

Building evidence for conservation globally

# Journal of Threatened TAXA



10.11609/jott.2022.14.8.21487-21750

[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

26 August 2022 (Online & Print)

14(8): 21487-21750

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)

Open Access





ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher  
**Wildlife Information Liaison Development Society**  
www.wild.zooreach.org

Host  
**Zoo Outreach Organization**  
www.zooreach.org

No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road, Saravanampatti,  
Coimbatore, Tamil Nadu 641035, India

Ph: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)

Email: [sanjay@threatenedtaxa.org](mailto:sanjay@threatenedtaxa.org)

#### EDITORS

##### Founder & Chief Editor

**Dr. Sanjay Molur**

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),  
12 Thiruvannamalai Nagar, Saravanampatti, Coimbatore, Tamil Nadu 641035, India

##### Deputy Chief Editor

**Dr. Neelesh Dahanukar**

Noida, Uttar Pradesh, India

##### Managing Editor

**Mr. B. Ravichandran**, WILD/ZOO, Coimbatore, India

##### Associate Editors

**Dr. Mandar Paingankar**, Government Science College Gadchiroli, Maharashtra 442605, India

**Dr. Ulrike Streicher**, Wildlife Veterinarian, Eugene, Oregon, USA

**Ms. Priyanka Iyer**, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

**Dr. B.A. Daniel**, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

##### Editorial Board

**Dr. Russel Mittermeier**

Executive Vice Chair, Conservation International, Arlington, Virginia 22202, USA

**Prof. Mewa Singh Ph.D., FASC, FNA, FNASC, FNAPsy**

Ramanna Fellow and Life-Long Distinguished Professor, Biopsychology Laboratory, and  
Institute of Excellence, University of Mysore, Mysuru, Karnataka 570006, India; Honorary  
Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore; and Adjunct  
Professor, National Institute of Advanced Studies, Bangalore

**Stephen D. Nash**

Scientific Illustration, Conservation International, Dept. of Anatomical Sciences, Health Sciences  
Center, T-8, Room 045, Stony Brook University, Stony Brook, NY 11794-8081, USA

**Dr. Fred Pluthero**

Toronto, Canada

**Dr. Priya Davidar**

Sigur Nature Trust, Chadapatti, Mavinhalla PO, Nilgiris, Tamil Nadu 643223, India

**Dr. Martin Fisher**

Senior Associate Professor, Battcock Centre for Experimental Astrophysics, Cavendish  
Laboratory, JJ Thomson Avenue, Cambridge CB3 0HE, UK

**Dr. John Fellowes**

Honorary Assistant Professor, The Kadoorie Institute, 8/F, T.T. Tsui Building, The University of  
Hong Kong, Pokfulam Road, Hong Kong

**Prof. Dr. Mirco Solé**

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Vice-coordenador  
do Programa de Pós-Graduação em Zoologia, Rodovia Ilhéus/Itabuna, Km 16 (45662-000)  
Salobrinho, Ilhéus - Bahia - Brasil

**Dr. Rajeev Raghavan**

Professor of Taxonomy, Kerala University of Fisheries & Ocean Studies, Kochi, Kerala, India

##### English Editors

**Mrs. Mira Bhojwani**, Pune, India

**Dr. Fred Pluthero**, Toronto, Canada

**Mr. P. Ilangoan**, Chennai, India

##### Web Development

**Mrs. Latha G. Ravikumar**, ZOO/WILD, Coimbatore, India

##### Typesetting

**Mr. Arul Jagadish**, ZOO, Coimbatore, India

**Mrs. Radhika**, ZOO, Coimbatore, India

**Mrs. Geetha**, ZOO, Coimbatore India

#### Fundraising/Communications

**Mrs. Payal B. Molur**, Coimbatore, India

#### Subject Editors 2019–2021

##### Fungi

Dr. B. Shivaraju, Bengaluru, Karnataka, India

Dr. R.K. Verma, Tropical Forest Research Institute, Jabalpur, India

Dr. Vatsavaya S. Raju, Kakatiya University, Warangal, Andhra Pradesh, India

Dr. M. Krishnappa, Jnana Sahyadri, Kuvempu University, Shimoga, Karnataka, India

Dr. K.R. Sridhar, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

Dr. Gunjan Biswas, Vidyasagar University, Midnapore, West Bengal, India

##### Plants

Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India

Dr. N.P. Balakrishnan, Ret. Joint Director, BSI, Coimbatore, India

Dr. Shonil Bhagwat, Open University and University of Oxford, UK

Prof. D.J. Bhat, Retd. Professor, Goa University, Goa, India

Dr. Ferdinando Boero, Università del Salento, Lecce, Italy

Dr. Dale R. Calder, Royal Ontario Museum, Toronto, Ontario, Canada

Dr. Cleofas Cervancia, Univ. of Philippines Los Baños College Laguna, Philippines

Dr. F.B. Vincent Florens, University of Mauritius, Mauritius

Dr. Merlin Franco, Curtin University, Malaysia

Dr. V. Irudayaraj, St. Xavier's College, Palayamkottai, Tamil Nadu, India

Dr. B.S. Kholia, Botanical Survey of India, Gangtok, Sikkim, India

Dr. Pankaj Kumar, Kadoorie Farm and Botanic Garden Corporation, Hong Kong S.A.R., China

Dr. V. Sampath Kumar, Botanical Survey of India, Howrah, West Bengal, India

Dr. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Vijayasankar Raman, University of Mississippi, USA

Dr. B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantpur, India

Dr. K. Ravikumar, FRLHT, Bengaluru, Karnataka, India

Dr. Aparna Watve, Pune, Maharashtra, India

Dr. Qiang Liu, Xishuangbanna Tropical Botanical Garden, Yunnan, China

Dr. Noor Azhar Mohamed Shazili, Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr. M.K. Vasudeva Rao, Shiv Ranjani Housing Society, Pune, Maharashtra, India

Prof. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Mandar Datar, Agharkar Research Institute, Pune, Maharashtra, India

Dr. M.K. Janarthanam, Goa University, Goa, India

Dr. K. Karthikeyan, Botanical Survey of India, India

Dr. Errol Vela, University of Montpellier, Montpellier, France

Dr. P. Lakshminarasimhan, Botanical Survey of India, Howrah, India

Dr. Larry R. Noblick, Montgomery Botanical Center, Miami, USA

Dr. K. Haridasan, Pallavur, Palakkad District, Kerala, India

Dr. Analinda Manila-Fajard, University of the Philippines Los Baños, Laguna, Philippines

Dr. P.A. Sinu, Central University of Kerala, Kasaragod, Kerala, India

Dr. Afroz Alam, Banasthali Vidyapeeth (accredited A grade by NAAC), Rajasthan, India

Dr. K.P. Rajesh, Zamorin's Guruvayurappan College, GA College PO, Kozhikode, Kerala, India

Dr. David E. Boufford, Harvard University Herbaria, Cambridge, MA 02138-2020, USA

Dr. Ritesh Kumar Choudhary, Agharkar Research Institute, Pune, Maharashtra, India

Dr. Navendu Page, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

Dr. Kannan C.S. Warrior, Institute of Forest Genetics and Tree Breeding, Tamil Nadu, India

##### Invertebrates

Dr. R.K. Avasthi, Rohtak University, Haryana, India

Dr. D.B. Bastawade, Maharashtra, India

Dr. Partha Pratim Bhattacharjee, Tripura University, Suryamaninagar, India

Dr. Kailash Chandra, Zoological Survey of India, Jabalpur, Madhya Pradesh, India

Dr. Ansie Dippenaar-Schoeman, University of Pretoria, Queenswood, South Africa

Dr. Rory Dow, National Museum of Natural History Naturalis, The Netherlands

Dr. Brian Fisher, California Academy of Sciences, USA

Dr. Richard Gallon, Ilandudno, North Wales, LL30 1UP

Dr. Hemant V. Ghate, Modern College, Pune, India

Dr. M. Monwar Hossain, Jahangirnagar University, Dhaka, Bangladesh

Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.

Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK

For Focus, Scope, Aims, and Policies, visit [https://threatenedtaxa.org/index.php/JoTT/aims\\_scope](https://threatenedtaxa.org/index.php/JoTT/aims_scope)

For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>

For Policies against Scientific Misconduct, visit [https://threatenedtaxa.org/index.php/JoTT/policies\\_various](https://threatenedtaxa.org/index.php/JoTT/policies_various)

continued on the back inside cover

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.



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

Dinelka Thilakarathne<sup>1</sup> & Gayan Hirimuthugoda<sup>2</sup>

<sup>1,2</sup>Department of Zoology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka.

<sup>1</sup>Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.

<sup>1</sup>Department of Zoology, Faculty of Science, University of Ruhuna, Matara, Sri Lanka.

<sup>1</sup>dinelkat@yahoo.com (corresponding author), <sup>2</sup>nadeela@lankamail.com

**Abstract:** *Labeo fisheri* is an endemic and endangered freshwater fish of Sri Lanka. Mainly restricted to the upper reaches of the Mahaweli River basin, it has been previously reported living in deep rapids and among large rocks and boulders. An accidental record of a *Labeo fisheri* specimen from Victoria Reservoir led us to further study this habitat during the period from January to August 2017. This study was carried out to confirm the presence of a population of *Labeo fisheri* within the Victoria Reservoir and report its new habitat type in deep stagnant waters. We further investigated the food habits by analyzing the gut contents of *L. fisheri* in the Victoria Reservoir. Seven individuals were recorded from fishermen's gill net catch in three fish landing sites along Victoria Reservoir, with an average total length of  $24.80 \pm 4.30$  cm, average standard length of  $19.70 \pm 3.86$  cm and average body weight of  $197.69 \pm 107.12$  g. Based on gut content analysis, only phytoplankton, especially diatoms and cyanobacteria, were found in the gut of *L. fisheri*. This new population is facing the direct threat of fishing. Effective conservation measures are doubtful, since a fishery is well established in the Victoria Reservoir and the fishing gear used is not species-specific. More research is necessary to understand the population dynamics of *L. fisheri* in the Victoria Reservoir. In order to conserve it at this locality, community-based conservation measures are recommended.

**Keywords:** Adaptation, habitats, feeding habit, freshwater fish, gut analysis, *Labeo fisheri*, new locality, stagnant water, Victoria Reservoir.

**Editor:** J.A. Johnson, Wildlife Institute of India, Dehradun, India.

**Date of publication:** 26 August 2022 (online & print)

**Citation:** Thilakarathne, D. & G. Hirimuthugoda (2022). Can the Sri Lankan endemic-endangered fish *Labeo fisheri* (Teleostei: Cyprinidae) adapt to a new habitat? *Journal of Threatened Taxa* 14(8): 21579–21587. <https://doi.org/10.11609/jott.7621.14.8.21579-21587>

**Copyright:** © Thilakarathne & Hirimuthugoda 2022. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use, reproduction, and distribution of this article in any medium by providing adequate credit to the author(s) and the source of publication.

**Funding:** Self-funded.

**Competing interests:** The authors declare no competing interests.

**Author details:** DINELKA THILAKARATHNE (BSc and MPhil) is a Lecturer (Probationary) in the Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka. She is currently a Ph.D. student at University of Nebraska-Lincoln, USA. Animal ecology and wildlife conservation are her main research interests and she is currently conducting biodiversity and animal ecology related research in Sri Lanka. GAYAN HIRIMUTHUGODA is a Technical officer at Department of Zoology, University of Peradeniya for 10 years and was OIC of the Department's Aquarium. He is currently working as an Educator and Scientific illustrator. In relation to his interests in biodiversity, he is currently engaged in research work related to fish breeding, embryology and rearing, especially of endemic, Endangered species.

**Author contributions:** DT—specimen identification and measuring, data analysis and manuscript writing; GH—specimen collection, measuring and manuscript writing.



## INTRODUCTION

Sri Lanka and the Western Ghats of India collectively are one of the 34 biodiversity hotspots in the world (Bossuyt et al. 2004; Gunawardene et al. 2007). Sri Lanka is situated at the southeastern tip of the Indian peninsula between 6° & 9° north of the equator and 79° & 82° east of the Greenwich mean line. It is a small island (65,610 km<sup>2</sup>) with rich biological diversity. Its proximity to the equator, heterogeneity of topography and climatic conditions help to support vast diversity of both flora and fauna (Weerakoon 2012). Sri Lanka harbors a rich ichthyofaunal diversity comprising 127 species, including 61 endemics and 30 introduced species (De Silva et al. 2015; Goonatilake et al. 2020). Exotic species have been introduced to the island mainly to increase the inland fisheries, and the rest are from aquarium escapes (Goonatilake 2007). According to the distribution patterns of freshwater fish, four major zones have been identified: transition, southwestern, Mahaweli, and dry (Senanayake & Moyle 1982). Of these four zones, the Mahaweli zone and southwestern zone have the highest species diversity. This is due to the high heterogeneity of the habitats, rainfall patterns and the topography of these regions. Although the fish of the Mahaweli zone are relatively well known, it continues to produce significant discoveries despite widespread habitat destruction (Senanayake & Moyle 1982).

Taxonomic nomenclature is an important tool to identify fish species. Nomenclature of Sri Lankan freshwater fish has been extensively revised during the past two decades. For example, the genus *Rasbora* (Silva et al. 2011; Sudasinghe et al. 2020), genus *Rasboroides* (Batuwita et al. 2013; Sudasinghe et al. 2018), genus *Puntius* (Pethiyagoda et al. 2012; Sudasinghe et al. 2020, 2021), genus *Devario* (Batuwita et al. 2017; Sudasinghe et al. 2020), genus *Labeo* (Sudasinghe et al. 2018), and genus *Esomus* (Sudasinghe et al. 2019) were revised and new species have been described. Taxonomy has been always important as scientists struggle to identify species in order to understand the evolutionary relationships and complex interactions of ecosystems threatened due by anthropogenic activities. The genus *Labeo* is one such fish group that was recently revised by Sudasinghe et al. (2018).

*Labeo fisheri* (Jordan & Starks, 1917), commonly called Sri Lankan Mountain Labeo, is an endemic and endangered freshwater fish species (MOE 2012; Goonatilake et al. 2020). It is mainly confined to the upper reaches of the Mahaweli River, and is also recorded at a few locations of the lower reaches of the river. It has not

been recorded from any other river basin in Sri Lanka (Sudasinghe et al. 2018). It is found in deep, rocky areas with rock crevices where the water current is strong with rich oxygen. It is reported that *L. fisheri* is highly sensitive to these microhabitat conditions (Pethiyagoda 1991). The alteration of river morphology as a result of different hydropower projects since the 1980s has caused habitat loss for *L. fisheri*. This has probably led to a population fragmentation. In the inland fishery sector, there is a high demand for this fish not only for its delicacy, but also for perceived aphrodisiac effect of its flesh (NARA 2017). Initially an accidental observation of a specimen of *L. fisheri* in a fisherman's catch was made in 2017 from the Victoria Reservoir. This catch was otherwise composed of *Oreochromis niloticus* (around 30 individuals) and a 9 cm stretched mesh size gill net was used by the fishermen. This accidental finding prompted us to investigate the presence of *L. fisheri* in Victoria Reservoir, with the aim of establishing a new distribution record and determining diet preference in the new habitat.

## MATERIALS AND METHODS

### Study Site and study period

Fieldwork was conducted from January to August 2017. The study sites were in the Victoria Reservoir between Thennekumbura (7.281 N, 80.666 E) and Anuragama (7.247 N, 80.731 E), Sri Lanka (Figure 1; Image 1). These sites are located in the intermediate zone with elevation ranging 641–764 m. The mean annual rainfall in this area is 50–200 mm.

