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### **SHORT COMMUNICATION**

## On the freshwater fish fauna of Krishna River, Sangli District, Maharashtra, India

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# On the freshwater fish fauna of Krishna River, Sangli District, Maharashtra, India

Short communication

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Abstract: Freshwater fish fauna of Krishna River, Sangli district was studied from 2013 to 2017. A total of 73 species belonging to 10 orders, 22 families, and 49 genera were recorded, of which, 29 species are endemic to the Western Ghats and 11 species endemic to the Krishna River system. Labeo kontius, an endemic barb of the Cauvery River System was recorded for the first time from the Krishna River, Maharashtra. As per the IUCN Red List of Threatened Species, 54 species are assessed as 'Least Concern', four species as 'Near Threatened', three species as 'Vulnerable', five as 'Endangered', and two as 'Data Deficient'. The conservation status of two species has not yet been assessed. Fish fauna of the Krishna River within the study area is threatened as a result of alien species, and several anthropogenic stressors such as pollution from industrial as well as agricultural sources, human settlements, and overfishing. Since, this small study area harbours 28 endemic and eight threatened species, their conservation should be given high priority.

**Keywords:** Conservation, endemic species, fish diversity, threats, Western Ghats.

The Western Ghats of India is global biodiversity hotspot (Myers et al. 2000), known for its high level of endemism of taxonomic groups such as amphibians and freshwater fish. Around 320 species belonging to 11 orders, 35 families, and 112 genera are known from this region (Dahanukar & Raghavan 2013) and this number is certain to increase given the high number of species being discovered on a yearly basis. Krishna is one of the major perennial rivers of the northern Western Ghats. The river originates at Mahabaleshwar (17.988°N; 73.637°E), Satara District, Maharashtra, and traverses a distance of 290 km through Satara, Sangli, and Kolhapur districts in Maharashtra, thereafter flowing through the states of Karnataka and Telangana before emptying into the Bay of Bengal at Hamasaladeevi in Andhra Pradesh.

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Earliest studies on the fish fauna of Deccan was carried out by Sykes (1839). Specific studies on the fish fauna of the Krishna River (in addition to the Godavari) were carried out by David (1963), but no separate 'riverwise' locations for the species collected, were provided. A major study on the fish fauna of Krishna River was also carried out by Jayaram (1995), but no separate list of fishes collected specifically from the tributaries in Sangli District was provided.

Previous studies on the fish fauna of Krishna River has largely focused on the tributaries in Satara District.

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Figure 1. Sampling sites in the Krishna River surveyed as part of the study

Annandale (1919) reported 18 species from the Yenna River at Medha, followed by Silas (1953) who studied the fish fauna of Mahabaleshwar and Wai and recorded 14 species. Arunachalam et al. (2002) recorded 14 species from Dhom reservoir, and subsequently Jadhav et al. (2011) reported 58 species from the Koyna tributary. More recently, Kharat et al. (2012) provided an updated checklist of the fish fauna of Krishna River at Wai and Dhom reservoir, and reported the presence of 51 species. The only published work on the freshwater fishes of the Krishna River in Sangli District is by Kumbar & Lad (2014) who recorded 13 species of catfishes. In the present paper, we provide a comprehensive checklist of the freshwater fishes of the Krishna River flowing through Sangli district in Maharashtra and identify possible threats so as build baseline data for future conservation action.

### METHODS

Field surveys were undertaken in the Krishna River, Sangli district, Western Maharashtra from the year 2013 to 2017. Fish specimens were collected from Bahe (17.1138°N & 74.2811°E), Borgaon (17.0808°N & 74.3691°E), Sangli (16.8591°N & 74.5577°E), Miraj (16.7877°N & 74.6291°E), and Mhaisal (16.7358°N & 74.6986°E) (Figure 1), with the help of local fishers using different mesh-sized gill nets and cast nets. Alternatively, fish samples were also procured from local fish markets.

Assuming that the fishing effort for a given type of net was constant, the relative abundance of the fish was grossly categorized following Dahanukar et al. (2012), namely abundant (76–100 % of total catch), common (51–75 % of total catch), moderate (26–50 % of total catch), and rare (1–25 % of total catch). Samples were preserved in 10% formalin and identified using the available literature (Menon 1987, 1992; Talwar & Jhingran 1991; Jayaram & Dhas 2000; Jayaram &

Sanyal 2003; Jayaram 1991, 2006, 2010) and relevant recent taxonomic literature related to different groups (Dahanukar et al. 2011; Keskar et al. 2015; Katawate et al. 2016; Lavoué et al. 2020; Sudasinghe et al. 2020). All identified specimens are deposited at the Department of Zoology, Arts, Commerce and Science College, Palus, Sangli District, Maharashtra, with accession numbers from ZID 01–73.

