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Cover: Fish species recorded in the Gowthami-Godavari Estuary, Andhra Pradesh: *Lutjanus johnii* (top left), *Triacanthus biaculeatus* (top right), *Acentrogobius cyanomos*, *Elops machnata*, *Trypauchen vagina*, *Oxyurichthys microlepis*. © Paromita Ray.



Conservation status of freshwater fishes reported from Tungabhadra Reservoir, Karnataka, India

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Abstract: Fishes constitute the major biomass of the aquatic ecosystem. The economy of the aquatic habitats is chiefly composed of fishes, crustaceans and molluscs inhabiting the given ecosystem. In the present investigation, an attempt was made to study the conservation status of the fishes that are naturally occurring in the Tungabhadra Reservoir located at Hospet, Vijayanagara district of Karnataka. The survey was spread across 12 months from June 2018 to May 2019. A total of 76 species, belonging to 50 genera and 20 families were recorded. As per the latest IUCN Red List, six Endangered, six Vulnerable, four Near Threatened, five Data Deficient and fifty four Least Concern fishes inhabit in TBR.

Keywords: Aquatic ecosystem, fish diversity, IUCN Red List, peninsular India, survey, Vijayanagara district.

India is endowed with vast aquatic resources possessing ecological heritage and rich biodiversity. Fishes inhabiting freshwater habitat are profoundly affected due to reduction in water flow, over fishing and increased water pollution. In order to maintain a healthy population of reservoir fisheries it is necessary to monitor water quality parameters, lake hydrobiology, periodic bioassay, and other environmental variables influencing the fish community (CIFRI 2008). Although, Tungabhadra Reservoir (TBR) is subjected to comprehensive fisheries studies, yet there is limited information available on fishes in the reservoir (Rao & Govind 1964; David et al.

1969; Govind 1969; Banerjee & Ray 1979). The TBR is located at 76.333°E & 15.300°N on the river Tungabhadra. It is one of the largest contributors of the river Krishna with an annual discharge of approximately 14,700 million m³ of water at its confluence point, which holds 498m at the full reservoir level. It has an average water spread area of about 23,500 ha. The reservoir is located in northeastern Karnataka state and it supplies water to the neighbouring states. The reservoir produced 24 tonnes of fish in 1954–55 to 4,200 tonnes in 1981–82 to 25,638 metric tonnes in 2004–05. Carp seeds (Catla, Rohu and Fimbriatus) are nursed in the neighbouring fish seed farm and stocked at the rate of 4–5 million/ha until the larvae reach the fingerling size. These 70–80 mm fingerlings are stocked in the reservoir to enhance carp production.

Considering its fish diversity, a study was carried out between June 2018 and May 2019 to document fishes of TBR. The aim of this study is to understand fish diversity and explore their conservation status.

MATERIALS AND METHODS

The Tungabhadra Reservoir has many fish landing centres all along its periphery (Image 1). The fishes are caught using gill nets, cast nets, drag nets and giant alivi