### Survey of *Labeo fisheri* in the Victoria reservoir

Fishermen were advised to collect any specimens of *L. fisheri* found in their daily catch and inform the members of our research team, who in turn collected the specimens during the study period. Specimens collected by fishermen were photographed using a Nikon (5300) digital camera and brought to the aquarium in the Department of Zoology, University of Peradeniya for further study. Caudal fin samples of each individual specimen were collected into 100% ethanol vials onsite, and stored at 4°C for molecular analysis. After taking the meristic and morphometric measurements, the collected specimens were dissected and the gut was separated into 90% ethanol containers for diet analysis.

### Taxonomic identification

The fish were identified using available fish guides and literature (Pethiyagoda 1991; Goonatilake 2007;

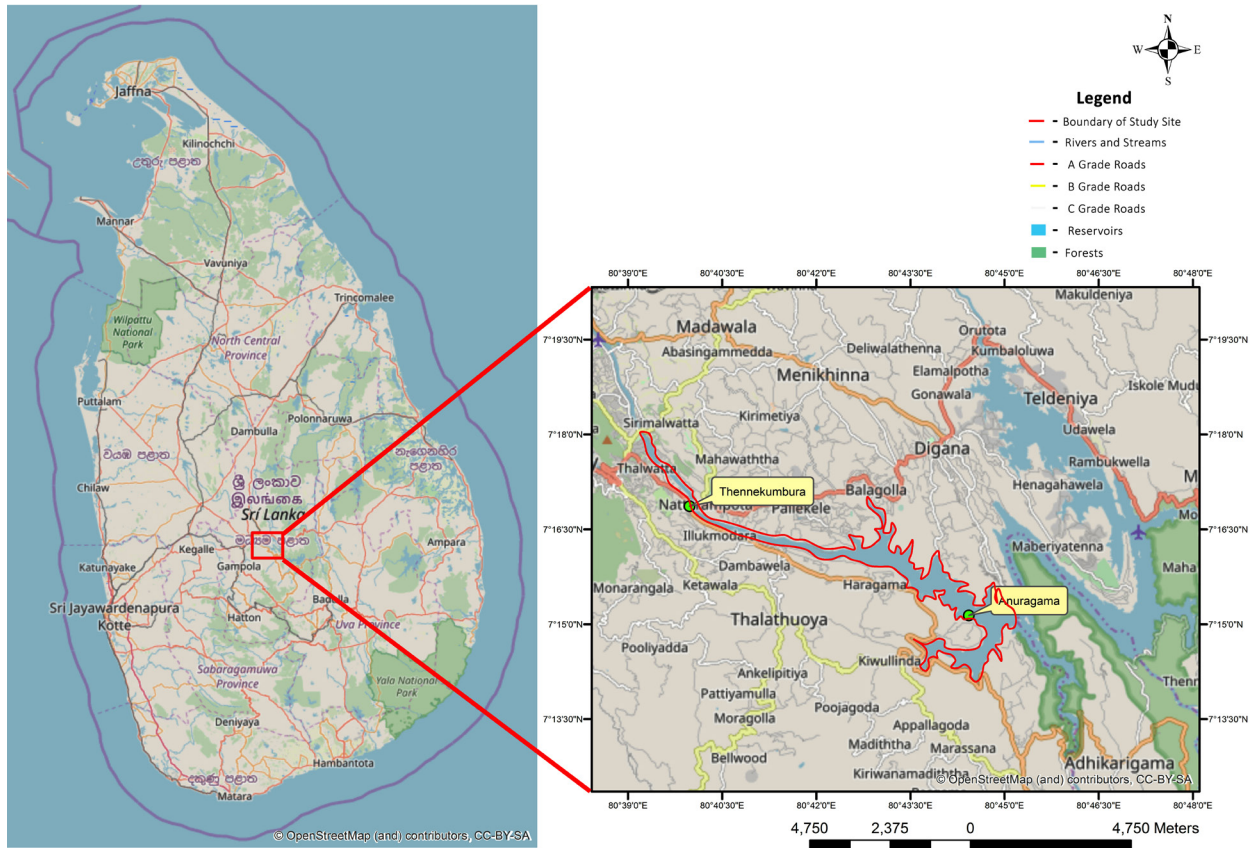


Figure 1. A Geographical map of the Victoria Reservoir where the new locality of *Labeo fisheri* was found starting from Thennekumbura to Anuragama, Sri Lanka.



Image 1. Habitat of *Labeo fisheri* in Victoria Reservoir between Thennekumbura and Anuragama, Sri Lanka. © Tithira Lakkana.

De Silva et al. 2015; Sudasinghe et al. 2018). Taxonomic analysis was done for further confirmation of the *L. fisheri* captured from Victoria Reservoir.

The morphometric measurements (total body length, standard body length, body depth, caudal peduncle depth, caudal peduncle length, pre-dorsal length, length of dorsal fin base, length of anal fin base, height of dorsal fin, height of anal fin, length of pectoral fin, length of pelvic fin, length of longest dorsal fin, spine, head length, head

width, snout length, suborbital width, length of orbit to pre-opercular angle, eye diameter, upper jaw length, and gape width) of the collected fish were measured using a digital Vernier caliper. The following meristic characters (dorsal fin spines, dorsal fin rays, anal fin spines, anal fin rays, pectoral fin rays, scales along lateral line, scales above lateral line, scales below lateral line, scales before dorsal fin and scales around caudal peduncle) of the fish were also noted (Armbruster 2012). These morphometric

measures were used in principal component analysis (PCA) in Minitab® 17.1.0 (©2013 Minitab Inc.) to compare the morphometric characters of individuals collected from Victoria Reservoir.

**Analysis of food habit of *Labeo fisheri***

The anterior part of the gut was crushed adding distilled water and the gut content was extracted. The crushed solution was used to analyze the food habit of the fish. The gut solution was mixed well and 0.05 ml was pipetted onto a clean glass slide, covered with a cover slip and observed under a Primo-star light microscope. Ten drops (0.05 ml each) of gut solution were analyzed for each individual captured from the Victoria Reservoir. Types of plankton species present in the samples were identified using plankton guides (Fernando & Weerewardhena 2002; Yatigamma & Perera 2009) and photographed using a Zeiss Primo star inverted microscope attached with camera. The relative abundance of each plankton species was calculated as follows:

$$\text{Relative abundance} = \frac{\text{Number of individuals of a particular plankton species}}{\text{Total number of individuals of all plankton species}} \times 100\%$$

Comparisons were determined using one-way ANOVA in R version 3.6.1 (R foundation for statistical computing) using 95% confidence intervals ( $\alpha = 0.05$ ).

**RESULTS**

A total of seven *Labeo fisheri* specimens were collected during this period. The specimens showed two distinct coloration patterns. Adults with olive green body coloration dorso-laterally, the color becoming lighter in the ventral region. Sub adults (<220 mm snout length) have yellowish-brown color dorso-laterally and white ventrally. Base of the fins show dark green color and it eventually turn into the reddish-orange color towards the top. All specimens have a black blotch at the base of the caudal peduncle which is 6–7 scales long and 4–5 scales high. There is a single pair of barbels which is maxillary in position. Its mouth is ventrally positioned and has a well-developed rostral fold with thick fleshy lips. The snout was covered with white color tubercles (Image 2).

The average total body length of the seven specimens collected was 24.80 ± 4.30 cm and the average standard length was 19.70 ± 3.86 cm (Table 1). The maximum recorded standard length and the body weight of *Labeo fisheri* from Victoria reservoir was 24.00 cm and 333.00 g, respectively. The average body weight of the seven specimens was 197.69 g. Morphometric characters

**Table 1. Body length and body weight of captured *Labeo fisheri* in Victoria Reservoir, Sri Lanka (N = 7).**

	Average total body length / cm	Average standard length / cm	Average body weight / g
Mean	24.80	19.70	197.69
SD	4.31	3.86	107.12
SE	0.62	0.55	15.30

SD—Standard Deviation | SE—Standard Error

expressed as a ratio to the standard length are given in the Table (2). Principal component analysis (PCA) carried out for the Victoria population revealed that this population share the same morphometric characters compared to the *L. fisheri* populations in some other Mahaweli tributaries such as Moragolla and Gatambe (Figure 2).

