera were recorded from the Peechi-vazhani WLS (Table 2). Checklist of species recorded during study were arranged systematically following Nelson *et al.* (2016) and Fricke *et al.* (2021) and presented as Table 2. As showed in Table 2, Order Cypriniformes dominated with 29 species (55%), followed by Anabantiformes and Siluriformes (10%) respectively and Cichliformes (8%)(Fig 2). Cypriniformes fishes were represented by three families (Cyprinidae, Nemacheilidae, Cobitidae). As per the IUCN Red List of Threatened Species, the majority of the fish species found in the study region were classified as 'Least Concern' (IUCN 2020). It was observed that one species (*Mesonoemacheilus herrei*) were 'critically endangered' (CR), four were 'Near Threatened' (NT), one species was 'Endangered' (EN) one species is listed as 'Vulnerable' (VU) and one species were listed as 'Data deficient' (DD) (Fig 4). Six exotic species has reported during the study. The observation of present investigation shows that the population trend for five species

(*Mesonoemacheilus herrei*, *Aplocheilichthys lineatus*, *Clarias dussumieri*, *Epiplatys suratensis* and *Tetraodon lineatus*) is decreasing, while the population trend for sixteen species is stable and one species (*Horadandia brittani*) trend was not evaluated. The population trend for the other species recorded from the WLS is unknown (Fig 5). The number of species changes significantly as elevation changes and moreover elevation increases, the number of species decreases (Fig 6). The distribution of *Mesonemachilus spp.* has been noticed over 600 m, and *Garramullya* has been recorded from all of the sites. *Dawkinsia filamentosa*, *Channa gachua*, *Garra mullia*, *Devario malabaricus*, *Haludaria melanampyx*, *Rasbora dandia*, *Mesonoe macheilus triangularis*, and *Ompok malabaricus* were reported from all sampling locations.

The earlier studies of fish diversity in the Chimmony and Peechi WLS was done by Thomas *et al.* (2000a), reported 37 species from 15 families. According to their results, the Peechi WLS has just 33 species from 15 families. The current study covers the entire Peechi-Vazhani WLS and reported 53 species. Thomas *et al.* (2000a) were limited to visiting three sample locations within the sanctuary. The current study conducted a detailed exploratory study of the protected area's freshwater ecosystems over multiple seasons. The presence of 53 species inside the Peechi-Vazhani WLS can only indicate that ichthyodiversity is greater than previously recorded. The

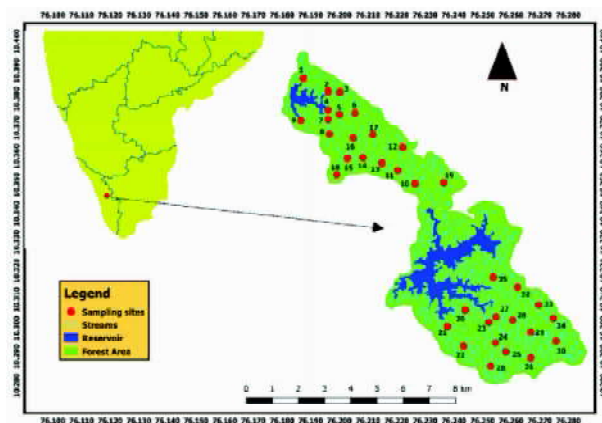
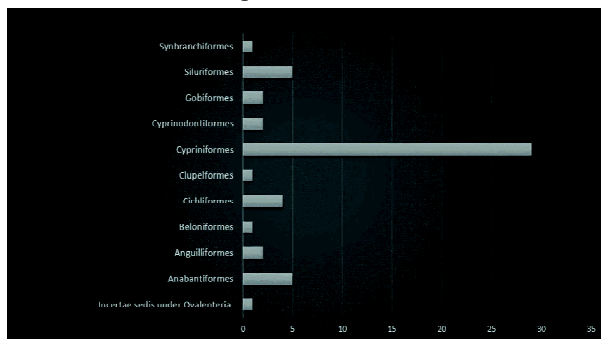


Fig. 1: Map of Peechi-Vazhani WLS. Red coloured markings denote different sampling stations in the study area.