### RESULTS

We recorded a total 73 species of freshwater fish belonging to 10 orders, 22 families and 49 genera from the Krishna River in Sangli district (Table 1). Order Cypriniformes dominated with 42 species, followed by Siluriformes (18 species), Anabantiformes (three species), Synbranchiformes, Perciformes, & Beloniformes (two species each), and Cyprinodontiformes, Gobiiformes, Osteoglossiformes, & Cichliformes (one species each). Representative species of fish collected from Krishna River are shown in (Images 1, 2, 3 & 4). As per the IUCN Red List of Threatened Species, 54 species are assessed as 'Least Concern', four species as 'Near Threatened', three species as 'Vulnerable', five as 'Endangered', two as 'Data Deficient', and the conservation status of two species has not yet been assessed. Of the 73 species, 29 are endemic to the Western Ghats, and 11 are endemic to the Krishna River System (Table 1). Microlevel distribution of species along the upstream-downstream gradient showed that 56 species occurred in upper reaches, 28 species in middle stream, and 37 species in downstream respectively (Figure 1). Of the total fish collected, 15 species were found to be common, six abundant, 28 moderate and 24 rare.

Fish fauna of Krishna River is severely threatened by pollution from organic wastes particularly around Kumbar et al.

the towns of Sangli and Miraj as well as from pollution due to agricultural runoff and sewage. Recently, sand mining has also increased significantly along the stretch of the river near Bahe and Borgaon, resulting in the loss of available habitats to the fish fauna of these areas. Similarly, overfishing, indiscriminate use of poison to collect fish in large numbers and using fine-meshed gill-nets, is a specific threat to species of the genera *Bangana, Tor, Hypselobarbus, Labeo, Cirrhinus, Opsarius, Salmostoma, Botia, Mystus, Cirrhinus,* and *Puntius*.

We also recorded seven non-native species—four transplanted: *Cirrhinus mrigala, Labeo rohita, Labeo catla, Labeo calbasu* in all sites and three alien invasive species: *Oreochromis mossambicus, Cyprinus carpio* and *Clarias gariepinus* at Sangli and Miraj. Studies in their entirety of Krishna River by Jayaram (1995) have recorded 10 invasive alien species, but interestingly Jadhav et al. (2011) could not record any alien species from Koyna tributary. However, Dahanukar et al. (2012) recoded seven introduced species from Indrayani River near Pune, and four species from Hiranyekeshi River by Kumkar et al. (2017).

### DISCUSSION

Krishna River harbours a number of endemic and threatened species. We collected *Glyptothorax* cf. *poonaensis* from Bahe near Islampur in moderate numbers. These specimens resemble *G. poonaensis* (Hora 1938), but differs considerably with the description provided in Dahanukar et al. (2011). It is therefore possible that this species might comprise a 'complex'. The population of Endangered and endemic *Bangana nukta* is declining drastically in the study area as per the local knowledge of fishers. Pollution, overfishing and the competition created by transplanted carps such as



Image 1. Labeo kontius collected from Krishna River near Miraj . Lateral view. After preservation. Scale= 10 mm. (Voucher No, ZID 26)