The dorsal fin comprised of two simple rays and 10–12 branched rays. The anal fin had two simple rays and five branched rays. The pectoral fin comprised of one simple ray and 15–18 branched rays. Ventral fins composed of one simple and eight branched rays. The lateral line is complete with 38–39 lateral line scales. There are 16–18 scales along the pre dorsal region. The formula for meristic characters could be given as; D ii/10-12; A ii/5; P i/15-18; V i/8; LL 38-39; L. lat 7 ½ / 5½.

According to the food habit analysis, a total of 21 phytoplankton species belonging to five classes were identified in the gut contents of *Labeo fisheri* recorded from the Victoria Reservoir. Bacillariophyceae (diatoms) and Cyanophyceae (cyanobacteria) were the dominant classes, although the preference for species each differed (F = 3.01; p <0.05). The most preferred were *Aulacoseira* sp., followed by *Chlorococcus* sp. and *Staurastrum cingulum*. It is also found that the diatoms *Closterium* sp., *Cyclotella* sp., *Lyngbya* sp., *Merismopedia* sp., *Nostoc* sp., *Oscillatoria* sp., *Staurastrum megacanthum*, and *Tabellaria* sp. were least preferred (Image 3; Figure 3).

**DISCUSSION**

*Labeo fisheri* has been exclusively recorded from Mahaweli river basin and mostly in the upper reaches of the river. Highest recorded elevation is Ulapane-Gampola at 562 m and lowest is Angammedilla-Polonaruwa at 80 m (NARA 2017; Sudasinghe et al. 2018). It had been earlier recorded along the Mahaweli River (upstream of the Victoria Reservoir) at Ulapane-Gampola, Getambe, Lewella, Polgolla, and Digana. They were also earlier recorded downstream of the Victoria reservoir at Randenigala, Minipe anicut, and Badulu Oya (Sudasinghe

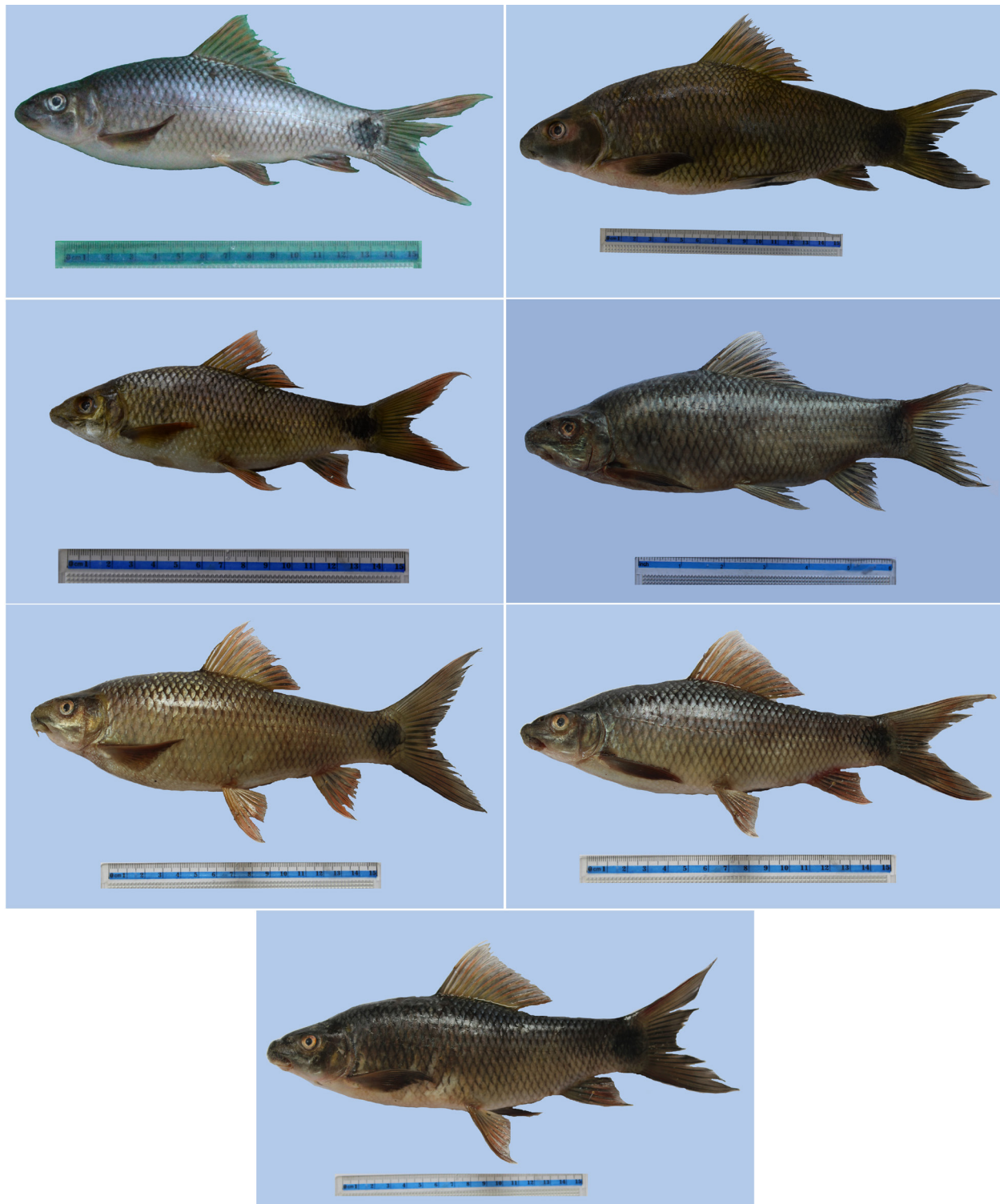


Image 2. Seven captured specimens of *Labeo fisheri* in the Victoria Reservoir, Sri Lanka show mainly two colorations. Adults have olive green dark color body on dorso-laterally and sub-adults have yellowish brown dorso-laterally. © Dinelka Thilakarathne & Gayan Hirimuthugoda.

et al. 2018). *Labeo fisheri* was also recorded in the Mahaweli tributaries at Heen Ganga, Thelgamu Oya, and Amban Ganga (NARA 2017; Sudasinghe et al. 2018). *Labeo fisheri* was last recorded in 1952 at Lewella (type locality)

and in 1991 at locations around Victoria Reservoir such as Randenigala, Digana, and Polgolla. In this study, for the first time we confirm a presence of a well-established population of *L. fisheri* in the Victoria Reservoir.

In the past *L. fisheri* was found in lentic habitat conditions. This is a strong indication that *L. fisheri* can change habitat from lotic to lentic, and introduction of exotic species such as Tilapia and tank cleaners may have played a role. *L. fisheri* was earlier recorded in deep rapids among large rock crevices and boulders, whereas juveniles and sub-adults were common in shallow regions with a moderate, non-turbulent flow (Sudasinghe et al. 2018). Specimens in this study were collected from the middle of the reservoir in stagnant waters, and the depth they were entangled in the net is around 10 m. It is possible that there are more recordings of *L. fisheri* from the Victoria Reservoir, because we only collected specimens from three landing sites out of a total of ten around the Reservoir. Therefore, more research work has to be done to confirm the presence of a viable population in the reservoir. Since fisheries in the reservoir are being monitored by National Aquaculture Development Authority (NAQDA), Sri Lanka, they are able to collect such extensive fisheries data.