Table 1: Sampling sites, their co-ordinates and altitude

Sl. no	Sampling sites	Longitude (°E)	Latitude (°N)	Altitude(m)
1	Kakkinikadu	76.1848	10.3840	75
2	Ainiplavuthodu	76.1945	10.3821	69
3	Ungumchoola	76.1945	10.3743	128
4	Perinchira	76.1936	10.3743	58
5	Thottikundu	76.1952	10.3744	125
6	Kakumchola	76.2006	10.3751	234
7	Mulappara	76.1934	10.3727	63
8	Vattapara	76.1950	10.3715	160
9	Mekkalammukku	76.1845	10.3720	86
10	Randampuzha	76.2316	10.3422	77
11	Chakolamtharisu	76.2253	10.3454	103
12	Mundipadam	76.2305	10.3519	155
13	Mattangalkuthu	76.2204	10.3528	104
14	Varayanpara	76.2128	10.3548	120
15	Kalakuthu	76.2056	10.3602	159
16	Odakundu	76.2103	10.3642	297
17	Munipadam	76.2146	10.3634	280
18	Vellayinimala	76.2008	10.3550	221
19	Karadikundu	76.2341	10.3459	107
20	Cheenipallam	76.2428	10.3031	150
21	Kuthirakottukayam	76.2344	10.3013	120
22	Karadipara	76.2404	10.2925	340
23	Mampara	76.2507	10.3023	186
24	Vaavala	76.2616	10.2946	360
25	Cheriyamaduchalu	76.2532	10.2913	583
26	Veliyamaduchalu	76.2519	10.2843	694
27	Thozhukuthu	76.2528	10.3022	117
28	Ayyappankundu	76.2611	10.3014	152
29	Thallikuzhi	76.2656	10.2940	269
30	Aamakaralu	76.2737	10.2932	351
31	Narayan	76.2644	10.2855	548
32	Olakkara	76.2613	10.3113	165
33	Patrankandam	76.2645	10.3055	202
34	Munipara	76.2716	10.3019	252
35	Alakana	76.2552	10.3107	204

similar studies included the Neyyar (38 species) and Idukki (40 species) wildlife sanctuaries (Thomas *et al.*, 2000b). New Amarambalam Reserve Forest has 43 freshwater fish species from 13 families and 28

**Fig. 2: Order based fish species in Peechi-Vazhani WLS.**

genera (Baby *et al.*, 2010) and 46 fish species from 17 families and 31 genera were reported from the

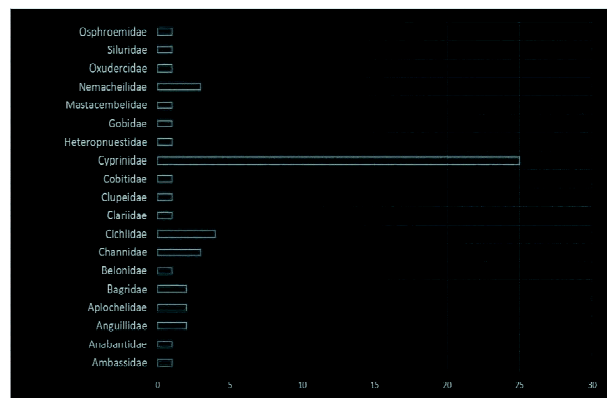
**Fig. 3: Family based fish species in Peechi-Vazhani WLS.**

Table 2: Checklist of fishes collected from Peechi-Vazhani WLS and its IUCN status and Population trend