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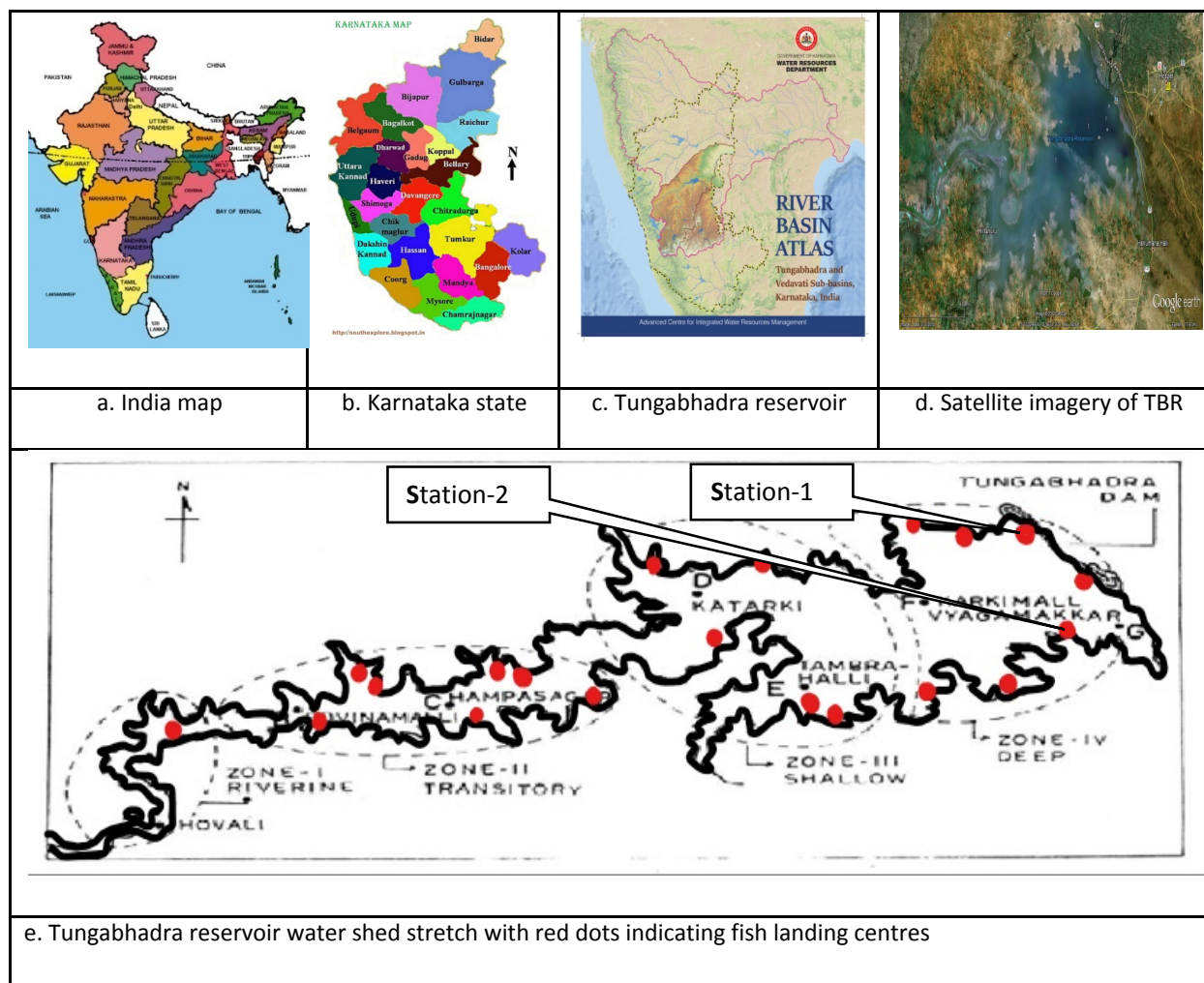


Image 1. Map showing the location of Tungabhadra Reservoir (Image courtesy: Google).

seine net. The fish samples hauled during the catch at the two landing centres S-1 and S-2 in the zone-IV deep (Image 1) were collected and identified on site and others were brought to the laboratory for identification using the available taxonomic literatures (Day 1958; Jhingran 1991; Jayaram 2010) and open access fish base website (www.fishbase.org and Eschmeyer's Catalog of Fishes). Local fishermen and the faculty of the Zoology Department, Kuvempu University, Shankaraghatta and Vijayanagara Sri Krishnadevaraya University, Ballari were also consulted for fish species confirmation.

RESULTS AND DISCUSSION

In the present investigation seventy six fishes belonging to 20 families were recorded from the reservoir. Among the recorded species, 40 species of fishes were represented from Cyprinidae family, five from Bagridae, four from Danionidae, three each from

Ailiidae & Channidae, two species each belonged to Ambassidae, Balitoridae, Cobitidae, Mastacembellidae, Siluridae, & Sisoridae, and one each representative species from Anguillidae, Aplocheilidae, Belonidae, Gobidae, Horabagridae, Nemachilidae, Notopteridae, Osphronemidae, & Pangassidae are depicted in Figure 1. David et al. (1974) reported that *Labeo fimbriatus*, *L. catla*, and *L. rohita* were part of the major fish composition in the TBR. A similar trend was observed in the present findings. It is attributed to the carp seed stocking in the reservoir on seasonal basis at the rate of 2–3 million fingerlings per hectare.

Among the species, *Cyprinus carpio* was exotic; *Labeo catla*, *L. fimbriatus*, *L. calbasu* were non-native to TBR, whereas native species such as *Cirrhinus cirrhosus*, *Hypselobarus jerdoni*, *Systomus sarana*, *Pethia ticto*, *Opsarius bendelisis*, *Devario aequipinnatus*, *Silonia childreni*, *Proeutropiichthys taakree*, *Wallago*

Table 1. IUCN Red List status of fishes encountered in Tungabhadra Reservoir during the study period.