Gut content analysis is the best method to get a proper understanding of fish feeding habits. Previous studies have shown that *L. fisheri* scrapes submerged rocks using thick and horny lips in the ventral mouth. Earlier Pethiyagoda (1991) reported that they only feed on algae. It is believed that *L. fisheri* in Ulapane and Gatambe feed on an aquatic plant belonging to the family Podostemaceae (NARA 2017). However, according to our findings they mainly feed on diatoms and cyanobacteria. This may be due to inadequate submerged vegetation and algae in the Victoria Reservoir.

Water entering to the Victoria reservoir during the rainy season is highly turbid due to wash off from upstream areas. At the reservoir where water is stagnant, soil particles start to settle at the bottom. Sedimentation increases and reduces the production of algae and macrophytes due to lack of oxygen in the bottom of the reservoir. Sedimentation also increases eutrophication of the reservoir. Both these factors affect the transparency of the water and limit sunlight penetration to the bottom, which can damage the food source of *L. fisheri*.

Many people use Mahaweli River for washing, bathing and dumping garbage. All these pollutants are collected and concentrated at the reservoir. Thus water pollution is observable in the reservoir. The gut content analysis of *L. fisheri* also confirmed that this reservoir was highly polluted because *Aulacoseira* sp. and some cyanobacteria were the most prominent phytoplankton species in the gut of the *L. fisheri*. *Aulacoseira* sp., and *Navicula* sp. often attain high biomass in eutrophic rivers and reservoirs (Akinyemi et al. 2007). Thus, it is a useful indicator species

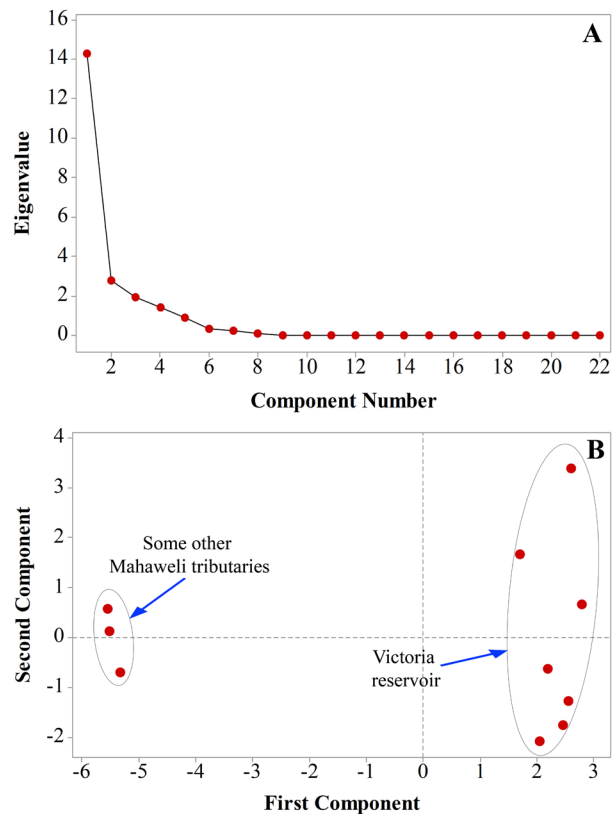


Figure 2. PCA analysis of morphometric characters of seven specimens of *Labeo fisheri* obtained from Victoria reservoir, Sri Lanka: A—Scree plot | B—Score plot.

for trophic conditions (Akinyemi et al. 2007). So, this is a clear indication that water in the Victoria Reservoir is polluted and it may have adverse effects on the native species living there. Some of the areas of Victoria Reservoir have been used as dumping sites for garbage which also contributes to the water pollution of the reservoir.

Sometimes illegal small-meshed gill nets were used to capture fish, especially at the shallow areas and at mouths of tributaries. These are potential habitats of juveniles and sub adults of *L. fisheri* though they migrate up streams for spawning and they are subjected to be caught. This new population is facing the direct threat of inland fisheries. Effective conservation measures are doubtful since fisheries are well established in the Victoria reservoir and the fishing gear is size specific but, not species specific. During the dry season from February to September, the reservoir water level goes down and they are highly vulnerable to be captured by the gill nets.

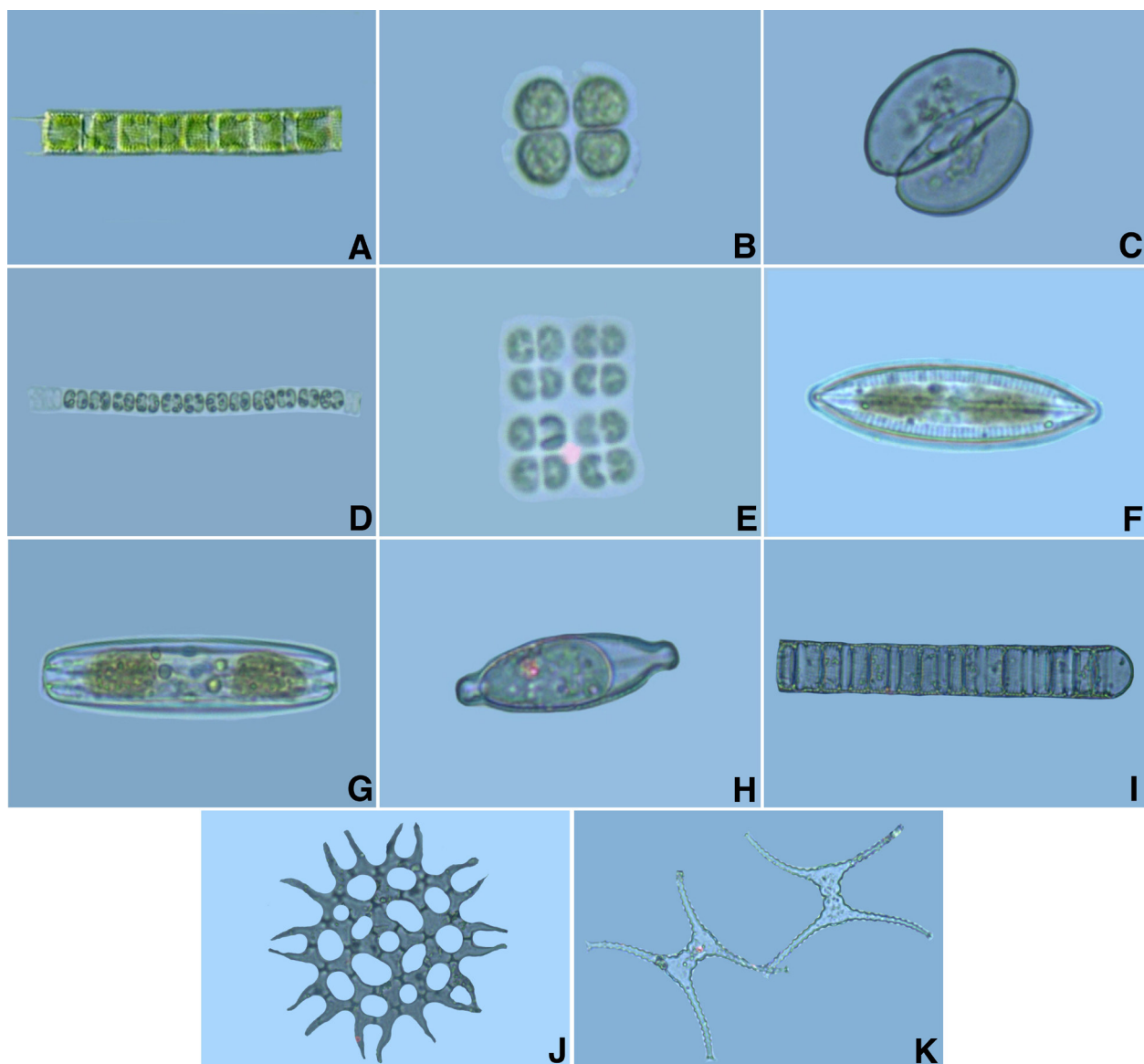
Victoria Reservoir has several invasive species of fish such as *Pterygoplichthys disjunctivus* (tank cleaner), potentially invasive *Oreochromis mossambicus* and *Oreochromis niloticus*. *Pterygoplichthys* sp. was initially an aquarium escapee, which later became well-established in



**Table 2. Morphometric characteristics of *Labeo fisheri* in Victoria Reservoir, Sri Lanka (N = 7).**

	Ratio to standard length																		
	Body depth	Caudal peduncle depth	Caudal peduncle length	Pre-dorsal length	Length of dorsal base	Length of anal base	Height of dorsal fin	Height of anal fin	Length of pectoral fin	Length of pelvic fin	Length of longest dorsal spine	Head length	Head width	Snout length	Suborbital width	Length of orbit to pre-opercula angle	Eye diameter	Upper jaw length	Gape width
Mean	0.30	0.14	0.16	0.44	0.20	0.08	0.19	0.16	0.23	0.19	0.11	0.23	0.16	0.09	0.05	0.09	0.09	0.06	0.14
SD	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.13	0.01	0.01
SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00

SD—Standard deviation of sample | SE—Standard error of sample.