Order/family	Scientific name	Authority	IUCN status	Population trend	Voucher No.
Anabantiformes					
Anabantidae	<i>Anabas testudineus</i>	Bloch, 1792	LC	Stable	KUFOS.FV.2019.1062
Osphroemidae	<i>Pseudosphromenus cupanus</i>	G. Cuvier, 1831	LC	Stable	KUFOS.FV.2019.1114
Channidae	<i>Channa gachua</i>	Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1063
	<i>Channa striata</i>	Bloch, 1793	LC	Stable	KUFOS.FV.2019.1064
	<i>Channa psuedomarulius</i>	Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1065
Anguilliformes					
Anguillidae	<i>Anguilla bengalensis</i>	Gray, 1831	NT	Unknown	KUFOS.FV.2019.1066
	<i>Anguilla bicolor</i>	McClelland, 1844	NT	Unknown	KUFOS.FV.2019.1067
Beloniformes					
Belonidae	<i>Xenentodon cancila</i>	Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1068
Cichliformes					
Cichlidae	<i>Pseudotropheus maculatus</i>	Bloch, 1795	LC	Stable	KUFOS.FV.2019.1069
	<i>Oreochromis niloticus</i>	Linnaeus, 1758	EX	Unknown	KUFOS.FV.2019.1070
	<i>Oreochromis mossambicus</i>	W. K. H. Peters, 1852	EX	Unknown	KUFOS.FV.2019.1071
	<i>Etroplus suratensis</i>	Bloch, 1790	LC	Decreasing	KUFOS.FV.2019.1072
Clupeiformes					
Clupeidae	<i>Dayella malabarica</i>	Day, 1873	LC	Unknown	KUFOS.FV.2019.1073
Cypriniformes					
Cobitidae	<i>Lepidocephalichthys thermalis</i>	Valenciennes, 1846	LC	Stable	KUFOS.FV.2019.1074
Cyprinidae	<i>Amblypharyngodon melettinus</i>	Valenciennes, 1844	LC	Unknown	KUFOS.FV.2019.1075
	<i>Gibelion catla</i>	Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1076
	<i>Cyprinus carpio</i>	Linnaeus, 1758	VU	Unknown	KUFOS.FV.2019.1077
	<i>Cirrhinus mrigala</i>	Hamilton, 1822	LC	Stable	KUFOS.FV.2019.1078
	<i>Ctenopharyngodon idella</i>	Cuvier & Valenciennes, 1844	EX	Unknown	KUFOS.FV.2019.1079
	<i>Hypothalmichthys molitrix</i>	Valenciennes, 1844	EX	Unknown	KUFOS.FV.2019.1080
	<i>Labeo dussumieri</i>	Valenciennes, 1842	LC	Unknown	KUFOS.FV.2019.1081
	<i>Labeo Rohitha</i>	F. Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1082
	<i>Dawkinsia filamentosa</i>	Valenciennes, 1844	LC	Unknown	KUFOS.FV.2019.1083
	<i>Devario malabaricus</i>	Jerdon, 1849	LC	Stable	KUFOS.FV.2019.1084
	<i>Garra mullya</i>	Sykes, 1839	LC	Stable	KUFOS.FV.2019.1085
	<i>Hypsleobarbus kurali</i>	Menon & Rema Devi, 1995	LC	Unknown	KUFOS.FV.2019.1086
	<i>Hypsleobarbus carnaticus</i>	Jerdon, 1849	LC	Unknown	KUFOS.FV.2019.1087
	<i>Haludaria melanampyx</i>	Jerdon, 1849	LC	Unknown	KUFOS.FV.2019.1088
	<i>Pethia punctata</i>	Day, 1865	LC	Stable	KUFOS.FV.2019.1089
	<i>Puntius mahecola</i>	Valenciennes, 1844	DD	Unknown	KUFOS.FV.2019.1090
	<i>Puntius chola</i>	F. Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1091
	<i>Puntius parrah</i>	Day, 1865	LC	Unknown	KUFOS.FV.2019.1092
	<i>Puntius vittatus</i>	Day, 1865	LC	Unknown	KUFOS.FV.2019.1093
	<i>Rasbora dandia</i>	Valenciennes, 1844	LC	Stable	KUFOS.FV.2019.1094
	<i>Systomus sarana</i>	Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1095
	<i>Horadandia brittani</i>	Rema Devi & Menon, 1992	NA	NA	KUFOS.FV.2019.1096
	<i>Salmostoma boopis</i>	F. Day, 1874	LC	Stable	KUFOS.FV.2019.1097
	<i>Salmostoma balooke</i>	Sykes, 1839	LC	Unknown	KUFOS.FV.2019.1098
	<i>Tor malabaricus</i>	Jerdon, 1849	EN	Decreasing	KUFOS.FV.2019.1099
Nemacheilidae	<i>Mesonoemacheilus herrei</i>	Nalbant & Banarescu, 1982	CR	Decreasing	KUFOS.FV.2019.1100
	<i>Mesonoemacheilus triangularis</i>	Day, 1865	LC	Stable	KUFOS.FV.2019.1101
	<i>Mesonoemacheilus guentheri</i>	Day, 1865	LC	Stable	KUFOS.FV.2019.1102
Cyprinodontiformes					
Aplocheilidae	<i>Aplocheilus lineatus</i>	Valenciennes, 1846	LC	Decreasing	KUFOS.FV.2019.1103
	<i>Aplocheilus blockii</i>	Arnold, 1911	LC	Unknown	KUFOS.FV.2019.1104
Gobiiformes					
Gobiidae	<i>Glossogobius giuris</i>	Hamilton, 1822	LC	Unknown	KUFOS.FV.2019.1105
Oxudercidae	<i>Pseudogobiopsis oligactis</i>	Bleeker 1875	LC	Unknown	KUFOS.FV.2019.1106
Incertaedis under Ovalentaria					
Ambassidae	<i>Parambassis dayi</i>	Bleeker, 1874	LC	Stable	KUFOS.FV.2019.1107
Siluriformes					
Bagridae	<i>Mystus armatus</i>	Day, 1865	LC	Unknown	KUFOS.FV.2019.1108
	<i>Mystus malabaricus</i>	Jerdon, 1849	NT	Unknown	KUFOS.FV.2019.1109
	<i>Clarias dussumieri</i>	Valenciennes, 1840	NT	Decreasing	KUFOS.FV.2019.1110
Clariidae	<i>Heteropneustes fossilis</i>	Bloch, 1794	LC	Stable	KUFOS.FV.2019.1111
Heteropneustidae	<i>Ompok malabaricus</i>	Valenciennes, 1840	LC	Unknown	KUFOS.FV.2019.1112
Siluridae					
Synbranchiformes					
Mastacembelidae	<i>Mastacembelus armatus</i>	Lacepede, 1800	LC	Stable	KUFOS.FV.2019.1113