### Table 1. List of Freshwater Fishes collected from the Krishna River, Sangli District, Maharashtra

	Order	Family	Species	Status	WGE	KRE	IUCN Red List
1	Angles M		Channa gachua (Hamilton, 1822)	М	-	-	LC
2	Anabantiformes	Channidae	Channa punctata (Bloch, 1793)	м	-	-	LC
3			Channa striata (Bloch, 1793)	R	-	-	LC
4	Beloniformes	Belonidae	Xenentodon cancila (Hamilton, 1822)	R	-	-	LC
5		Hemiramphidae	Hyporhamphus limbatus (Valenciennes, 1847)	R	-	-	LC
6	Cichliformes	Cichlidae	Oreochromis mossambicus (Peters, 1852)	С	-	-	
7		Botiidae	Botia striata Rao, 1920	A	+	+	EN
8		Cobitidae	Lepidocephalichthys thermalis (Valenciennes, 1846)	A	-	-	LC
9			Bangana nukta (Sykes, 1839)	R	+	-	EN
10			Cirrhinus reba (Hamilton, 1822)	М	-	-	LC
11			Cyprinus carpio Linnaeus, 1758	R	-	-	
12			Garra bicornuta Rao, 1920	С	+	+	NT
13			Garra mullya (Sykes, 1839)	A	-	-	LC
14			Gymnostomus ariza (Hamilton, 1807)	R	-	-	LC
15			Gymnostomus fulungee (Sykes, 1839)	M	+	+	LC
16			Hypselobarbus jerdoni (Day, 1870)	M	+	-	LC
17			Hypselobarbus kolus (Sykes, 1839)	M	+	-	VU
18			Hypselobarbus mussullah (Sykes, 1839)	M	+	-	EN
19			Labeo calbasu (Hamilton, 1822)	M	-	-	LC
20			Labeo catla (Hamilton, 1822)	R	-	-	LC
21		Cyprinidae	Labeo fimbriatus (Bloch, 1795)	R	-	-	LC
22			Labeo kontius (Jerdon, 1849)	R	+	-	LC
23			Labeo porcellus (Heckel, 1844)	R	+	-	LC
24			Labeo potail (Sykes, 1839)	R	+	-	EN
25			Labeo rohita (Hamilton, 1822)	R	-	-	LC
26	Cypriniformes		Osteobrama neilli (Day, 1873)	R	+	+	LC
27	cyprimornics		Ostobrama peninsularis Silas, 1952	M	+	-	DD
28			Osteobrama vigorsii (Sykes, 1839)		-	-	
30			Parapsilornynchus alscophorus Hora, 1921 Pethia sanjaymoluri Katwate, Jadhav, Kumkar,	A	+ +	+	NE
			Raghavan & Dahanukar, 2016				
31			Puntius chola (Hamilton, 1822)	M	-	-	LC
32			Puntius sophore (Hamilton, 1822)		-	-	
33			Kontee ogiibii Sykes, 1839	IVI C	+	+	
34			Systomus sarana (Hamilton, 1822)		+	-	
35			Ambiyphur yngouon molu (Hamiton, 1822)	ĸ	-	-	
27			Operative handalisis (Hamilton, 1807)	M	-	-	
29			Pachara daniconius (Hamilton, 1807)		-	-	
30		Danionidae	Salmostoma acinaces (Valenciennes 1844)	C C	+		
40			Salmostoma halookee (Sykes 1839)	C C	-		
40			Salmostoma bacaila (Hamilton, 1822)	M	_	_	
42			Salmostoma bacana (Harmeent, 1022)	Δ	+	-	10
43			Salmostoma novacula (Valenciennes, 1838)	M	+	_	LC
44		Nemacheilidae	Indoreonectes of evezardi (Day 1872)	R	-	-	10
45			Nemacheilus anguilla Annandale, 1919	м	+	+	LC
46			Nemachilichthys rueppelli (Svkes. 1839)	M	+	+	LC
47			Paracanthocobitis mooreh (Svkes. 1839)	A			LC
48			Schistura denisoni (Day. 1867)	R	-	-	LC
-	Commission 1 and	Andral 111	Aplocheilus lineatus				
49	Cyprinodontiformes	Apiocheilidae	(Valenciennes, 1846)	К	-	-	LC
50	Gobiiformes	Gobiidae	Glossogobius giuris (Hamilton, 1822)	с	-	-	LC
51	Osteoglossiformes	Notopteridae	Notopterus synurus (Bloch & Schneider, 1801)	с	-	-	LC
52	Perciformes	Ambassidae	Chanda nama Hamilton, 1822	м	-	-	LC
53		,	Parambassis ranga (Hamilton, 1822)	М	-	-	LC

	Order	Family	Species	Status	WGE	KRE	IUCN Red List
54		Ailiidae	Proeutropiichthys taakree (Sykes, 1839)	М	-	-	LC
55		Bagridae	Hemibagrus maydelli (Rossel, 1964)	М	+	+	LC
56			Mystus bleekeri (Day, 1877)	М	-	-	LC
57	Siluriformes		Mystus malabaricus (Jerdon, 1849)	М	+	-	NT
58			Mystus seengtee (Sykes, 1839)	М	+	-	LC
59			Mystus vittatus (Bloch, 1794)	R	-	-	LC
60			Rita gogra (Sykes, 1839)	М	+	-	LC
61			Rita kuturnee (Sykes, 1839)	м	+	-	LC
62			Sperata cf. aor (Hamilton, 1822)	С	-	-	LC
63			Sperata seenghala (Sykes, 1839)	м	-	-	LC
64		Clariidae	Clarias gariepinus (Burchell, 1822)	С	-	-	
65		Heteropneustidae	Heteropneustes fossilis (Bloch, 1794)	м	-	-	LC
66		Horabagridae	Pachypterus khavalchor (Kulkarni, 1952)	R	+	+	DD
67		Pangasiidae	Pangasius pangasius (Hamilton, 1822)	R	-	-	LC
68		Siluridae	Ompok bimaculatus (Bloch, 1794)	С	-	-	NT
69			Wallago attu (Bloch & Schneider, 1801)	R	-	-	NT
70		Sisoridae	Glyptothorax cf. poonaensis Hora, 1938	R	+	+	EN
71			Gagata itchkeea (Sykes, 1839)	R	+		VU
72	Synbranchiformes	Mastacembelidae	Macrognathus pancalus (Hamilton, 1822)	м	-	-	LC
73			Mastacembelus armatus (Lacepede, 1800)	С	-	-	LC

A—Abundant | C—Common | M—Moderate | R—Rare | EN—Endangered | VU—Vulnerable | NT—Near Threatened | DD—Data Deficient | LC—Least Concern. Taxonomic status as per Fricke et al. (2020). Status for invasive alien species are not provided.