**Image 3. Gut contents of *Labeo fisheri* in the Victoria Reservoir, Sri Lanka: A—*Aulacoseira* sp. | B—*Chlorococcus* sp. | C—*Cosmarium* sp. | D—*Lyngbya* sp. | E—*Merismopedia* sp. | F—*Navicula lanceolate* | G—*Navicula* sp. | H—*Navicula* sp. | I—*Oscillatoria* sp. | J—*Pediastrum duplex* | K—*Staurastrum cingulum*. © Dinelka Thilakarathne & Nayanaka Wickramasinghe.**

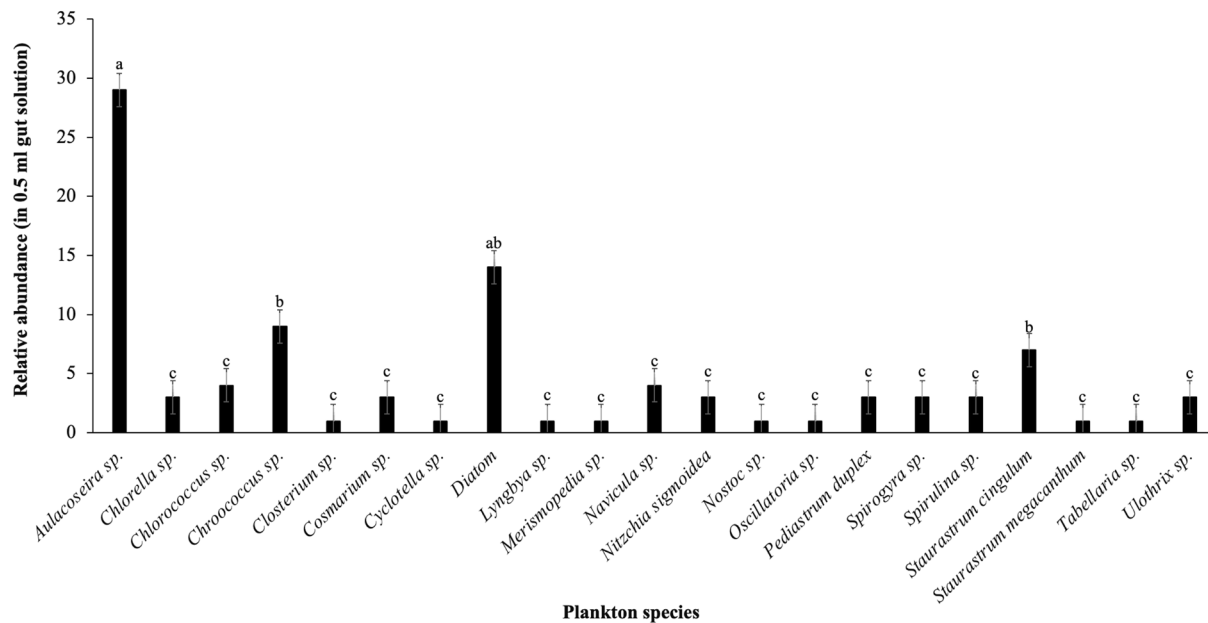


Figure 3. Relative abundance of phytoplankton in the gut contents of *Labeo fisheri* recorded from Victoria Reservoir, Sri Lanka. (a, b and c denote the significant different among relative abundance of the plankton species;  $F = 3.01$ ;  $p < 0.05$ ).

the river and reservoir systems of the country. They have a high rate of reproduction and high rate of survival during harsh environmental conditions. *Pterygoplichthys* sp. is piscivorous and feeds on the native species, especially fry, fingerling and juvenile stages (Bambaradeniya et al. 1999). *Oreochromis mossambicus* and *Oreochromis niloticus* were introduced in to reservoirs as food fish and to encourage a commercial capture fishery (De Silva 1988). They are competitive species for the food and space in the reservoir. Due to their high natality rates, survival rate and voracious feeding habit, the native fish populations declined. In the dry zone, *Oreochromis mossambicus* is considered responsible for the extinction of *L. lankae*, due to overlapped habitats and niches in the dry zone reservoirs (Pethiyagoda 2006). In the same way *Oreochromis* sp. might pose risk for the extinction of *Labeo fisheri* as well due to the niche overlapping. Unlike the *Oreochromis* sp., *L. fisheri* cannot adapt well to the new habitats. They have to compete for their usual food and other resources in the reservoir. That may cause the population reduction of *Labeo fisheri* from the reservoir in the future. Other than the *L. fisheri*, *L. rohita* was recorded from the Victoria reservoir and *Labeo heladiva* was recorded from the Rantambe reservoir downstream of the Mahaweli River. This indicates that the some of the species in the genus *Labeo* can adapt to the lentic conditions.

Most of the endemic and threatened freshwater fish are found outside protected areas with high

anthropogenic activities. Therefore, they need to be protected by protecting habitats (their catchment areas and the quality of water). Any type of development that cause harm to these habitats (such as mini hydro projects) needs to be clearly assessed. Species oriented and habitat-oriented conservation programs should be established at least for the endangered species. When the species are located outside of the protected areas, the local communities must be made aware and have to be involved in conservation programs. Such community awareness program has been successfully implemented for *Pethia bandula* (MOE 2012; Goonatilake et al. 2020). Ex situ breeding programs, translocation, reintroduction should be established with the aim of increasing the wild population. Some of these translocation programs have been highly successful while others have failed (Goonatilake 2012; Sudasinghe et al. 2018). Therefore, we need to find proper conservation measures and implement early to help safeguard the *Labeo fisheri* in the Victoria Reservoir.

## CONCLUSIONS

Endemic and endangered *Labeo fisheri* is recorded in a new locality (Victoria Reservoir) where it has not been previously recorded and this appears to be a new habitat. It is interesting that this fish was able to adapt for stagnant water apart from its original habitat (fast flowing waters).



Not only that, their food habit is slightly changed from algae to diatoms and cyanobacteria due to the availability in this reservoir. However, more research work has to be done to ensure the existence of a viable population in the reservoir and since fisheries in the reservoir is being monitored by National Aquaculture Development Authority (NAQDA), they are in a better position to collect such extensive fisheries data. Water pollution and direct exposure to the fisheries poses greatest threat to its survival. Community based conservation efforts should be taken if this species needs to be conserved at this locality.