	Family	Common name	Scientific name	Population trend	IUCN Red List (2019)
1	Ailiidae	Goongwaree Vacha	<i>Eutropiichthys goongwaree</i> Sykes, 1839	--	DD 2010
2	Ailiidae	Indian Taakree	<i>Proeutropiichthys taakree</i> (Sykes, 1839)	Decreasing	LC 2011
3	Ailiidae	White Cat Fish	<i>Silonia childreni</i> (Sykes, 1839)	Decreasing	EN 2010
4	Ambassidae	Elongate Glass Perchlet	<i>Chanda nama</i> Hamilton, 1822	Decreasing	LC 2010
5	Ambassidae	Indian Glassy Fish	<i>Parambassis ranga</i> (Hamilton, 1822)	Stable	LC 2011
6	Anguillidae	Indian Mottled Eel	<i>Anguilla bengalensis</i> (Grey, 1834)	--	NT 2019
7	Aplocheilidae	Striped Panchax	<i>Aplocheilichthys lineatus</i> (Valenciennes, 1846)	--	LC 2009
8	Bagridae	Giant River Cat Fish	<i>Sperata seenghala</i> (Sykes, 1839)	--	LC 2010
9	Bagridae	Giant Cat Fish	<i>Hemibagrus maydelli</i> (Rossel, 1964)	--	LC
10	Bagridae	Long-whiskered Catfish	<i>Sperata aor</i> (Hamilton, 1822)	--	LC 2011
11	Bagridae	Gangetic Mystus	<i>Mystus cavasius</i> (Hamilton, 1822)	Decreasing	LC 2009
12	Bagridae	Gogra rita	<i>Rita gogra</i> (Sykes, 1839)	Decreasing	LC2010
13	Balitoridae	Slender Stone Loach	<i>Balitora mysorensis</i> Hora, 1941	--	VU
14	Balitoridae	Dotted Loach	<i>Nemacheilus semiarmatus</i> (Day, 1867)	Stable	LC 2010
15	Belontiidae	Gar Fish	<i>Xenentodon cancila</i> (Hamilton, 1822)	--	LC 2019
16	Channidae	Great Snake Head	<i>Channa marulius</i> (Hamilton, 1822)	--	LC 2009
17	Channidae	Snake-headed Murrel	<i>Channa striata</i> (Bloch, 1793)	Stable	LC 2019
18	Channidae	Spotted Snakehead	<i>Channa punctata</i> (Bloch, 1793)	Stable	LC 2019
19	Cobitidae	Zebra Loach	<i>Botia striata</i> Rao, 1920	--	EN 2011
20	Cobitidae	Common Spiny Loach	<i>Lepidocephalichthys thermalis</i> (Valenciennes, 1846)	Stable	LC 2019
21	Cyprinidae	Mola Carpet	<i>Amblypharyngodon mola</i> (Hamilton, 1822)	Stable	LC 2009
22	Cyprinidae	Catla	<i>Labeo catla</i> (Hamilton, 1822)	--	LC 2010
23	Cyprinidae	Mrigal Carp	<i>Cirrhinus cirrhosus</i> (Bloch, 1795)	Decreasing	VU 2011
24	Cyprinidae	Deccan White Carp	<i>Gymnostomus fulungee</i> (Sykes, 1839)	--	LC 2010
25	Cyprinidae	Mrigal	<i>Cirrhinus mrigal</i> (Hamilton, 1822)	Stable	LC 2010
26	Cyprinidae	Reba Carp	<i>Cirrhinus reba</i> (Hamilton, 1822)	Stable	LC 2010
27	Cyprinidae	Grass Carp	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	--	Exotic and Not evaluated
28	Cyprinidae	Common Carp	<i>Cyprinus carpio</i> Linnaeus, 1758	--	Exotic, but globally VU 2008
29	Cyprinidae	Muliyar Garra	<i>Garra mullya</i> (Sykes, 1839)	Stable	LC 2010
30	Cyprinidae	Minor Carp	<i>Labeo bata</i> (Hamilton, 1822)	--	LC 2011
31	Cyprinidae	Boga Labeo	<i>Labeo boga</i> (Hamilton, 1822)	--	LC 2010
32	Cyprinidae	Boggut Labeo	<i>Labeo boggut</i> (Sykes, 1839)	Stable	LC 2010
33	Cyprinidae	Calbasu	<i>Labeo calbasu</i> (Hamilton, 1822)	--	LC 2010
34	Cyprinidae	Finger Lipped Peninsula Carp	<i>Labeo fimbriatus</i> (Bloch, 1795)	--	LC 2011
35	Cyprinidae	Plymouth Carp	<i>Labeo kontius</i> (Jordon, 1849)	Decreasing	LC 2010
36	Cyprinidae	Pangusia Labeo	<i>Labeo pangusia</i> (Hamilton, 1822)	Decreasing	NT 2010
37	Cyprinidae	Bombay Labeo	<i>Labeo porcellus</i> (Haeckel, 1844)	Decreasing	LC 2010
38	Cyprinidae	Deccan Labeo	<i>Labeo potail</i> (Sykes, 1839)	Decreasing	EN 2011
39	Cyprinidae	Rohu	<i>Labeo rohita</i> (Hamilton, 1822)	--	LC 2010