LC–Least Concern | NT–Near Threatened | CR–Critically Endangered | EX–Exotic Species | DD–Data Deficient | VU–Vulnerable | NA–Not Assessed.

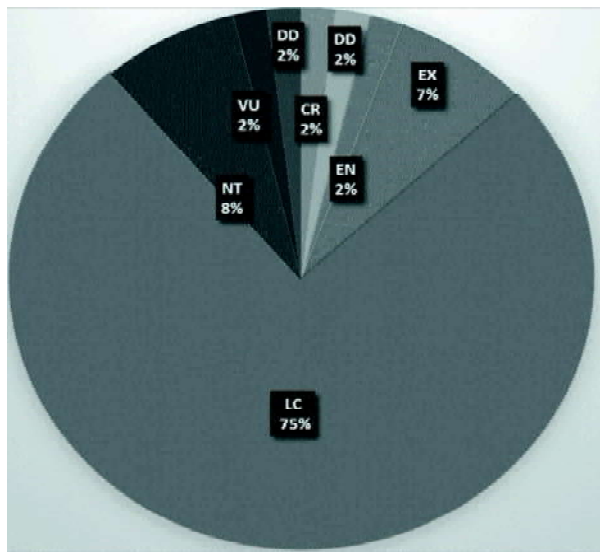


Fig. 4: IUCN Red List Threat status of fishes collected from Peechi-Vazhani WLS.

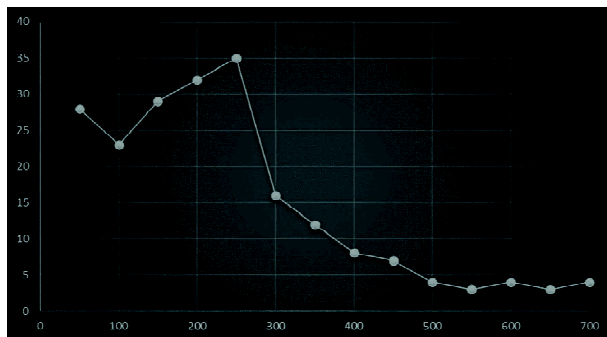


Fig. 6: Elevation based fish species richness in Peechi-Vazhani WLS.