## REFERENCES

- Abesinghe, A., H. Sudasinghe, A. Amarasinghe, F. Fareed, T. Senavirathna & M. Meegaskumbura (2020). The identity of the exotic *Pterygoplichthys* sailfin catfishes in Sri Lanka (Teleostei: Loricariidae). *Zootaxa* 4852(1): 145–150.
- Akinyemi, S.A., S.A. Nwankwo & A.O. Fasuyi (2007). Diatoms as indicator of pollution in Awon reservoir, Oya town, Nigeria. *Research Journal of Microbiology* 2(3): 228–238.
- Armbruster, J.W. (2012). Standardized measurements, landmarks, and meristic counts for cypriniform fishes. *Zootaxa* 3586: 8–16.
- Bambaradeniya, C.N.B., S.P. Ekanayake & J. Gunawardane (1999). Preliminary observations on the status of alien invasive biota in natural ecosystems of Sri Lanka. Report on alien invasive species, GBF-SSEA, Colombo, IUCN Regional biodiversity program, Asia. Colombo, Sri Lanka, 56 pp.
- Batuwita, S., M. de Silva & U. Edirisinghe (2013). A review of the danionine genera *Rasboroides* and *Horadandia* (Pisces: Cyprinidae), with description of a new species from Sri Lanka. *Ichthyological Exploration of Freshwaters* 24(2): 121–140.
- Batuwita, S., M. de Silva & S. Udugampala (2017). A review of the genus *Devario* in Sri Lanka (Teleostei: Cyprinidae), with description of two new species. *FishTaxa* 2(3): 156–179.
- Bossuyt, F., M. Meegaskumbura, N. Beenaerts, D. J. Gower, R. Pethiyagoda, K. Roelants, A. Mannaert, M. Wilkinson, M.M. Bahir, K.N.G.P.K.L. Manamendra-Arachchi, C.J. Schneider, O.V. Oommen & M.C. Milinkovitch (2004). Local endemism within the western Ghats—Sri Lanka biodiversity hotspot. *Science* 306: 479–481.
- de Silva, M., N. Hapuarachchi & T. Jayarathne (2015). *Sri Lankan Freshwater Fishes, 1<sup>st</sup> Edition*. Wildlife Conservation Society, Galle, 391 pp.
- de Silva, S.S. (1988). *Reservoirs of Sri Lanka and Their Fisheries*. FAO, Rome, Italy, 128 pp.
- de Silva, S.S. (2006). Current Status of the Reptiles of Sri Lanka, pp. 103–112. In: Bambaradeniya, C.N.B. (ed.). *Fauna of Sri Lanka: Status of Taxonomy, Research and Conservation*. The World Conservation Union, Colombo, Sri Lanka & Government of Sri Lanka, viii + 308 pp.
- Fernando, C.H. & S. R. Weerewardhena (2002). Sri Lanka freshwater fauna and fisheries, A guide to the freshwater fauna of Sri Lanka and a genesis of the fisheries. *African Journal of aquatic science* 28(1): 19–63.
- Goonatilake, S. de A. (2007). *Freshwater Fishes of Sri Lanka*. Ministry of Environment, Sri Lanka, 147 pp.
- Goonatilake, S. de A. (2012). The Taxonomic Conservation Status of the freshwater Fishes in Sri Lanka, pp. 77–80. In: *The National Red List 2012 of Sri Lanka*; conservation status of the fauna and flora. Ministry of Environment, Colombo.
- Goonatilake, S. De A., M. Fernando, O. Kotagama, N. Perera, S. Vidanage, D. Weerakoon, A.G. Daniels & L. Máiz-Tomé (2020). The National Red List of Sri Lanka: Assessment of the Threat Status of the Freshwater Fishes of Sri Lanka 2020 Colombo: IUCN, International Union for Conservation of Nature, Sri Lanka and the Biodiversity Secretariat, Ministry of Environment and Wildlife Resources, xv-106 pp.
- Gunawardene, N.R., A.E.D. Daniels, I.A.U.N. Gunatilleke, C.V.S. Gunatilleke, P.V. Karunakaran, K.G. Nayak, S. Prasad, P. Puyravaud, B.R. Ramesh, K.A. Subramanian & G. Vasanthy (2007). A brief overview of the Western Ghats – Sri Lanka biodiversity hotspot. *Current Science* 93: 1562–1568.
- Minitab 17 Statistical Software (2010). [Computer software]. State College, PA: Minitab, Inc. (www.minitab.com).
- MOE (2012). *The National Red List 2012 of Sri Lanka*; Conservation Status of the Fauna and Flora. Ministry of Environment, Colombo, Sri Lanka, 476 pp.
- NARA (2017). Report on surveying of *Labeo fisheri* in Mahaweli river at Moragolla Hydropower project area. Performance report- Fish survey. National Aquatic Resources Research and Development Agency, Sri Lanka.
- Pethiyagoda, R. (1991). *Freshwater fishes of Sri Lanka*. Colombo: The Wildlife Heritage Trust of Sri Lanka, 362 pp.
- Pethiyagoda, R. (2006). Conservation of Sri Lankan Freshwater Fishes in The Fauna of Sri Lanka: status of Taxonomy, conservation and research. Bambaradeniya CNB (eds). IUCN, Colombo, Sri Lanka.
- Pethiyagoda, R., M. Meegaskumbura & K. Maduwage (2012). Synopsis of the South Asian fishes referred to *Puntius* (Pisces: Cyprinidae). *Ichthyological Exploration of Freshwaters* 23: 69–95.
- Senanayake, F.R. & P.B. Moyle (1982). Conservation of Freshwater Fishes of Sri Lanka. *Biological Conservation* 22: 181–195.
- Silva, A., K. Maduwage & R. Pethiyagoda (2011). A review of the genus *Rasbora* in Sri Lanka, with description of two new species (Teleostei: Cyprinidae). *Ichthyological Exploration of Freshwaters* 21: 27–50.
- Sudasinghe, H., J. Herath, R. Pethiyagoda & M. Meegaskumbura (2018). Undocumented translocations spawn taxonomic inflation in Sri Lankan fire rasboras (Actinopterygii, Cyprinidae). *PeerJ* 6: e6084. <https://doi.org/10.7717/peerj.6084>
- Sudasinghe, H., R. H. T. Ranasinghe, S. de A. Goonatilake & M. Meegaskumbura (2018). A review of the genus *Labeo* (Teleostei: Cyprinidae) in Sri Lanka. *Zootaxa* 4486(3): 201–235.
- Sudasinghe, H., R. Pethiyagoda & M. Meegaskumbura (2019). A review of the genus *Esomus* in Sri Lanka (Teleostei: Cyprinidae). *Ichthyological Exploration of Freshwaters* 2019: 1–18. <https://doi.org/10.23788/IEF-1106>
- Sudasinghe, H., R. Pethiyagoda, R. H. T. Ranasinghe, R. Raghavan, N. Dahanukar & M. Meegaskumbura (2020). A molecular phylogeny of the freshwater-fish genus *Rasbora* (Teleostei: Cyprinidae) in Sri Lanka reveals a remarkable diversification and a cryptic species. *Journal of Zoological Systematics and Evolutionary Research* 58: 1076–1110.
- Sudasinghe, H., R. Pethiyagoda & M. Meegaskumbura (2020). Evolution of Sri Lanka's Giant Danios (Teleostei: Cyprinidae: Devario): teasing apart species in a recent diversification. *Molecular Phylogenetics and Evolution* 149: 106853. <https://doi.org/10.1016/j.ympev.2020.106853>
- Sudasinghe, H., R. Pethiyagoda, R. Raghavan, N. Dahanukar, L. Rüber & M. Meegaskumbura (2020). Diversity, phylogeny and biogeography of *Systomus* (Teleostei, Cyprinidae) in Sri Lanka. *Zoologica Scripta* 49: 710–731.
- Sudasinghe, H., T. Ranasinghe, J. Herath, K. Wijesooriya, R. Pethiyagoda, L. Rüber & M. Meegaskumbura (2021). Molecular phylogeny and phylogeography of the freshwater-fish genus *Pethia* (Teleostei: Cyprinidae) in Sri Lanka. *BMC Ecology and Evolution* 21: 203. <https://doi.org/10.1186/s12862-021-01923-5>
- Tamura, K., G. Stecher, D. Peterson, A. Filipski & S. Kumar (2013). MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Molecular Biology and Evolution* 30: 2725–2729.
- Weerakoon, D. (2012). Analysis of Faunal Groups, pp. 145–147. In: Weerakoon, D.K. & S. Wijesundara (eds.). *The National Red List 2012 of Sri Lanka*; Conservation Status of the Fauna and Flora. Ministry of Environment, Colombo, Sri Lanka.
- Yatigammana, S. & B. Perera (2009). *A guide to common planktons in Sri Lanka*. Department of Zoology, Faculty of Science, University of Peradeniya, 31 pp.