	Family	Common name	Scientific name	Population trend	IUCN Red List (2019)
40	Cyprinidae	Ray-finned Fish	<i>Osteobrama peninsularis</i> Silas, 1952	--	DD 2011
41	Cyprinidae	Finescale Razorbelly Minnow	<i>Salmostoma phulo</i> (Hamilton, 1822)	--	LC 2009
42	Cyprinidae	Ray-finned Fish	<i>Osteobrama vigorsii</i> (Sykes, 1839)	Stable	LC 2011
43	Cyprinidae	Konti Barb	<i>Osteochilichthys thomassi</i> (Day, 1877)	--	LC 2011
44	Cyprinidae	Ray-finned Fish	<i>Puntius ambassis</i> (Day, 1869)	--	DD 2010
45	Cyprinidae	Scarlet Banded Barb	<i>Puntius amphibius</i> (Valenciennes, 1842)	--	DD 2010
46	Cyprinidae	Chola Barb	<i>Puntius chola</i> (Hamilton, 1822)	--	LC 2010
47	Cyprinidae	Jakkali	<i>Hypselobarbus jerdoni</i> (Day, 1870)	Decreasing	LC 2010
48	Cyprinidae	Long-snouted Barb	<i>Puntius dorsalis</i> (Jordan, 1849)	--	LC 2019
49	Cyprinidae	Kolus Barb	<i>Hypselobarbus kolus</i> (Sykes, 1839)	Decreasing	VU 2010
50	Cyprinidae	Narayan Barb	<i>Pethia narayani</i> (Hora, 1937)	--	LC 2010
51	Cyprinidae	Red Side Barb	<i>Puntius bimaculatus</i> (Bleeker, 1863)	Stable	LC 2019
52	Cyprinidae	Olive Barb	<i>Systomus sarana</i> (Hamilton, 1822)	--	LC 2010
53	Cyprinidae	Spot Fin Swamp Barb	<i>Puntius sophore</i> (Hamilton, 1822)	--	LC 2010
54	Cyprinidae	Ticto Barb	<i>Pethia ticto</i> (Hamilton, 1822)	--	LC 2010
55	Cyprinidae	Vatani Rohtee	<i>Rohtee ogilbii</i> Sykes, 1839	--	LC 2010
56	Cyprinidae	Salmostoma Phulo	<i>Salmophasia phulo</i> (Hamilton, 1822)	--	LC 2009
57	Cyprinidae	Nukta	<i>Schismatorhynchus nukta</i> (Sykes, 1839)	Decreasing	EN 2010
58	Cyprinidae	Sandkhhol Carp	<i>Thynnichthys sandkhhol</i> (Sykes, 1839)	Decreasing	EN 2010
59	Cyprinidae	Black Mahseer	<i>Tor khudree</i> (Sykes, 1839)	increasing	LC 2019
60	Cyprinidae	Musulla Barb	<i>Hypselobarbus mussullah</i> (Sykes, 1839)	Decreasing	EN 2010
61	Danionidae	Baril	<i>Opsarius bendelisis</i> (Hamilton, 1822)	--	LC
62	Danionidae	Silver Harchet Chela	<i>Chela cachius</i> (Hamilton, 1822)	--	LC 2010
63	Danionidae	Giant Danio	<i>Devario aequipinnatus</i> (McClelland, 1839)	--	LC 2010
64	Danionidae	Flying Barb	<i>Esomus danrica</i> (Hamilton, 1822)	Stable	LC 2007
65	Gobiidae	Tank Gobi	<i>Glossogobius giuris</i> (Hamilton, 1822)	--	LC 2019
66	Horabagridae	Khavalchor Catfish	<i>Pachypterus khavalchor</i> (Kulkarni, 1952)	--	DD 2010
67	Mastacembellidae	Spiny Eel	<i>Mastacembelus armatus</i> (Lacepede, 1800)	Stable	LC 2019
68	Mastacembellidae	Barrel Spiny Eel	<i>Macrognathus pancalus</i> Hamilton, 1822	--	LC 2010
69	Nemacheilidae	Ray-finned Fish	<i>Indoreonectes evezardi</i> (Day, 1872)	--	LC 2010
70	Notopteridae	Bronze Featherback	<i>Notopterus notopterus</i> (Pallas, 1769)	Stable	LC 2019
71	Osphronemidae	Spiketail Paradise Fish	<i>Pseudosphromenus cupanus</i> (Cuvier, 1831)	Stable	LC 2019
72	Pangassidae	Pangas Cat Fish	<i>Pangasius pangassius</i> (Hamilton, 1822)	--	LC 2009
73	Siluridae	Butter Cat Fish	<i>Ompok bimaculatus</i> Bloch, 1794	--	NT 2009
74	Siluridae	Cat Fish	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Decreasing	VU 2019
75	Sisoridae	Devil Cat Fish	<i>Bagarius bagarius</i> (Hamilton, 1822)	Decreasing	NT 2009
76	Sisoridae	Sucker Cat Fish	<i>Gagata itchkeea</i> (Sykes, 1839)	Decreasing	VU 2011