Cirrhinus mrigala, Labeo rohita, and Labeo catla may also be contributing to the population decline of B. nukta (Ghate et al. 2002; Kharat et al. 2003; Dahanukar et al. 2012). Similarly, Hypselobarbus mussullah assessed as 'Endangered' as per IUCN criteria (Dahanukar & Raghavan 2011) was collected in low numbers at Bahe. Labeo potail, a species that has been assessed as 'Endangered' due to population decline of 50-60 % in the last 10 years due to organic and inorganic pollution, exploitation and competition created by transplanted carps (Dahanukar 2011) was collected near Palus and Sangli. However, their numbers are declining rapidly due to pollution from domestic organic waste and effluents released heavily from industries situated on the riverbank. Another Krishna River endemic and threatened species, Botia striata (locally called 'waghmasa') (Image 3-22) was recorded from Bahe, Borgaon and Islampur. At Bahe and Borgaon, indiscriminate collection of this species by aquarium traders in the summer months is a major threat to the species. The species is however relatively abundant in the study area, and also in Koyna River (Jadhav et al. 2011).

Gagata itchkeea (Image 3-25) a species recorded previously from the Krishna River system (Kalwar & Kelkar 1956; Jayaram 1995; Kharat *et al.* 2003; Wagh & Ghate 2003; Chandanshive *et al.* 2007) was collected from Bahe in very low numbers. Other important endemic species such as *Garra bicornuta, Parapsilorhynchus discophorus,*  *Pachypterus khavalchor* were also collected from various sampling sites.

We recorded *Labeo kontius* (Image 1) for the first time from the Krishna River system in, Maharashtra State, through samples from Miraj, thus extending its range to the northern part of the Western Ghats. *Labeo kontius* was described by Jerdon (1849) from Cauvery River and its tributaries. Currently, the species is also known to occur in the Bhavani and Moyar rivers and their tributaries (Rajan 1955; Manimekalan 1998), as well as in the main stretch of the Cauvery River (Jayaram et al. 1982; Jayaram & Dhas 2000).

Krishna River harbours a rich diversity of endemic and threatened fishes of Western Ghats. However, this fauna is threatened due to overfishing, introduced species, sand mining and organic and inorganic pollution. If the present anthropogenic impact continues, this might lead to a drastic decline of habitats and populations of fish species available in this region. It is therefore essential to declare some stretch of rivers as aquatic sanctuaries, particularly near Bahe and Miraj for protection and preservation of endemic and threatened species and mitigation of anthropogenic stress.

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Image 2. 1—Systomus sarana (Hamilton) | 2—Pethia sanjaymoluri Katwate, Jadhav, Kumkar, Raghavan & Dahanukar | 3—Hypselobarbus jerdoni (Day) | 4—Puntius chola (Hamilton) | 5—Bangana nukta (Sykes) | 6—Hypselobarbus kolus (Sykes) | 7—Devario aequipinnatus (McClelland) | 8—Salmostoma bacaila (Hamilton) | 9—Salmostoma novacula (Valenciennes) | 10—Opsarius bendelisis (Hamilton) | 11—Osteobrama vigorsii (Sykes) | 12—Rohtee ogilbii (Sykes) | 13—Hypselobarbus mussullah (Sykes) | 14—Gymnostomus ariza (Hamilton) | 15—Xenentodon cancila (Hamilton).



Image 3. 16—Labeo fimbriatus (Bloch) | 17—Labeo rohita (Hamilton) | 18—Cirrhinus reba (Hamilton) | 19—Garra bicornuta Rao | 20— Osteobrama peninsularis Silas | 21—Paracanthocobitis mooreh (Sykes) | 22—Botia striata Rao | 23—Sperata seenghala (Sykes) | 24— Mystus vittatus (Bloch) | 25—Gagata itchkeea (Sykes) | 26—Pangasius pangasius (Hamilton) | 27—Mastacembelus armatus (Lacepede) | 28—Macrognathus pancalus (Hamilton) | 29—Hyporhamphus limbatus (Valenciennes) | 30—Oreochromis mossambicus (Peters) | 31— Parambassis ranga (Hamilton) | 32—Channa punctata (Bloch).





Image 4. 33—Channa striata (Bloch) | 34—Channa gachua (Hamilton) | 35—Amblypharyngodon mola (Hamilton) | 36—Ompok bimaculatus (Bloch).

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