Achenkovil Reserve forest (Baby *et al.*, 2011). Comparing all these studies Peechi-Vazhani WLS has a larger diversity of fish (53 species). Exotic species (*Oreochromis mossambicus*, *Oreochromis niloticus*, *Hypothalmichthys molitrix*, and *Ctenopharyngodon idella*) collected from several sample locations of wildlife sanctuaries are an alarming sign because they may pose a major threat to the native fish fauna, especially rare and vulnerable species.

Present study recorded several unhealthy practices that may cause dangers to the sanctuary's ichthyofaunal diversity. Illegal fishing is still a danger to the sanctuary's fish diversity. Invasive fishing tactics, water restrictions caused by dams, and climate change may lead to severe damage to

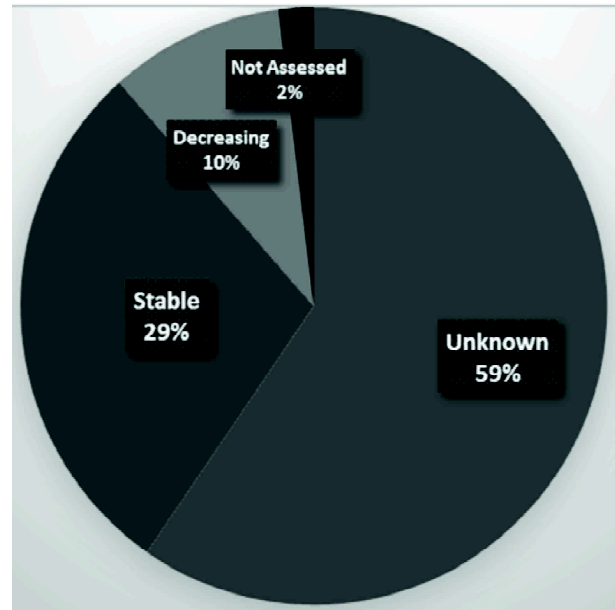


Fig. 5: IUCN Red List population trend of fishes collected from Peechi-Vazhani WLS.

the habitat and to native fishes of this region. Indiscriminate capture of adult individuals during their yearly spawning, locally known as 'Ootha,' is one of the greatest threats to the survival of indigenous species. In addition, the threat of exotic species on the indigenous fish species in the present study site was relatively high causing decline or even extinction of native species. Sarkar *et al.* (2010) found that the higher relative abundance and distribution of exotic species indicate threat to the other local species. They reproduce rapidly, outcompete native species for food, water, and space, and may act as a major cause of biodiversity loss. In addition, climate change has also become one of the greatest threats to aquatic systems in the study area. Natural changes such as rising temperatures and unpredictable rainfall have a significant impact on stream morphology and hydrology. The majority of protected area managers were unaware of freshwater fish conservation, and there were no active stream protection measures in place in the protected areas. A comprehensive multi-year study of the variety, distribution, ecology, and dangers to fishes and other aquatic species in the Peechi-Vazhani WLS is urgently needed to assist future conservation efforts.

CONCLUSION

Results of the present study on diversity of fishes from Peechi-Vazhani WLS will be a resource for policymakers, managers, and conservationists. Extensive ecological study as well as boosting awareness among protected area managers in order to identify priority conservation places for freshwater species and ecosystems is an urgent need for ichthyofaunal conservation. Illegal fishing by residents should be strictly banned. The presence of 53 freshwater fish species in the current study emphasises the significance of the species in WLS. Immediate action is necessary to prevent deterioration of present circumstances and to implement preventive measures to avoid the unintentional introduction of invasive fish species. More research on WLS is needed, and extensive ecological research may assist in the adoption of urgent conservation and management measures to save the fish species from further endangerment and perhaps extinction.

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