LC—Least Concern | EN—Endangered | NT—Near Threatened | VU—Vulnerable | DD—Data Deficient

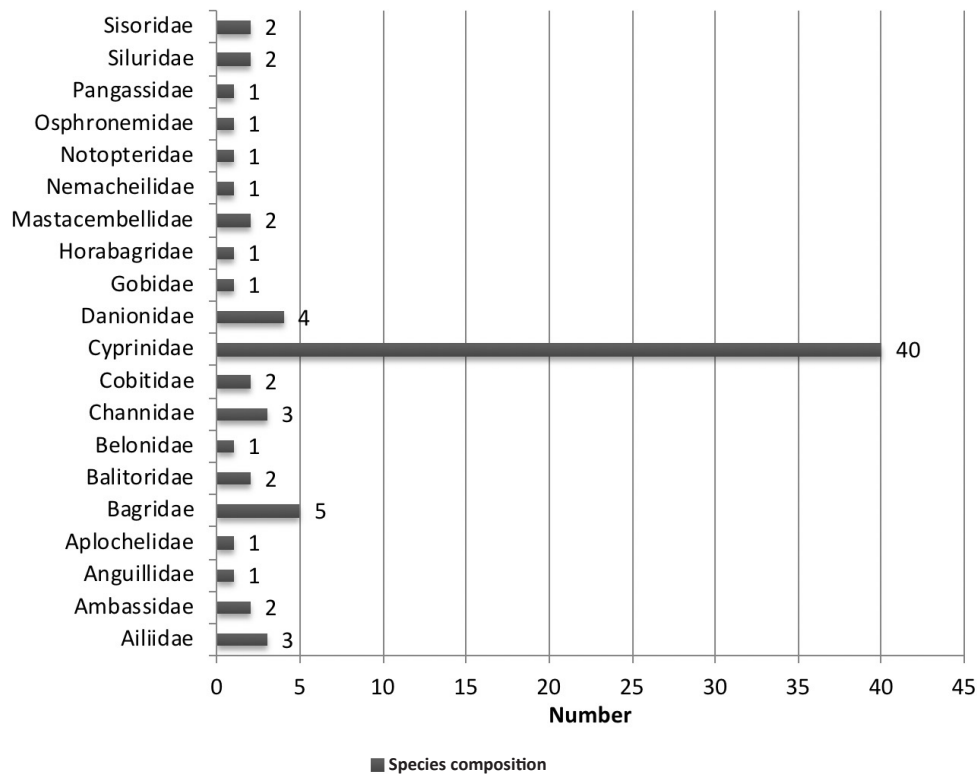


Figure 1. Family-wise species composition of fishes from Tungabhadra Reservoir.