Dr. George Mathew, Kerala Forest Research Institute, Peechi, India  
Dr. John Noyes, Natural History Museum, London, UK  
Dr. Albert G. Orr, Griffith University, Nathan, Australia  
Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium  
Dr. Nancy van der Poorten, Toronto, Canada  
Dr. Kareen Schnabel, NIWA, Wellington, New Zealand  
Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India  
Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India  
Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India  
Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India  
Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India  
Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India  
Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain  
Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong  
Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India  
Dr. M. Nithyanandan, Environmental Department, La Ala Al Kuwait Real Estate. Co. K.S.C., Kuwait  
Dr. Himender Bharti, Punjabi University, Punjab, India  
Mr. Purnendu Roy, London, UK  
Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan  
Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India  
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam  
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India  
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore  
Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.  
Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India  
Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil  
Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany  
Dr. James M. Carpenter, American Museum of Natural History, New York, USA  
Dr. David M. Claborn, Missouri State University, Springfield, USA  
Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand  
Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil  
Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India  
Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia  
Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia  
Dr. Siddharth Kulkarni, The George Washington University, Washington, USA  
Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India  
Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia  
Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia  
Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.  
Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan  
Dr. Keith V. Wolfe, Antioch, California, USA  
Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA  
Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic  
Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway  
Dr. V.P. Uniyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India  
Dr. John T.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India  
Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

#### Fishes

Dr. Neelesh Dahanukar, IISER, Pune, Maharashtra, India  
Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México  
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore  
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India  
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK  
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India  
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia  
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India  
Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India  
Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India  
Dr. R. Ravinesh, Gujarat Institute of Desert Ecology, Gujarat, India

#### Amphibians

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India  
Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

#### Reptiles

Dr. Gernot Vogel, Heidelberg, Germany  
Dr. Raju Vyas, Vadodara, Gujarat, India  
Dr. Pritpal S. Soorae, Environment Agency, Abu Dhabi, UAE.  
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey  
Prof. Chandrashekher U. Rivonker, Goa University, Taleigao Plateau, Goa, India  
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India  
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

#### Birds

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia  
Mr. H. Byju, Coimbatore, Tamil Nadu, India  
Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK  
Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India  
Dr. J.W. Duckworth, IUCN SSC, Bath, UK  
Dr. Rajah Jayapal, SACON, Coimbatore, Tamil Nadu, India  
Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India  
Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India  
Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India  
Mr. J. Praveen, Bengaluru, India  
Dr. C. Srinivasulu, Osmania University, Hyderabad, India  
Dr. K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA  
Dr. Gombobaatar Sunde, Professor of Ornithology, Ulaanbaatar, Mongolia  
Prof. Reuven Yosef, International Birding & Research Centre, Eilat, Israel  
Dr. Taej Mundkur, Wetlands International, Wageningen, The Netherlands  
Dr. Carol Inskipp, Bishop Auckland Co., Durham, UK  
Dr. Tim Inskipp, Bishop Auckland Co., Durham, UK  
Dr. V. Gokula, National College, Tiruchirappalli, Tamil Nadu, India  
Dr. Arkady Lelej, Russian Academy of Sciences, Vladivostok, Russia  
Dr. Simon Dowell, Science Director, Chester Zoo, UK  
Dr. Mário Gabriel Santiago dos Santos, Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, Portugal  
Dr. Grant Connette, Smithsonian Institution, Royal, VA, USA  
Dr. M. Zafar-ul Islam, Prince Saud Al Faisal Wildlife Research Center, Taif, Saudi Arabia

#### Mammals

Dr. Giovanni Amori, CNR - Institute of Ecosystem Studies, Rome, Italy  
Dr. Anwaruddin Chowdhury, Guwahati, India  
Dr. David Mallon, Zoological Society of London, UK  
Dr. Shomita Mukherjee, SACON, Coimbatore, Tamil Nadu, India  
Dr. Angie Appel, Wild Cat Network, Germany  
Dr. P. O. Nameer, Kerala Agricultural University, Thrissur, Kerala, India  
Dr. Ian Redmond, UNEP Convention on Migratory Species, Lansdown, UK  
Dr. Heidi S. Riddle, Riddle's Elephant and Wildlife Sanctuary, Arkansas, USA  
Dr. Karin Schwartz, George Mason University, Fairfax, Virginia.  
Dr. Lala A.K. Singh, Bhubaneswar, Orissa, India  
Dr. Mewa Singh, Mysore University, Mysore, India  
Dr. Paul Racey, University of Exeter, Devon, UK  
Dr. Honnavalli N. Kumara, SACON, Anaikatty P.O., Coimbatore, Tamil Nadu, India  
Dr. Nishith Dharaiya, HNG University, Patan, Gujarat, India  
Dr. Spartaco Gippoliti, Socio Onorario Società Italiana per la Storia della Fauna "Giuseppe Altobello", Rome, Italy  
Dr. Justus Joshua, Green Future Foundation, Tiruchirappalli, Tamil Nadu, India  
Dr. H. Raghuram, The American College, Madurai, Tamil Nadu, India  
Dr. Paul Bates, Harison Institute, Kent, UK  
Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA  
Dr. Dan Challender, University of Kent, Canterbury, UK  
Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK  
Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA  
Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India  
Prof. Karan Bahadur Shah, Budhanilakantha Municipality, Kathmandu, Nepal  
Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraja, Indonesia  
Dr. Hemanta Kafley, Wildlife Sciences, Tarleton State University, Texas, USA

#### Other Disciplines

Dr. Aniruddha Belsare, Columbia MO 65203, USA (Veterinary)  
Dr. Mandar S. Paingankar, University of Pune, Pune, Maharashtra, India (Molecular)  
Dr. Jack Tordoff, Critical Ecosystem Partnership Fund, Arlington, USA (Communities)  
Dr. Ulrike Streicher, University of Oregon, Eugene, USA (Veterinary)  
Dr. Hari Balasubramanian, EcoAdvisors, Nova Scotia, Canada (Communities)  
Dr. Rayanna Hellem Santos Bezerra, Universidade Federal de Sergipe, São Cristóvão, Brazil  
Dr. Jamie R. Wood, Landcare Research, Canterbury, New Zealand  
Dr. Wendy Collinson-Jonker, Endangered Wildlife Trust, Gauteng, South Africa  
Dr. Rajeshkumar G. Jani, Anand Agricultural University, Anand, Gujarat, India  
Dr. O.N. Tiwari, Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India  
Dr. L.D. Singla, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India  
Dr. Rupika S. Rajakaruna, University of Peradeniya, Peradeniya, Sri Lanka  
Dr. Bahar Baviskar, Wild-CER, Nagpur, Maharashtra 440013, India

#### Reviewers 2019–2021

Due to paucity of space, the list of reviewers for 2018–2020 is available online.

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

**Journal of Threatened Taxa** is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:  
The Managing Editor, JoTT,  
c/o Wildlife Information Liaison Development Society,  
No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road,  
Saravanampatti, Coimbatore, Tamil Nadu 641035, India  
ravi@threatenedtaxa.org



[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at [www.threatenedtaxa.org](http://www.threatenedtaxa.org). All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

August 2022 | Vol. 14 | No. 8 | Pages: 21487–21750

Date of Publication: 26 August 2022 (Online & Print)

DOI: 10.11609/jott.2022.14.8.21487-21750

#### 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, Vanlalhrui Ralte, P.C. Vanlalnunpuia, Elizabeth Vanlalruati Ngamlai & Joney Lalnunpuii Pachuau, 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

Publisher & Host