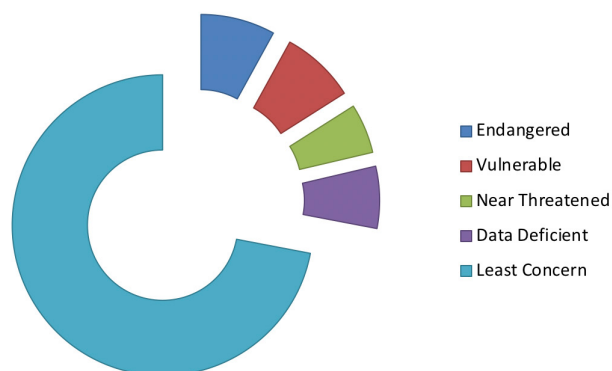


Figure 2. IUCN Red List status of fishes in Tungabhadra Reservoir during 2018–19.

attu, *Mastacembelus armatus*, *Bagarius bagarius*, *Osteobrama vigorsii*, and *Sperata seenghala* were recorded from all landing centers across the study period. The order of abundance of fishes was major carps > minor carps > cat fishes > small fishes. Kumar et al. (2006) observed a similar fish abundance trend in Gersud Reservoir, Ranchi. As per the latest IUCN Red List, six Endangered, six Vulnerable, four Near Threatened, five Data Deficient, and 54 Least Concern (Figure 2). It also includes exotic species which are not evaluated. Details of the present conservation status of

fishes inhabiting TBR are given in Table 1.

CONCLUSION

In the present study 76 species of freshwater fishes were recorded. As per the recent IUCN Red List, the conservation status of the fishes showed six Endangered, five Vulnerable, four Near Threatened, and five Data Deficient. Commercially important species were being reduced in certain landing centers along left flank of TBR and alien species were occupying the native species niches. To monitor the continuous potential fish yield of the reservoir, adequate release of carp seeds, utilizing the other vacant niches, monitoring the illegal fishing activities along the reservoir and continuous annual documentation of fish catches is necessary.

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Article

Dietary preference of Assamese Macaque *Macaca assamensis* McClelland, 1840

(Mammalia: Primates: Cercopithecidae) in Dampa Tiger Reserve, India

– Ht. Decemson, Sushanto Gouda, Zothan Siam & Hmar Tlawmte Lalremsanga, Pp. 21487–21500

Reviews

Natural history notes on three bat species

– Dharmendra Khandal, Ishan Dhar, Dau Lal Bohra & Shyamkant S. Talmale, Pp. 21501–21507

The checklist of birds of Rajkot district, Gujarat, India with a note on probable local extinction

– Neel Sureja, Hemanya Radadia, Bhavesh Trivedi, Dhavalkumar Varagiya & Mayurdan Gadhavi, Pp. 21508–21528

Alien flora of Uttarakhand, western Himalaya: a comprehensive review

– Shikha Arora, Amit Kumar, Khima Nand Balodi & Kusum Arunachalam, Pp. 21529–21552

Communications

New records of *Nyctalus leisleri* (Kuhl, 1817) and *Myotis nattereri* (Kuhl, 1817) (Mammalia: Chiroptera: Vespertilionidae) from National Park “Smolny” and its surroundings, Republic of Mordovia

– Dmitry Smirnov, Nadezhda Kirillova, Alexander Kirillov, Alexander Ruchin & Victoria Vekhnik, Pp. 21553–21560

Avifaunal diversity in unprotected wetlands of Ayodhya District, Uttar Pradesh, India

– Yashmita-Ulman & Manoj Singh, Pp. 21561–21578

Can the Sri Lankan endemic-endangered fish *Labeo fisheri* (Teleostei: Cyprinidae) adapt to a new habitat?

– Dinelka Thilakarathne & Gayan Hirimuthugoda, Pp. 21579–21587

An overview of the fish diversity and their threats in the Gowthami-Godavari Estuary in Andhra Pradesh, India

– Paromita Ray, Giridhar Malla, J.A. Johnson & K. Sivakumar, Pp. 21588–21604

DNA barcoding of a lesser-known catfish, *Clupisoma bastari* (Actinopterygii: Ailiidae) from Deccan Peninsula, India

– Boni Amin Laskar, Harikumar Adimalla, Shantanu Kundu, Deepa Jaiswal & Kailash Chandra, Pp. 21605–21611

Description of the larva of *Vestalis melania* (Selys, 1873) (Odonata: Calopterygidae) identified through DNA barcoding

– Don Mark E. Guadalquivir, Olga M. Nuneza, Sharon Rose M. Tabugo & Reagan Joseph T. Villanueva, Pp. 21612–21618

Checklist of Carabidae (Coleoptera) in the Chinnar Wildlife Sanctuary, a dry forest in the rain shadow region of the southern Western Ghats, India

– M.C. Sruthi & Thomas K. Sabu, Pp. 21619–21641

Zoophily and nectar-robbing by sunbirds in *Gardenia latifolia* Ait. (Rubiaceae)

– A.J. Solomon Raju, S. Sravan Kumar, L. Kala Grace, K. Punny, Tebesi Peter Raliengoane & K. Prathyusha, Pp. 21642–21650

A new population record of the Critically Endangered *Dipterocarpus bourdillonii* Brandis from the Anamalai Tiger Reserve, India

– Navendu Page, Srinivasan Kasinathan, Kshama Bhat, G. Moorthi, T. Sundarraj, Divya Mudappa & T.R. Shankar Raman, Pp. 21651–21659

Checklist of the orchids of Nokrek Biosphere Reserve, Meghalaya, India

– Bikarma Singh & Sneha, Pp. 21660–21695

Morphological assessment and partial genome sequencing inferred from matK and rbcL genes of the plant *Tacca chantrieri*

– P.C. Lalbiaknii, F. Lalnunmawia, Vanlalhruii Ralte, P.C. Vanlalnunpuia, Elizabeth Vanlalruati Ngamlai & Joney Lalnunpuui Pachauu, Pp. 21696–21703

Short Communications

Conservation status of freshwater fishes reported from Tungabhadra Reservoir, Karnataka, India

– C.M. Nagabhushan, Pp. 21704–21709

Species diversity and distribution of large centipedes (Chilopoda: Scolopendromorpha) from the biosphere reserve of the western Nghe An Province, Vietnam

– Son X. Le, Thuc H. Nguyen, Thinh T. Do & Binh T.T. Tran, Pp. 21710–21714

Eremotermes neoparadoxalis Ahmad, 1955 (Isoptera: Termitidae: Amitermitinae) a new record from Haryana, India

– Bhanupriya, Nidhi Kakkar & Sanjeev Kumar Gupta, Pp. 21715–21719

New state records of longhorn beetles (Insecta: Coleoptera: Cerambycidae) from Meghalaya, India

– Vishwanath Duttatray Hegde, Sarita Yadav, Prerna Burathoki & Bhaskar Saikia, Pp. 21720–21726

Range extension of lesser-known orchids to the Nilgiris of Tamil Nadu, India

– M. Sulaiman, K. Kiruthika & P.B. Harathi, Pp. 21727–21732

Notes

Opportunistic sighting of a Sperm Whale *Physeter macrocephalus* Linnaeus, 1758 in Lakshadweep Archipelago

– Manokaran Kamalakannan, C.N. Abdul Raheem, Dhriti Banerjee & N. Marimuthu, Pp. 21733–21735

An unusual morph of *Naja naja* (Linnaeus, 1758) (Squamata: Serpentes) from Goa, India

– Nitin Sawant, Amrut Singh, Shubham Rane, Sagar Naik & Mayur Gawas, Pp. 21736–21738

Drape Fin Barb *Oreichthys crenuchoides* (Schäfer, 2009) (Cypriniformes: Cyprinidae) a new fish species report for Nepal

– Tapil Prakash Rai, Pp. 21739–21741

New distribution record of *Gazalina chrysolopha* Kollar, 1844 (Lepidoptera: Notodontidae) in the Trans-Himalayan region of western Nepal

– Ashant Dewan, Bimal Raj Shrestha, Rubina Thapa Magar & Prakash Gaudel, Pp. 21742–21744

First record of *Xanthia (Cirrha) icteritia* (Hufnagel, 1766) (Noctuidae: Xyleninae) from India

– Muzafar Riyaz & K. Sivasankaran, Pp. 21745–21748

First report of the mymarid genus *Proarescon* Huber (Hymenoptera: Chalcidoidea: Mymaridae) from India

– Ayyavu Athithya & Sagadai Manickavasagam, Pp. 21749–21750

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